KLEINZEE SOLAR PV FACILITY AND ASSOCIATED GRID CONNECTION INFRASTRUCTURE, NORTHERN CAPE PROVINCE

Basic Assessment Report

May 2023

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PROJECT DETAILS

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Title	:	Basic Assessment Process: Report for the Kleinzee Solar PV Facility and associated gid connection infrastructure, Northern Cape Province
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PURPOSE OF THE BASIC ASSESSMENT REPORT AND INVITATION TO COMMENT

Energy Team (Pty) Ltd has appointed Savannah Environmental as the independent environmental consultant to undertake the Basic Assessment (BA) for the Kleinzee Solar PV facility and associated grid connection infrastructure, Northern Cape. The BA process is being undertaken in accordance with the requirements of the 2014 EIA Regulations promulgated in terms of the National Environmental Management Act (NEMA; Act No. 107 of 1998).

This Basic Assessment (BA) report represents the findings of the BA process and contains the following chapters:

- **Chapter 1** provides background to Kleinzee Solar PV Facility and associated grid connection infrastructure and the BA process.
- **Chapter 2** provides a description of Kleinzee Solar PV Facility and associated grid connection infrastructure.
- **Chapter 3** outlines strategic regulatory and legal context for energy planning in South Africa and specifically relating to the project.
- **Chapter 4** describes the need and desirability and alternatives considered for the Kleinzee Solar Facility.
- **Chapter 5** outlines the approach to undertaking the basic assessment process.
- **Chapter 6** describes the existing biophysical and social environment within and surrounding the broader study and development area.
- **Chapter 7** provides an assessment of the potential issues and impacts associated with the solar PV facility and associated grid connection infrastructure and presents recommendations for the mitigation of significant impacts.
- **Chapter 8** provides an assessment of the potential for cumulative impacts.
- **Chapter 9** presents the conclusions and recommendations based on the findings of the BA Report.

Chapter 10 provides references used in the compilation of the BA Report.

The BA report will be available for public review from **3 May 2023 – 2 June 2023** the Savannah Environmental website (https://savannahsa.com/public-documents/energy-generation). All comments received will be recorded and responded to in a Comments and Responses Report, will be included in Appendix C8 of the final BA Report.

DEFINITIONS AND TERMINOLOGY

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Commence: The start of any physical activity, including site preparation and any other activity on site furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study if such investigation or feasibility study does not constitute a listed activity or specified activity.

Commercial Operation date: The date after which all testing and commissioning has been completed and is the initiation date to which the seller can start producing electricity for sale (i.e., when the project has been substantially completed).

Commissioning: Commissioning commences once construction is completed. Commissioning covers all activities including testing after all components of the solar PV infrastructure installed.

Construction: Construction means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity. Construction begins with any activity which requires Environmental Authorisation.

Cumulative impacts: Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present, or reasonably foreseeable future activities (e.g., discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period and can include both direct and indirect impacts.

Decommissioning: To take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. This usually occurs at the end of the life of a facility.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g., noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation, or maintenance of an activity and are generally obvious and quantifiable.

Disturbing noise: A noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or

whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Emergency: An undesired/ unplanned event that results in a significant environmental impact and requires the notification of the relevant statutory body, such as a local authority.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that are made up of:

i. The land, water, and atmosphere of the earth.
ii. Micro-organisms, plant, and animal life.
iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental impact: An action or series of actions that influence the environment.

Environmental impact assessment: Environmental Impact Assessment, as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting, and communicating information that is relevant to the consideration of that application.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental management programme: An operational plan that organises and co-ordinates mitigation, rehabilitation, and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

Heritage: That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act of 2000).

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800.

Indirect impacts: Indirect or induced changes that may occur because of the activity (e.g., the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken, or which occur at a different place because of the activity.

Interested and affected party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups, and the public.

Method statement: A written submission to the ECO and the site manager (or engineer) by the EPC Contractor in collaboration with his/her EO.

Mitigation hierarchy: The mitigation hierarchy is a framework for managing risks and potential impacts related to biodiversity and ecosystem services. The mitigation hierarchy is used when planning and implementing development projects, to provide a logical and effective approach to protecting and conserving biodiversity and maintaining important ecosystem services. It is a tool to aid in the sustainable management of living, natural resources, which provides a mechanism for making explicit decisions that balance conservation needs with development priorities

No-go areas: Areas of environmental sensitivity that should not be impacted on or utilised during the development of a project as identified in any environmental reports.

Pollution: A change in the environment caused by substances (radio-active or other waves, noise, odours, dust, or heat emitted from any activity, including the storage or treatment or waste or substances.

Pre-construction: The period prior to the commencement of construction, this may include activities which do not require Environmental Authorisation (e.g., geotechnical surveys).

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare."

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Significant impact: An impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.

ACRONYMS

BGIS	Biodiversity Geographic Information System
BOP	Balance of Plant
CBA	Critical Biodiversity Area
DFFE	Department Forestry, Fisheries of the Environment (National)
DWS	Department of Water and Sanitation
CSIR	Council for Scientific and Industrial Research
DM	District Municipality
DMRE	Department of Mineral Resources Energy
EAP	Environmental Assessment Practitioner
EGIS	Environmental Geographic Information System
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
EN	Endangered
EP	Equator Principles
ESA	Ecological Support Area
GA	General Authorisation
IBA	Important Bird Area
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IEP	Integrated Energy Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
IRP	Integrated Resource Plan
IUCN	International Union for Conservation of Nature
I&AP	Interested and Affected Party
Km	Kilometre
kWh	Kilowatt hour
LC	Least Concern
LM	Local Municipality
M	Metre
m^2	Square meters
m^3	Cubic meters
mamsl	Metres Above Mean Sea Level
MW	Megawatts
NDP	National Development Plan
NEMA	National Environmental Management Act (No. 107 of 1998)
NEM:BA	National Environmental Management: Biodiversity Act (No. 10 of 2004)
NEM: WA	National Environmental Management: Waste Act (No. 59 of 2008)
NFA	National Forests Act (No. 84 of 1998)
NFEPA	National Freshwater Ecosystem Priority Area
NHRA	National Heritage Resources Act (No. 25 of 1999)
NT	Near Threatened
NWA	National Water Act (No. 36 of 1998)
ONA	Other Natural Area

PA	Protected Area
PV	Photovoltaic
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
TOPS	Threatened or Protected Species
VU	Vulnerable

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EXECUTIVE SUMMARY

Energy Team (Pty) Ltd is proposing the development of the Kleinzee Solar PV Facility, a photovoltaic (PV) solar energy facility and associated grid connection infrastructure to add new capacity to the national electricity grid. A project site consisting of five affected properties, has been identified as the preferred area for the development of the solar PV facility and the associated infrastructure:

PV Facility: Portion 4 of the Farm Zonnekwa 328
Grid line corridor: Portions 2, 3 and 4 of the Farm Zonnekwa 328, and Farm Zonnekwa 326 and Portion 1 of Farm Zonnekwa 326

A main access road up to ~4km in length and up to 8m in width will provide access to the facility, and ultimately to both planned solar PV sites (that is, a shared access route). The access to the facility/ies will be via an existing (unnamed) gravel road off the DR2964 between Komaggas and Kleinsee. This gravel road is well established, however it's likely portions of this road will require upgrading to accommodate the movement of heavy vehicles. This existing road traverses only Farm Zonnkewa 326. From this point, a planned access road up to ~7.5km in length and up to 8m in width located within the 300m grid connection corridor will traverse Farm Zonnkewa 326, Portion 1 of Farm Zonnekwa 326, Portions 2, 3 and 4 of Farm Zonnkewa 328.

A development area[1] of approximately 300ha has been identified within the study area by the Applicant. This development area has been fully considered within this Basic Assessment (BA) process and assessed in terms of its suitability from an environmental and social perspective. The development area is suitable for the construction of a contracted capacity of up to 200MW PV facility and provided the opportunity for the optimal placement of the infrastructure, ensuring avoidance of major identified environmental sensitivities. The infrastructure associated with the PV facility includes:

- Solar PV array comprising PV modules and mounting structures
- Inverters and transformers
- Low voltage cabling between the PV modules to the inverters
- 33kV cabling between the project components and the facility substation
- 132kV onsite facility substation
- 132kV power line to connect to the grid at the authorised Zonnequa Collector Substation within a 300m wide and 8.5km long corridor
- Battery Energy Storage System (BESS)
- Site offices and maintenance buildings, including workshop areas for maintenance and storage
- Laydown areas
- Site access and internal roads

From a regional perspective, the Kleinzee area is considered favourable for the development of a solar energy facility by virtue of prevailing climatic conditions, relief, aspect, the extent of the affected property, the availability of a direct grid connection (i.e., a point of connection to the national grid) and the availability of land on which the development can take place. The full extent of the development area and grid connection corridor is located within the Springbok Renewable Energy Development Zone (REDZ)[2] as well as

[1] The development area is that identified area where the 200MW PV facility is planned to be located. This area has been selected as a practicable option for the facility, considering technical preference and constraints. The development area is ~300ha in extent.
[2] The REDZ are zones identified by the Department of Forestry Fisheries and the Environment (DFFE) as geographical areas of strategic importance for the development of large-scale solar PV and wind energy development activities and which have been earmarked for the development of renewable energy facilities within South Africa as per GNR114 of February 2018 and GNR142 of February 2021.

the Northern Corridor of the Strategic Transmission Corridors[3]. Four authorised wind farm facilities are located north and west of the development area for the Kleinzee Solar PV Facility. The proposed site for the Kleinzee Solar PV Facility falls within the already authorised development area of the Namas Wind Energy Facility.

The facility is proposed in response to identified objectives of the national and provincial government, and local and district municipalities to develop renewable energy facilities for power generation purposes. It is the Developer's intention to bid the solar PV facility under the Department of Mineral Resource and Energy's (DMRE) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme or other public or private off-taker programmes. The development of the facility will assist in achieving the energy mix (through a process of diversification) as set out in the Integrated Resources Plan (IRP), as well as aiding in the stabilisation of the country's electricity supply.

As the project has the potential to impact on the environment, an Environmental Impact Assessment process is required to be completed in support of an application for Environmental Authorisation prior to the commencement of construction and operation of the Kleinzee Solar PV Facility and Grid Connection.

Evaluation of Kleinzee Solar PV Facility and Grid Connection

The preceding chapters of this report together with the specialist studies contained within **Appendices D-I** provide a detailed assessment of the potential impacts that may result from the development of proposed Kleinzee Solar PV Facility and associated infrastructure. This chapter concludes the environmental assessment of Kleinzee Solar PV Facility by providing a summary of the results and conclusions of the assessment of the development area. In so doing, it draws on the information gathered as part of the BA process, the knowledge gained by the environmental specialists and the EAP and presents a combined and informed opinion of the environmental impacts associated with the project.

No environmental fatal flaws were identified in the detailed specialist studies conducted, provided that the recommended mitigation measures are implemented. These measures include, amongst others, the avoidance of no-go features or buffers within the project development area by the development footprint and the undertaking of monitoring, as specified by the specialists.

The potential environmental impacts associated with the Kleinzee Solar PV Facility and grid connection infrastructure identified and assessed through the BA process include:

- Impacts on ecology, including flora and fauna
- Impacts on avifauna
- Impacts to soils and agricultural potential
- Impacts on heritage resources, including archaeology and palaeontology
- Visual impacts
- Social impacts.

Impacts on Ecology (including Flora and Fauna)

The Terrestrial Biodiversity Assessment (**Appendix D**) undertaken determined that there are no impacts associated with the Kleinzee Solar PV Facility and associated infrastructure that cannot be mitigated to an acceptable level and as such, the assessed layout was considered acceptable.

[3] The Strategic Environmental Assessment for Electricity Grid Infrastructure (EGI) in South Africa has identified five Strategic Transmission Corridors that are of strategic importance for the rollout of the supporting large-scale electricity transmission and distribution infrastructure in terms of Strategic Integrated Project 10: Electricity Transmission and Distribution. The Northern Corridor is one of these five Strategic Transmission Corridors as per GNR113 of February 2018.

The Kleinzee PV Facility falls within the Namaqualand Stranded vegetation type, which has been impacted to a relatively limited extent by transformation to date and is classified as Least Threatened. The field assessment found that the site has a relatively low abundance of plant SCC and only *Wahlenbergia asparagoides* (VU) was observed present. There are no significant biodiversity features within the site, and it is considered relatively low sensitivity. The development footprint falls within a NPAES Priority Focus Area and identified expansion area for the Namakwa National Park, with the loss of 300 ha representing less than 0.01% of the Focus Area. Solar PV facilities do not have a large edge effect in terms of noise and disturbance, so their proximity to protected areas is not likely to represent a significant threat to biodiversity.

The development is deemed acceptable from a terrestrial ecological impact perspective, with no impacts that cannot be mitigated. It is the specialist opinion that the development should be authorised subject to mitigation and avoidance measures.

Impacts on Avifauna

The Avifauna Impact Assessment (**Appendix E**), which considered the results of a desktop and two-season site visit of birds on the proposed Kleinzee Solar Energy Facility site indicated a medium level of activity in terms of Passage Rates of Priority species, and medium activity of Red Data species. Low overall species richness (46 species) and medium-low reporting rates for the four species of Priority birds. National Bird Atlas data (SABAP2) suggests that six Red Data species can occur in the area, but only one was seen on this small site. The DFFE Screening Tool Assessment indicated a low risk for the Avian theme. No small, threatened larks (Vulnerable Red Lark, or Near Threatened Barlow's Lark) were recorded on site. This suggests that the avian impact will be low for the proposed PV solar farm site at Kleinsee. The power lines exporting power to the grid pose a medium risk to the birds after mitigation, given their short length and the ability for the proposed line to be aligned and pylons staggered with those of the Gromis-Juno 400kV power line.

Due to the low avian diversity, low Passage Rates, and paucity of highly threatened species on this small site no mitigation measures are required for the solar farm, but the best form of mitigation is the staggered pylon idea (Pallett et al. 2022). No fatal flaws were identified during the assessment. The avian specialists consider the site and facility suitable for development from an avian perspective.

Impacts on Land Use, Soils and Agricultural Potential

Following the data analysis and impact assessment, the Kleinzee Solar PV Facility and associated infrastructure is considered an acceptable development within the development area in terms of soil and agricultural potential (**Appendix F**).

The total area assessed, has Low land capability and sensitivity. The land capability was calculated by using 30% terrain and soil, and 40% climate capability of the area. The calculations showed that Low land capability has been assigned to soils of the Namib and Coega soil form because of the regic sand and shallow depth that has a very low water holding capacity and structure. The low land capabilities of the soils within the development area is confirmed by the absence of crop field boundaries within the Kleinzee Solar PV Facility development area. With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of impacts of Kleinzee Solar PV is expected to have a Medium and Low impact on soils and agricultural potential, depending on which impact is being considered.

Impacts on Heritage Resources (Including Archaeology and Palaeontology)

The overall archaeological sensitivity of the Namaqualand with regard to the preservation of Early, Middle and Later Stone Age archaeology as well as Khoe and San heritage, early colonial settlement and the Namaqualand Copper Mining landscape is regarded as very high. The field assessment conducted for this project has demonstrated that the specific area proposed for development has low sensitivity for impacts to

significant heritage resources. None of the heritage resources identified fall within the area PV layout provided and as such, no direct impact to any heritage resources is anticipated.

No impact to significant palaeontological heritage is therefore anticipated. However, it is recommended that the Chance Fossil Finds Procedure (**Appendix G**) is implemented during the course of construction activities. The field assessment conducted for this project has demonstrated that the specific area proposed for development has low sensitivity for impacts to significant archaeological heritage. There is no objection to the proposed development of the Kleinzee Solar PV Facility in terms of impacts to heritage resources with the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of impacts of the Kleinzee Solar PV Facility will be low. From the outcomes of the studies undertaken, it is concluded that the solar PV facility can be developed.

Visual Impacts

The significance of the visual impacts for the Kleinzee Solar PV Facility and its associated grid connection infrastructure is expected to range from moderate to low due to the undeveloped landscape and remote location of the project infrastructure. There are a very limited number of potential sensitive visual receptors within a 3km radius of the proposed facility. Likelihood of visual impacts on sensitive visual receptors, including the Namakwa National Park, and observers travelling the along the secondary road are not considered to be fatal flaws. The site is located well outside of the National Park viewshed protection zone. Mitigation measures have been proposed to reduce the significance of the anticipated visual impacts, but they are considered to be good practice and should be implemented and maintained throughout the construction, operation and decommissioning phases of the proposed facility. If mitigation is undertaken as recommended, it is concluded that the significance of most of the anticipated visual impacts will remain at or be managed to acceptable levels, allowing the solar PV facility and associated grid connection infrastructure to be authorised.

Social Impacts

The social impacts identified (including all positive and negative impacts) will be either of a low or medium significance. No negative impacts with a high significance rating have been identified to be associated with the development of the Kleinzee Solar PV Facility and associated infrastructure. All negative social impacts are within acceptable limits with no impacts considered as unacceptable from a social perspective. The recommendations proposed for the project are appropriate and suitable for the mitigation of the negative impacts and the enhancement of the positive impacts. Kleinzee Solar PV Facility is supported at a national, provincial, and local level, and that the proposed project will contribute positively towards a number of targets and policy aims.

Based on the findings of the SIA (**Appendix I**) the proposed establishment of the Kleinzee Solar PV is supported.

Assessment of Cumulative Impacts

Cumulative impacts and benefits on various environmental and social receptors will occur to varying degrees with the development of several renewable energy facilities in South Africa and within the surrounding areas of the development area. The degree of significance of these cumulative impacts is difficult to predict without detailed studies based on more comprehensive data/information on each of the receptors and the site-specific developments. The alignment of renewable energy developments with South Africa's National Energy Response Plan and the global drive to move away from the use of non-renewable energy resources and to reduce greenhouse gas emissions is undoubtedly positive. The economic benefits of renewable energy developments at a local, regional, and national level have the potential to be significant.

Based on the specialist cumulative assessment and findings (**Appendix D** to **Appendix I** and **Chapter 8** of the BA), the development of the Kleinzee Solar PV facility, and its contribution to the overall impact of all proposed

wind energy facilities within a 30km radius, it can be concluded that cumulative impacts will be of a low to moderate significance. There are no impacts or risks identified to be considered as unacceptable with the development of Kleinzee Solar PV and other renewable energy facilities within the surrounding area. In addition, no impacts which will result in whole-scale change are expected.

Environmental Costs of the Solar PV Facility versus Benefits of the Solar PV Facility

Environmental costs (including those to the natural environment, economic and social environment) can be anticipated at a local and site-specific level and are considered acceptable provided the mitigation measures as outlined in the Basic Assessment Report and the EMPr are implemented and adhered to. No fatal flaws have been identified.

These environmental costs could include:

» A loss of biodiversity, flora and fauna due to the clearing of land for the construction and utilisation of land for the PV facility. The cost of loss of biodiversity has been minimised/avoided through the implementation of recommendations provided by the specialist. The development will result in a loss of a NPAES area impacting the ecological and conservation value of the broader area. The resulting impact is, however, considered to be acceptable loss.
» Impacts on birds due to a loss of habitat. The impact is however considered to be acceptable without any impact of high significance.
» Heritage impacts associated with the PV facility may occur. The heritage resources are outside of the facility development footprint and have a no-go buffer which is required to be adhered to. Mitigation measures that have been recommended will reduce the anticipated impacts.
» Loss of soil. Soil in the project area will have Low sensitivity, depending on the successful implementation of mitigation measures to prevent soil erosion, compaction, and pollution.
» Visual impacts associated with the PV facility. The PV facility is expected to have a low visual impact pre-mitigation and post mitigation on sensitive receptors. No sensitive receptors are located in close proximity to the proposed PV facility.
» Impacts on the social environment. Socio-economic impacts include impacts on the sense of place the effect on social and economic infrastructure, and crime and social conflicts in the area that could be created during only the construction phase. These impacts though will only affect local communities either temporarily or over the long term. These impacts are not highly significant and can be traded off for the net positive impact created by the project in terms of production, employment, government revenue, community benefits and households' earnings.

Benefits of the Kleinzee Solar PV Facility and grid connection include the following:

» The project will result in important economic benefits at the local and regional scale through job creation, income and other associated downstream economic development. These will persist during the preconstruction, construction, operation and decommissioning phases of the project.
» The project provides an opportunity for a new land use on the affected properties which is considered as a more efficient use of the land and provides an opportunity for financial benefits to the current land use.
» The project contributes towards the Provincial and Local goals for the development of renewable energy as outlined in the respective IDPs.
» The project serves to diversify the economy and electricity generation mix of South Africa through the addition of solar energy.
» The water requirement for a solar facility is negligible compared to the levels of water used by coal-based technologies. This generation technology is therefore supported in dry climatic areas.
» South Africa's per capita greenhouse gas emissions are amongst the highest in the world due to the reliance on fossil fuels. The Kleinzee Solar PV Facility will contribute to achieving goals for implementation of renewable energy and sustaining a 'green' economy within South Africa.

The benefits of the Kleinzee Solar PV Facility are expected to occur at a national, regional, and local level. As the costs to the environment at a site-specific level have been largely limited through the appropriate placement of infrastructure on the project site within lower sensitive areas through the avoidance of features and areas considered to be sensitive, the benefits of the project are expected to partially offset the localised environmental costs of the PV facility.

Overall Conclusion (Impact Statement)

The preferred activity was determined by the developer to be the development of a renewable energy facility on site using solar irradiation as the preferred technology, due to the availability of a suitable solar resource. Independent specialists were appointed to undertake the assessment of potential impacts associated with the project. The specialists considered desktop data, results from field work, existing literature and the National Web-based Environmental Screening Tool to inform the identification of sensitivities. No environmental sensitivities to avoid were identified, and proposed layout was designed to maximise the use of the available 300ha development area. The specialist findings have indicated that there are no identified fatal flaws associated with the implementation of the project within the development area, or the linear corridor (for the grid connection and access road).

From a review of the relevant policy and planning framework, it was concluded that the project is well aligned with the policy framework, and a clear need for the project is seen from a policy perspective at a local, provincial and National level. Even though the project development area is located within a NPAES Focus Area associated with the expansion of the Namakwa National Park, and within a Critical Biodiversity Areas (CBA2), the development area is still considered to be acceptable by the ecology specialist. When considering biodiversity and socio-economic benefits and impacts on the affected and surrounding areas, the following is concluded from the specialist studies undertaken within this EIA process.

From the specialist assessments, there are no specific long-term impacts likely to be associated with the development of the Kleinzee Solar PV Facility that cannot be reduced to a moderate or low significance. There are no fatal flaws associated with the development that should prevent it from proceeding. Identified ecological sensitivities were identified outside the PV development area, and therefore all sensitivities identified are avoided and recommended buffer areas are honoured. This approach is in line with the application of the mitigation hierarchy, where all the sensitive environmental features which could be impacted by the development have been avoided by the location or siting of the development area (i.e. tier 1 of the mitigation hierarchy). In addition, appropriate mitigation has been proposed to minimise impacts. It was concluded by the ecologist that the project does not adversely impact on the ecological integrity of the area.

The Social Impact Assessment has identified short-term (construction related) impact indicators and operational related socio-economic impact indicators. The assessment of the proposed facility, and its net effect from a socio-economic perspective, indicates that the project would generate greater socio-economic benefits during both the construction and operational phases than the potential losses that could occur as a result of its establishment.

As detailed in the cost-benefit analysis, the benefits of the Kleinzee Solar PV Facility and Grid Connection are expected to occur at a national, regional and local level. The costs to the environment at a site-specific level has been largely limited through the appropriate siting of the development area to avoid environmental features considered to be sensitive. From an economic perspective, both positive and negative impacts are expected.

Based on the conclusions of the specialist studies undertaken, it can be concluded that the development of the Kleinzee Solar PV Facility based on the current layout as provided by the Applicant will not result in

unacceptable environmental impacts (subject to the implementation of the recommended mitigation measures).

Overall Recommendation

Considering the findings of the independent specialist studies, the impacts identified, the development footprint proposed by the developer within the development site, the avoidance of the sensitive environmental features within the project development area, as well as the potential to further minimise the impacts to acceptable levels through mitigation, it is the reasoned opinion of the EAP that the Kleinzee Solar PV Facility and associated infrastructure (include the grid connection corridor and access road) is acceptable within the landscape and can reasonably be authorised. The proposed layout as provided by the Applicant is considered to be acceptable from an environmental perspective.

The following infrastructure would be included within an authorisation issued for the 200MW Solar PV facility project:

PV Facility: Portion 4 of the Farm Zonnekwa 328
Grid line corridor: Portions 2, 3 and 4 of the Farm Zonnekwa 328, and Farm Zonnekwa 326 and Portion 1 of Farm Zonnekwa 326 including:

- Solar PV array comprising PV modules and mounting structures
- Inverters and transformers
- Low voltage cabling between the PV modules to the inverters
- 33kV cabling between the project components and the facility substation
- 132kV onsite facility substation
- 132kV power line to connect to the grid at Zonnequa Collector Substation within a 300m wide and 8.5km long corridor
- Battery Energy Storage System (BESS)
- Site offices and maintenance buildings, including workshop areas for maintenance and storage
- Laydown areas
- Site access and internal roads.

A main access road up to ~4km in length and up to 8m in width will provide access to the facility, and ultimately to both planned solar PV sites (that is, a shared access route). The access to the facility/ies will be via an existing (unnamed) gravel road off the DR2964 between Komaggas and Kleinsee. This gravel road is well established, however it's likely portions of this road will require upgrading to accommodate the movement of heavy vehicles. This existing road traverses only Farm Zonnkewa 326. From this point, a planned access road up to ~7.5km in length and up to 8m in width located within the 300m grid connection corridor will traverse Farm Zonnkewa 326, Portion 1 of Farm Zonnekwa 326, Portions 2, 3 and 4 of Farm Zonnkewa 328.

The grid connection for the facility will consist of underground cabling within the facility, an on-site facility substation and switching substation to be connected to the authorised Zonnequa Substation (located on Farm Zonnekwa 326) via overhead power line (located ~8.5km north of the site). The grid connection infrastructure is to be located within an assessment corridor of 300m wide.

The following key conditions would be required to be included within an authorisation issued for the Kleinzee Solar PV Facility:

- All mitigation measures detailed within this BA report, as well as the specialist reports contained within **Appendices D to I** are to be implemented.

- The EMPr as contained within **Appendix K** of this BA report should form part of the contract with the Contractors appointed to construct and maintain the solar facility in order to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the Kleinzee Solar PV Facility is considered key in achieving the appropriate environmental management standards as detailed for this project.
- Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan.
- Prior to construction commencing, permits must be obtained from the relevant national and provincial authorities for disturbance or destruction of any protected flora or fauna species.
- A detailed site-specific eradication and management programme for alien invasive plants must be developed and implemented.
- Implement a chance finds procedure for the rescuing of any fossils or heritage resources discovered during construction.
- If any archaeological material or human burials are uncovered during construction activities, work in the immediate area should be halted, the find reported to the heritage authorities and inspected by an archaeologist. Such heritage is the property of the State and may require excavation and curation in an approved institution.
- Monitor all rehabilitated areas for one year following decommissioning and implement remedial actions as and when required.

A validity period of 10 years of the Environmental Authorisation is requested, should the project obtain approval from DFFE.

CHAPTER 1: INTRODUCTION

The development of a solar photovoltaic (PV) facility and associated infrastructure with a generating capacity of up to 200MW is proposed by Energy Team (Pty) Ltd on a site located approximately 20km west of the town of Komaggas, and 28km southeast of Kleinzee, in the Northern Cape Province (**Figure 1.1**). The site is located in the Nama Khoi Local Municipality, which falls within jurisdiction of the Namakwa District Municipality. The entire extent of the site falls within the Springbok Renewable Energy Development Zone and within the Northern Corridor of Strategic Transmission Corridors. The solar PV development will be known as the Kleinzee Solar PV Facility.

The project is planned as part of a cluster of renewable energy projects, which includes a second solar PV facility with a capacity up to 360MW (Daisy Solar PV Facility), which will be subject to a separate application for Environmental Authorisation.

A development area[4] of approximately 300ha has been identified within the study area by the Applicant. This development area has been fully considered within this Basic Assessment (BA) process and assessed in terms of its suitability from an environmental and social perspective. The development area is suitable for the construction of a 200MW PV facility and provided the opportunity for the optimal placement of the infrastructure, ensuring avoidance of major identified environmental sensitivities.

From a regional perspective, the Kleinzee area is considered favourable for the development of a solar energy facility by virtue of prevailing climatic conditions, relief, aspect, the extent of the affected property, the availability of a direct grid connection (i.e., a point of connection to the national grid) and the availability of land on which the development can take place. The full extent of the development area and grid connection corridor is located within the Springbok Renewable Energy Development Zone (REDZ)[5] as well as the Northern Corridor of the Strategic Transmission Corridors[6]. Four authorised wind farm facilities are located north and west of the development area for the Kleinzee Solar PV Facility. The proposed site for the Kleinzee Solar PV Facility falls within the already authorised development area of the Namas Wind Energy Facility.

The facility is proposed in response to identified objectives of the national and provincial government, and local and district municipalities to develop renewable energy facilities for power generation purposes. It is the Developer's intention to bid the solar PV facility under the Department of Mineral Resource and Energy's (DMRE) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme or other public or private off-taker programmes. The development of the facility will assist in achieving the energy mix (through a process of diversification) as set out in the Integrated Resources Plan (IRP), as well as aiding in the stabilisation of the country's electricity supply.

Grid connection infrastructure proposed to connect the Kleinzee Solar PV facility to the authorised Zonnequa Collector Substation located to the north of the facility is considered within this BA Process.

[4] The development area is that identified area where the 200MW PV facility is planned to be located. This area has been selected as a practicable option for the facility, considering technical preference and constraints. The development area is ~300ha in extent.

[5] The REDZ are zones identified by the Department of Forestry Fisheries and the Environment (DFFE) as geographical areas of strategic importance for the development of large-scale solar PV and wind energy development activities and which have been earmarked for the development of renewable energy facilities within South Africa as per GNR114 of February 2018 and GNR142 of February 2021.

[6] The Strategic Environmental Assessment for Electricity Grid Infrastructure (EGI) in South Africa has identified five Strategic Transmission Corridors that are of strategic importance for the rollout of the supporting large-scale electricity transmission and distribution infrastructure in terms of Strategic Integrated Project 10: Electricity Transmission and Distribution. The Northern Corridor is one of these five Strategic Transmission Corridors as per GNR113 of February 2018.

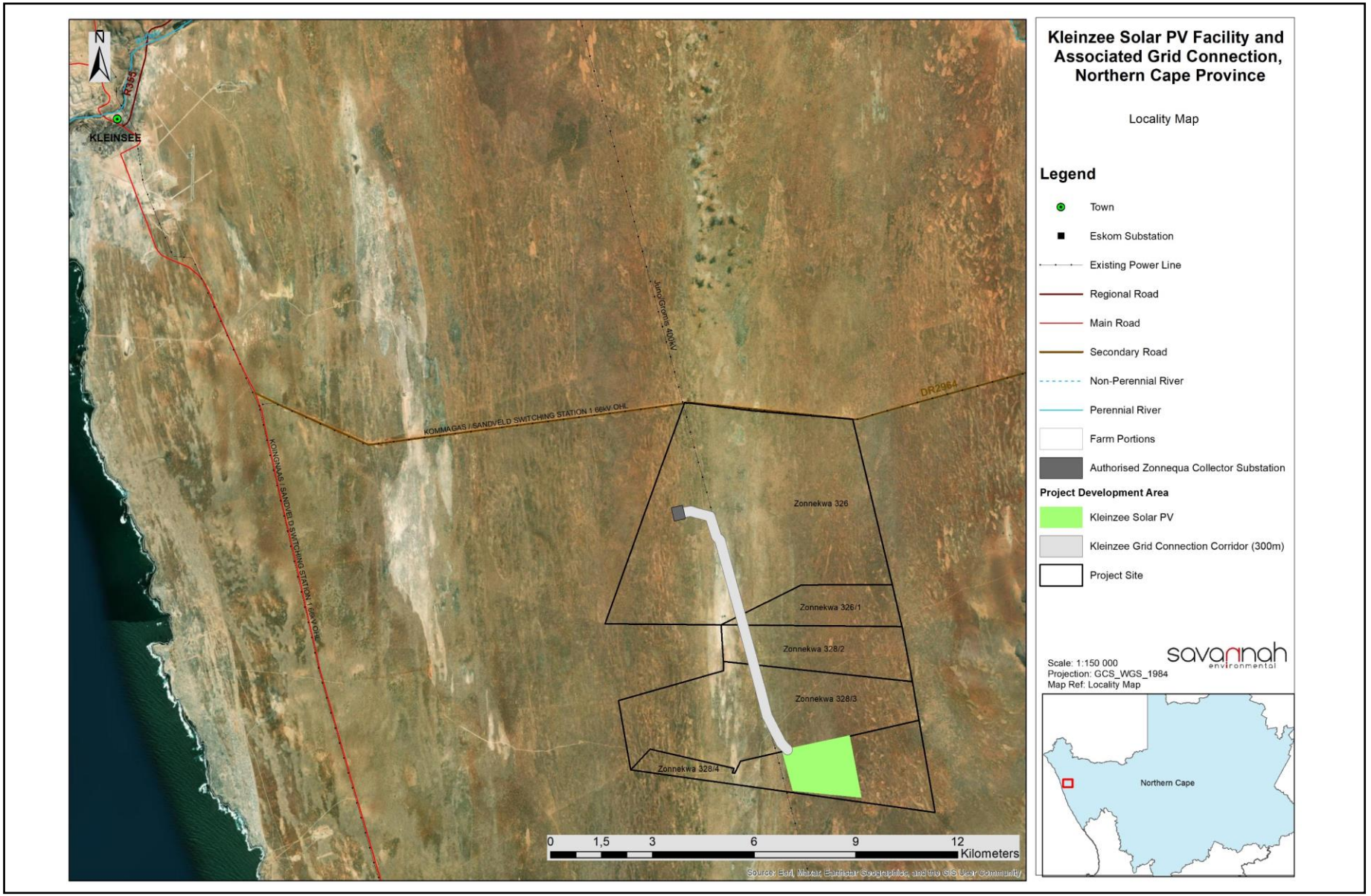


Figure 1.1: A locality map illustrating the Kleinzee Solar PV Facility and associated Grid Connection Infrastructure development area within the development area.

1.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

The National Environmental Management Act (NEMA, Act No. 107 of 1998) is the national legislation that provides for the authorisation of certain controlled activities known as 'listed activities. In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be considered, investigated, assessed, and reported on to the competent authority (the decision-maker) charged by the NEMA with the granting of the relevant environmental authorisation being applied for through this BA process.

The development (i.e. construction and operation) of Kleinzee Solar PV Facility and associated grid connection infrastructure is subject to the requirements of the EIA Regulations of 2014 (as amended), published in terms of Section 24(5) of NEMA. Therefore, in terms of the EIA Regulations of 2014, promulgated under Section 24 and 24D of NEMA, various aspects of the Kleinzee Solar PV Facility are listed as activities that may have a detrimental impact on the environment. The primary listed activity triggered is Activity 1 of Listing Notice 2 (GN R325) which relates to the development of facilities or infrastructure for the generation of electricity from a renewable resource where the generating capacity is 20MW or more. The Kleinzee Solar PV Facility will have a contracted capacity of 200MW$_{ac}$.

As the project has the potential to impact on the environment, an Environmental Impact Assessment process is required to be completed in support of an application for Environmental Authorisation prior to the commencement of construction of the project. The process to be followed in applying for environmental authorisation for a large-scale PV project in a REDZ area was formally gazetted on 16 February 2018, in GN R114. As the proposed development is located within the Springbok REDZ, the Kleinzee Solar PV facility and associated grid connection is subject to a BA process and not a full Scoping and Environmental Impact Reporting (SEIR) process, as well as a shortened timeframe of 57 days for the processing of an application for environmental authorisation.

The need to comply with the requirements of the EIA Regulations ensures that the decision-makers are provided with an opportunity to consider the potential environmental impacts of a project early in the development process and assess whether the environmental impacts can be avoided, minimised, or mitigated to acceptable levels. The nature and extent of Kleinzee PV and associated Grid Connection Infrastructure, as well as the potential environmental impacts and mitigation measures associated with the construction, operation and decommissioning has been assessed through detailed specialist assessments. This process provides an opportunity to test the environmental suitability of the development area, to delineate areas of sensitivity within the development area, and to define and optimise the facility layout of the components of Kleinzee PV and associated Grid Connection Infrastructure.

This BA Report has been prepared in accordance with the requirements of the EIA Regulations published on 08 December 2014 (as amended) promulgated in terms of Chapter 5 of the National Environmental Management Act (No. 107 of 1998). This Chapter of the BA Report includes the following information required in terms of Appendix 1: Content of Basic Assessment Reports:

Requirement	Relevant Section
3(a) the details of the EAP who prepared the report and (ii) the expertise of the EAP, including a curriculum vitae.	The details and expertise of the EAP who prepared the report is included in **Section 1.4** and CVs of the project team are included in **Appendix A**.

3(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 and (iii) where the required information in items (i) and (ii) is not available, the co-ordinates of the boundary of the property or properties.	A description of the location of the Kleinzee Solar PV Facility and associated grid connection infrastructure is included in **Section 1.3, Table 1.2 and Figure 1.1.** The information provided includes the 21-digit Surveyor General Code of the affected properties and the farm names. Additional information is also provided regarding the location of the development which includes the relevant province, local and district municipalities, ward and current land zoning.

This Basic Assessment (BA) report consists of the following sections:

- **Chapter 1** provides background to Kleinzee Solar PV Facility and associated grid connection infrastructure and the BA process.
- **Chapter 2** provides a description of Kleinzee Solar PV Facility and associated grid connection infrastructure.
- **Chapter 3** outlines strategic regulatory and legal context for energy planning in South Africa and specifically relating to the project.
- **Chapter 4** describes the need and desirability and alternatives considered for the Kleinzee Solar Facility.
- **Chapter 5** outlines the approach to undertaking the basic assessment process.
- **Chapter 6** describes the existing biophysical and social environment within and surrounding the broader study and development area.
- **Chapter 7** provides an assessment of the potential issues and impacts associated with the solar PV facility and associated grid connection infrastructure and presents recommendations for the mitigation of significant impacts.
- **Chapter 8** provides an assessment of the potential for cumulative impacts.
- **Chapter 9** presents the conclusions and recommendations based on the findings of the BA Report.
- **Chapter 10** provides references used in the compilation of the BA Report.

The Environmental Management Programme (EMPr) is included in Appendix L.

1.2 Project Overview

Energy Team (Pty) Ltd is proposing the development of the Kleinzee Solar PV Facility, a photovoltaic (PV) solar energy facility and associated grid connection infrastructure to add new capacity to the national electricity grid. A project site consisting of five affected properties (**Figure 1.1** and **Table 1.1**), has been identified as the preferred area for the development of the solar PV facility and the associated infrastructure:

PV Facility: Portion 4 of the Farm Zonnekwa 328
Grid line corridor: Portions 2, 3 and 4 of the Farm Zonnekwa 328, and Farm Zonnekwa 326 and Portion 1 of Farm Zonnekwa 326

A main access road up to ~4km in length and up to 8m in width will provide access to the facility, and ultimately to both planned solar PV sites (that is, a shared access route). The access to the facility/ies will be via an existing (unnamed) gravel road off the DR2964 between Komaggas and Kleinsee. This gravel road is well established, however it's likely portions of this road will require upgrading to accommodate the movement of heavy vehicles. This existing road traverses only Farm Zonnkewa 326. From this point, a planned access road up to ~7.5km in length and up to 8m in width located within the 300m grid connection

corridor will traverse Farm Zonnkewa 326, Portion 1 of Farm Zonnekwa 326, Portions 2, 3 and 4 of Farm Zonnkewa 328.

The identification of the project site was undertaken through a site selection process which included a regional screening process, as well a specific specialist input, to inform and confirm the suitability of the project site for the development of a solar PV facility and provide an upfront understanding of the potential social and environmental challenges which may be present within the project site and surrounding areas. The areas are adjacent to authorised wind farm projects, for which full assessments were undertaken in 2019. The projects included the Namas Wind Farm (DFFE ref 14/12/16/3/3/1/1971) and the Zonnequa Wind Farm (DFFE Ref 14/12/16/3/3/1/1970).

A development area[7] of approximately 300ha has been identified within the study area by Energy Team and considered suitable from a technical perspective for the development of a solar PV facility with a contracted capacity of up to 200MW. The infrastructure associated with the PV facility includes:

- Solar PV array comprising PV modules and mounting structures
- Inverters and transformers
- Low voltage cabling between the PV modules to the inverters
- 33kV cabling between the project components and the facility substation
- 132kV onsite facility substation
- 132kV power line to connect to the grid at the authorised Zonnequa Collector Substation within a 300m wide and 8.5km long corridor
- Battery Energy Storage System (BESS)
- Site offices and maintenance buildings, including workshop areas for maintenance and storage
- Laydown areas
- Site access and internal roads

The key infrastructure components associated with the development of the Kleinzee Solar PV Facility and associated Grid Connection Infrastructure are described in greater detail within Chapter 2 of this BA Report.

The key infrastructure components proposed as part of the project are described in greater detail in Chapter 2 of this BA Report. Details of the Kleinzee Solar PV Facility and associated infrastructure to be developed is included in **Table 1.1**.

Table 1.1: A detailed description of the Kleinzee Solar PV Facility and associated infrastructure

Province	**Northern Cape Province**
District Municipality	Namakwa District Municipality
Local Municipality	Nama Khoi Local Municipality
Ward number(s)	Ward 8
Nearest town(s)	20km west of the town of Komaggas, and 28km southeast of Kleinzee
Affected property of the development area: Farm name(s), number(s) and portion numbers	» PV Facility: Portion 4 of the Farm Zonnekwa 328 » Grid line: Portions 2, 3 and 4 of the Farm Zonnekwa 328, and Farm Zonnekwa 326 and Portion 1 of Farm Zonnekwa 326
SG 21 Digit Code (s)	C05300000000032600000

[7] The development area is that identified area where the 200MW PV facility is planned to be located. This area has been selected as a practicable option for the facility, considering technical preference and constraints. The development area is ~300ha in extent.

	C05300000000032600001 C05300000000032800002 C05300000000032800003 C053000000000328000004		
Current zoning and land use	Agricultural (i.e., grazing) and special use (i.e. energy generation)		
Site Coordinates (project site)		**Latitude:**	**Longitude:**
	Northern Point	29°50'49.86"S	17°16'28.54"E
	Eastern Point	29°51'13.33"S	17°17'9.58"E
	Southern Point	29°51'39.75"S	17°16'34.03"
	Western Point	29°51'18.07"S	17°15'55.35"E
	Centre Point	29°51'17.16"S	17°16'31.73"E
Power line Corridor Co-Ordinates		**Latitude:**	**Longitude:**
	Start	29°50'55.77"S	17°15'56.25"E
	Middle	29°49'17.63"S	17°15'20.35"E
	End	29°47'5.56"S	17°14'12.35"E

The grid connection infrastructure includes a power line within a 300m wide corridor. At the authorised Zonnequa collector substation, this corridor is shared with the Daisy Solar PV grid connection to allow for connection of the incoming grid line/s to the collector substation. The 300m wide corridor will allow for the optimisation of the infrastructure to accommodate identified environmental sensitivities. The servitude of the power line will be up to 32m in width. **Figure 1.2** provides a locality map of the Kleinzee Solar PV Facility and associated grid connection infrastructure development area relative to the planned Daisy Solar PV facility, as well as where the 300m wide grid connection corridor is shared.

Energy Team (Pty) Ltd has confirmed that the project site is particularly suitable for solar PV development from a technical perspective due to the solar resources, access to the electricity grid, compatibility with the current land use and land availability (refer to Chapter 2 for further details). The developer has been measuring the solar resource at the project site since 2021 and has determined that the solar resource is viable for the development of a solar PV facility. The total contracted capacity for the solar PV facility is up to 200MW.

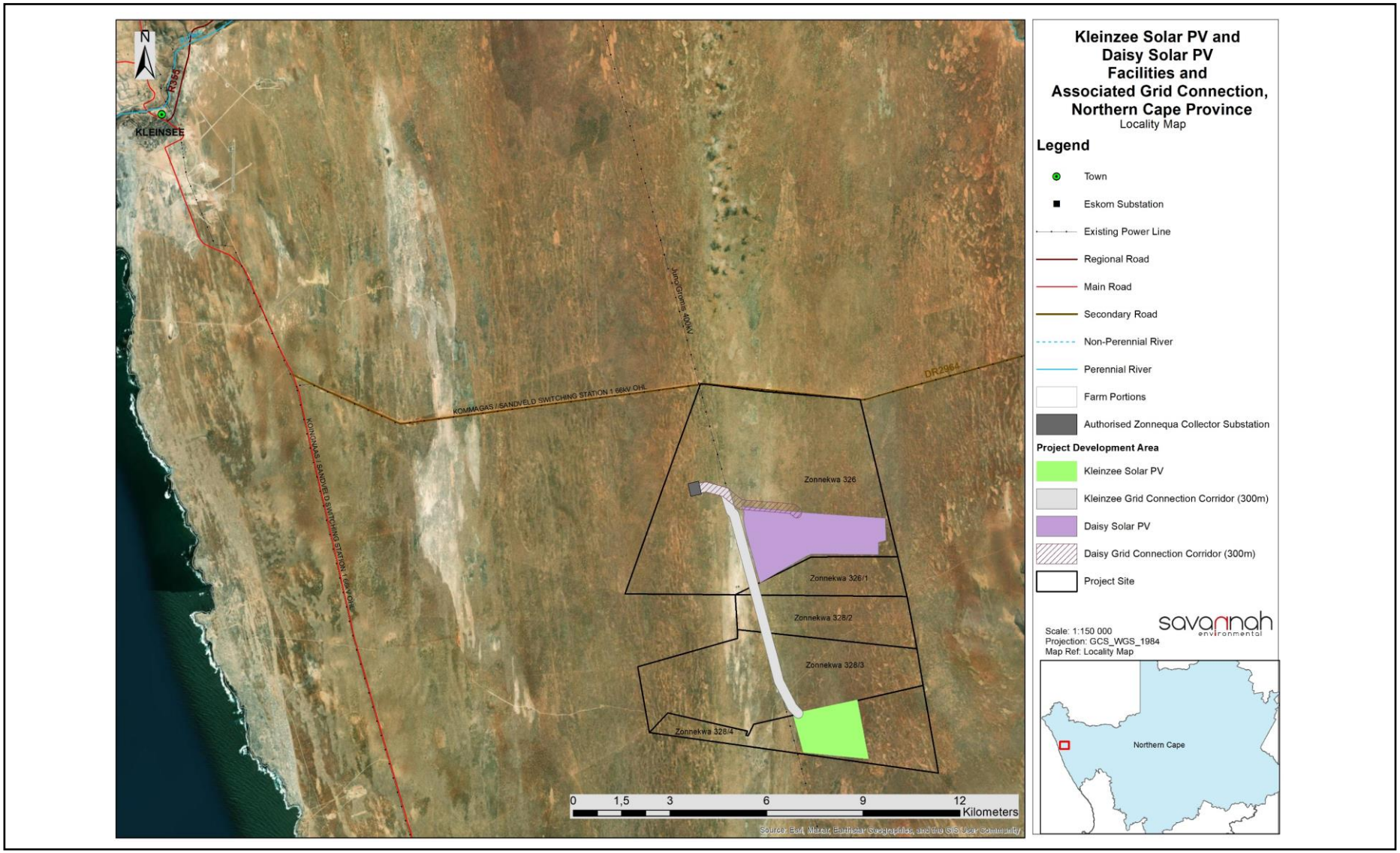


Figure 1.2: Locality map of the Kleinzee Solar PV Facility and associated grid connection infrastructure development area relative to the planned Daisy Solar PV facility

1.3 Details of the Environmental Assessment Practitioner and Expertise to conduct the BA process

In accordance with Regulation 12 of the 2014 EIA Regulations (GN R326), Energy Team (Pty) Ltd has appointed Savannah Environmental (Pty) Ltd as the independent environmental consultant to undertake the BA process and prepare the BA Report for the Kleinzee Solar PV Facility and associated grid connection infrastructure. Neither Savannah Environmental nor any of its specialists are subsidiaries of/or are affiliated to Energy Team (Pty) Ltd. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed project.

Savannah Environmental is a specialist environmental consulting company providing a holistic environmental management service, including environmental assessment and planning to ensure compliance and evaluate the risk of development, and the development and implementation of environmental management tools. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team.

The Savannah Environmental team have considerable experience in basic assessments and environmental management, and have been actively involved in undertaking environmental studies, for a wide variety of projects throughout South Africa, including those associated with electricity generation.

- **Karen Jodas** holds a Master of Science Degree and is registered as a Professional Natural Scientist (400106/99) with the South African Council for Natural Scientific Professions (SACNASP) and is registered with the Environmental Assessment Practitioners Association of South Africa (EAPASA (2022/5499). She has gained extensive knowledge and experience on potential environmental impacts associated with electricity generation and transmission projects through her involvement in related EIA processes over the past 25 years. She has successfully managed and undertaken EIA processes for infrastructure development projects throughout South Africa.
- **Nkhensani Masondo**, the senior EAP on this project, is registered with the Environmental Assessment Practitioners Association of South Africa (EAPASA (2020/1385) and holds a BSocSci in Environmental Analysis and Management and is currently completing her MSc in Environmental Management. She has six (6) years of working experience in the environmental field and has gained extensive experience in conducting Environmental Impact Assessments, Stakeholder Engagements, Environmental Auditing and Environmental Management Plans Programmes for a wide range of projects.
- **Nicolene Venter**, the public participation consultant for the project. She is a Board Member of IAPSA (International Association for Public Participation South Africa). She holds a Higher Secretarial Diploma and has over 21 years of experience in public participation, stakeholder engagement, awareness creation processes and facilitation of various meetings (focus group, public meetings, workshops, etc.). She is responsible for project management of public participation processes for a wide range of environmental projects across South Africa and neighbouring countries.
- **Debbie-Lee Janse van Rensburg,** is the junior EAP on this project and the GIS Practitioner. She holds a Bachelor of Arts in Psychology, Geography and Environmental Management and a BSc. Honours degree in Environmental Science. Her key focus is on undertaking environmental authorisations applications, environmental permitting, public participation, environmental impact assessments, basic assessments, and GIS mapping.

In order to adequately identify and assess potential impacts associated with the Kleinsee Solar PV facility, the following specialists have provided specialist input into this BA Report.

Company	Specialist Area of Expertise	Specialist Name
Birds & Bats Unlimited	Avifauna	Rob Simmons and Marlei Martins

Company	Specialist Area of Expertise	Specialist Name
3Foxes Biodiversity Consulting	Ecology	Simon Todd
TerraAfrica	Soils and Agricultural Potential	Marinè Pienaar
LOGIS	Visual	Lourens du Plessis
CTS Heritage	Heritage (including cultural landscape, archaeology and palaeontology)	Jenna Lavin
Eco Thunder	Social environment	Brogan Geldenhuys

CHAPTER 2: PROJECT DESCRIPTION

This Chapter provides an overview of the project and details related to the project scope, which include the planning/design, construction, operation and decommissioning activities required for the development. This Chapter also explores the use of solar energy as a means of power generation.

1.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the Basic Assessment Report includes the following information required in terms of Appendix 1: Content of Basic Assessment Reports:

Requirement	Relevant Section
3(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 and (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties.	The location of the proposed project is detailed in Chapter 1, **Table 1.1**, as well as **Section 2.2.1** below.
3(c)(i)(ii) 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 a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or on land where the property has not been defined, the coordinates within which the activity is to be undertaken	A layout map illustrating the development area of the Kleinzee Solar PV Facility, including the grid connection infrastructure corridor is included as **Figure 2.3**. This development area has been assessed within this BA Report and the independent specialist studies.
3(d)(ii) a description of the scope of the proposed activity, including a description of the activities to be undertaken including associated structures and infrastructure	A description of the activities to be undertaken with the development of project is included in **Table 2.1** and **Table 2.2**.

2.2 Nature and extent of the Kleinzee PV Facility

The development of a solar photovoltaic (PV) facility with a generating capacity of up to 200MW is proposed by Energy Team (Pty) Ltd on a site located located approximately 20km west of the town of Komaggas, and 28km southeast of Kleinsee to add capacity to the national electricity grid.

From a technical perspective, the Kleinsee area is considered favourable for the development of commercial solar energy facilities by virtue of the prevailing climatic conditions, relief and aspect, the extent of the project site and development area, the availability of a direct grid connection (i.e. point of connection to the national Eskom grid), and the availability of land on which development can take place.

The Kleinsee Solar PV facility will comprise the installation and operation of solar PV technology with a total contracted capacity of up to 200MW. The project will potentially make use of bifacial tracking PV technology. The solar panels which, once installed, will reach a height of up to 5m above ground level. The solar panels will be connected to centralised inverter power stations or utilize string inverters mounted above ground.

2.2.1 Overview of the Project Site and Planned Infrastructure

The preferred project site for the Kleinzee Solar PV Facility and associated grid connection infrastructure is located within Ward 8 in the Nama Khoi Local Municipality within the Namakwa District Municipality, Northern Cape. A project site consisting of five affected properties (**Figure 2.1**), has been identified as the preferred area for the development of the solar PV facility and the associated infrastructure:

PV Facility: Portion 4 of the Farm Zonnekwa 328
Grid line corridor: Portions 2, 3 and 4 of the Farm Zonnekwa 328, and Farm Zonnekwa 326 and Portion 1 of Farm Zonnekwa 326

It is within the project site that the development area for Kleinzee Solar PV Facility and associated Grid Connection Infrastructure has been identified and located. The Kleinzee Solar PV Facility development area[8] is ~300ha in extent and is assessed in its entirety within this BA Report. The entire extent of the project site is located within the Springbok Renewable Energy Development Zone (REDZ) and within the Northern Corridor of the Strategic Transmission Corridors. Access to the project site is possible existing roads. The project site and development area can be accessed via the secondary DR2964 road, which runs north of the development area.

A main access road up to ~4km in length and up to 8m in width will provide access to the facility, and ultimately to both planned solar PV sites (that is, a shared access route). The access to the facility/ies will be via an existing (unnamed) gravel road off the DR2964 between Komaggas and Kleinsee. This gravel road is well established, however it's likely portions of this road will require upgrading to accommodate the movement of heavy vehicles. This existing road traverses only Farm Zonnkewa 326. From this point, a planned access road up to ~7.5km in length and up to 8m in width located within the 300m grid connection corridor will traverse Farm Zonnkewa 326, Portion 1 of Farm Zonnekwa 326, Portions 2, 3 and 4 of Farm Zonnkewa 328.

The grid connection for the facility will consist of underground cabling within the facility, an on-site facility substation and switching substation to be connected to the authorised Zonnequa Substation (located on Farm Zonnekwa 326) via overhead power line (located ~8.5km north of the site). The grid connection infrastructure is to be located within an assessment corridor of 300m wide.

2.2.2. Components of the Kleinzee Solar PV Facility and associated Grid Connection Infrastructure

The project site is proposed to accommodate both the PV panels as well as the associated infrastructure, which is required for such a facility, and will include:

- Solar PV array comprising PV modules and mounting structures
- Inverters and transformers
- Low voltage cabling between the PV modules to the inverters
- 33kV cabling between the project components and the facility substation
- 132kV onsite facility substation
- 132kV power line to connect to the grid at Zonnequa Collector Substation within a 300m wide and 8.5km long corridor
- Battery Energy Storage System (BESS)
- Site offices and maintenance buildings, including workshop areas for maintenance and storage
- Laydown areas

[8] The development area is that identified area where the 200MW PV facility is planned to be located. This area has been selected as a practicable option for the facility, considering technical preference and constraints. The development area is ~300ha in extent.

» Site access and internal roads.

Table 2.1 provides a summary of the details and dimensions of the planned infrastructure associated with the Kleinzee Solar PV Facility and associated Grid Connection Infrastructure, including the main infrastructure components and services that will be required during the project life cycle. The details and dimensions of the facility development area were assessed as part of the independent specialist studies undertaken as part of the EIA process. **Figure 2.1** illustrates the development area of the Kleinsee Solar PV Facility assessed as part of this EIA report.

Table 2.1: Details of Kleinzee Solar PV Facility and associated infrastructure

Component	Description / Dimensions
Total extent of the Affected Properties, including the grid connection corridor, also referred to as the project site	~1115.11ha
Total extent of the Development area[9]	~300ha
Contracted capacity of the facility	Up to 200MW
Technology	» Monofacial or Bifacial PV panels, mounted on either fixed-tilt, or single-axis tracking systems
PV panels	» Height: ~5m from ground level (installed)
On-Site Facility Substation & Switching Substation	» On-site facility substation and switching substations hub located on Portion 4 of the Farm Zonnekwa 328. » Approximately 2ha in extent (2ha per substation)
Grid Connection	» 132kV grid connection » 33kV cabling between the project components and the facility substation » Low voltage cabling between the PV modules to the inverters. » Facility substation located within grid corridor. » A 300m wide grid connection corridor within which the grid connection infrastructure will be constructed and operated. » Corridor traverses Farm Zonnkewa 326, Portion 1 of the Farm Zonnkewa 326, Portions 2, 3 and 4 of the Farm Zonnkewa 328.
Corridor width (for grid connection assessment purposes)	» 300m wide
Power line servitude width	» Up to 32m
Corridor length	» Approximately 8.5km
Battery Energy Storage System (BESS)	» Solid state battery technology (e.g. Lithium-ion technology) as a preferred technology. » Housed in containers covering a total approximate footprint of up to 3ha within the assessed substation, BESS and O&M Building hub area.
Site access roads and internal roads	» Existing roads will be used, wherever possible, to access the project site and development area. » Access via existing gravel road the DR2964 located to the North of the site - portions of this road will require upgrading to 8m width to accommodate the movement of heavy vehicles. » From Farm Zonnkewa 326, a planned access road up to ~7.5km in length and up to 8m in width located within the 300m grid connection corridor will traverse Farm Zonnkewa

[9] The area to be covered by the facility layout and infrastructure of the proposed Kleinzee Solar PV Facility.

	326, Portion 1 of Farm Zonnekwa 326, Portions 2, 3 and 4 of Farm Zonnkewa 328. » Access road falls within 300m corridor assessed for the grid line » Internal access roads up to 6m in width.
Associated infrastructure hub	» Battery Energy Storage System (BESS). » Site offices and maintenance buildings, including workshop areas for maintenance and storage. » Laydown areas. » On-site facility substation and switching substation

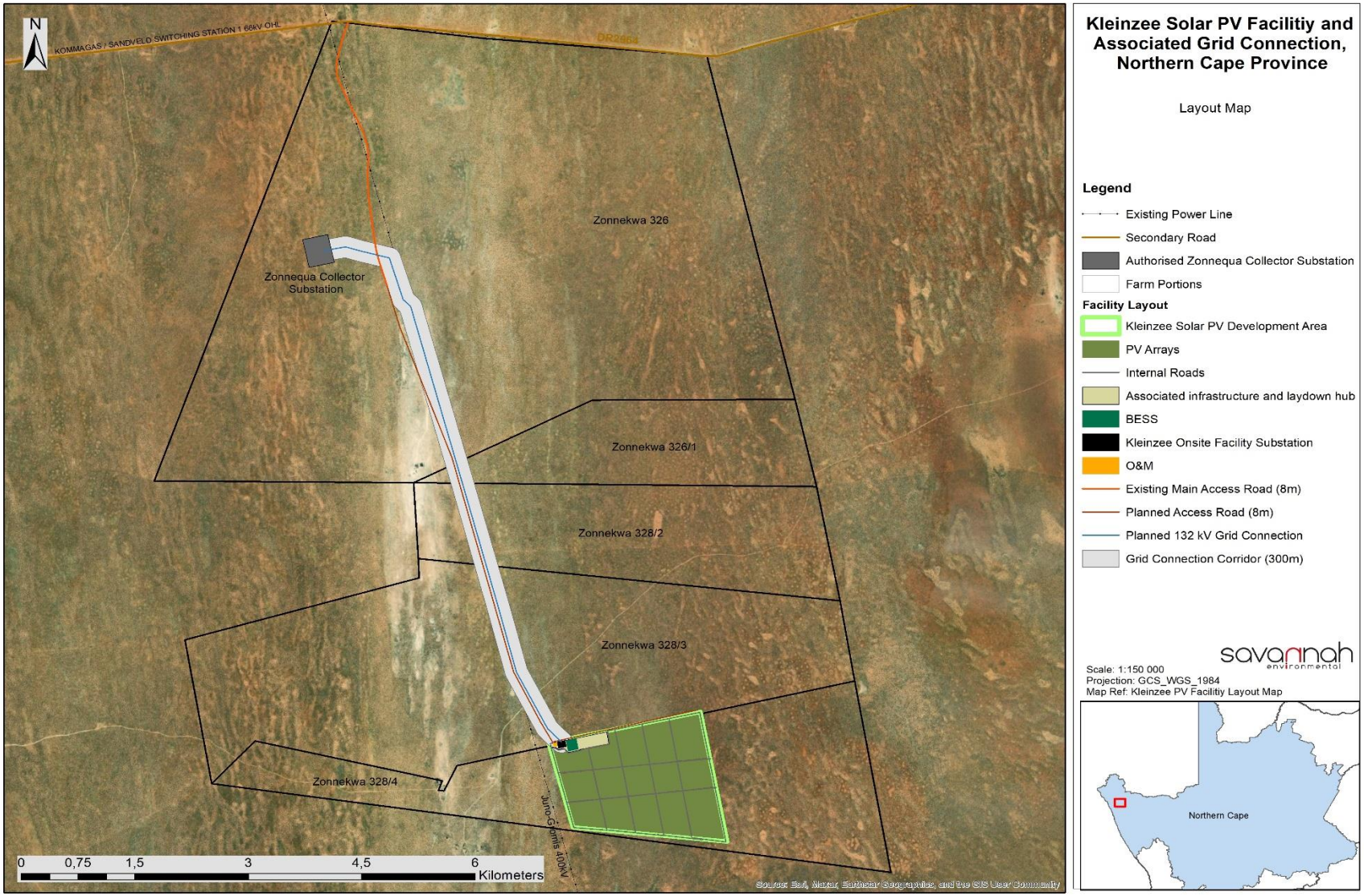


Figure 2.1: Map illustrating the facility layout (i.e., development area) for Kleinzee Solar PV facility and the associated grid connection infrastructure within the project site

2.3 Technology considered for the Solar Energy Facility and the Generation of Electricity

2.3.1. Solar PV technology

Solar PV energy facilities use the energy from the sun to generate electricity through a process known as the **Photovoltaic Effect**. This effect refers to photons of light colliding with electrons and placing them into a higher state of energy to create electricity.

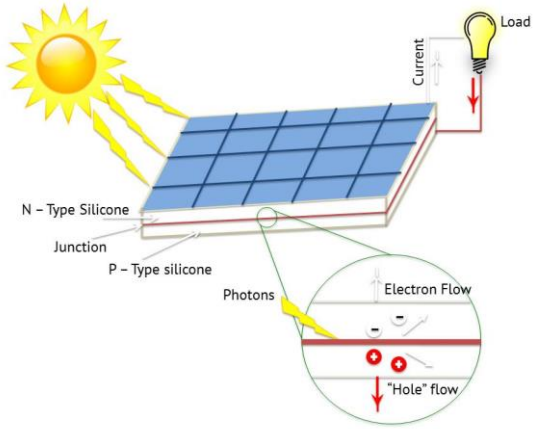


Figure 2.2: Diagram illustrating the Photovoltaic Effect (Source: Centre for Sustainable Energy)

The Photovoltaic Effect is achieved through the use of the following components:

Photovoltaic Cells

A PV cell is made of silicone that acts as a semi-conductor used to produce the Photovoltaic Effect. PV cells are arranged in multiples / arrays and placed behind a protective glass sheet to form a PV panel (refer to **Figure 2.3**). The PV cell is positively charged on one side and negatively charged on the other side and electrical conductors are attached to either side to form a circuit. This circuit then captures the released electrons in the form of an electric current (direct current). An inverter must be used to convert direct current (DC[10]) to alternating current (AC[11]). The electricity is then stepped up to a higher voltage via a transformer before being evacuated into the national grid via a power line.

The Inverter

An inverter is used to convert the electricity which is produced as direct current into alternating current for the purpose of grid connection. In order to connect a large solar PV facility to the national grid, numerous inverters will be arranged in several arrays to collect and convert the produced power.

[10] DC (direct current) is the unidirectional flow or movement of electric charge carriers (which are usually electrons). The intensity of the current can vary with time, but the general direction of movement stays the same at all times. As an adjective, the term DC is used in reference to voltage whose polarity never reverses. In a DC circuit, electrons emerge from the negative, or minus, pole and move towards the positive, or plus, pole. Nevertheless, physicists define DC as traveling from plus to minus. (sourced from https://whatis.techtarget.com/definition/DC-direct-current).

[11] An alternating current (AC) occurs when charge carriers in a conductor or semiconductor and periodically reverse their direction of movement. The voltage of an AC power source can be easily changed by means of a power transformer. This allows the voltage to be stepped up (increased) for transmission and distribution (sourced from https://whatis.techtarget.com/definition/alternating-current-AC).

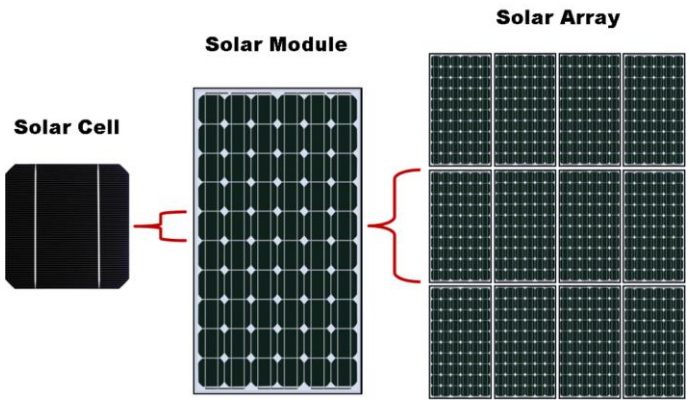


Figure 2.3: Overview of a PV cell, module and array / panel (Source: pveducation.com)

Bifacial Solar Panel Technology

Energy Team (Pty) Ltd is considering the use of bifacial tracking technology. Bifacial ("two-faced") modules produce solar power from both sides of the panel. Traditional solar panels capture sunlight on one light-absorbing side. The light energy that cannot be captured is simply reflected away. Bifacial solar panels have solar cells on both sides, which enables the panels to absorb light from the back and the front (refer to **Figure 2.4**). In general, more power can be generated from bifacial modules for the same area, without having to increase the development footprint.

The optimum tilt for a bifacial module has to be designed so as to capture a big fraction of the reflected irradiation. Use of trackers is recommended so the modules can track the sun's movement across the sky, enabling them to stay directed to receive the maximum possible sunlight to generate power.

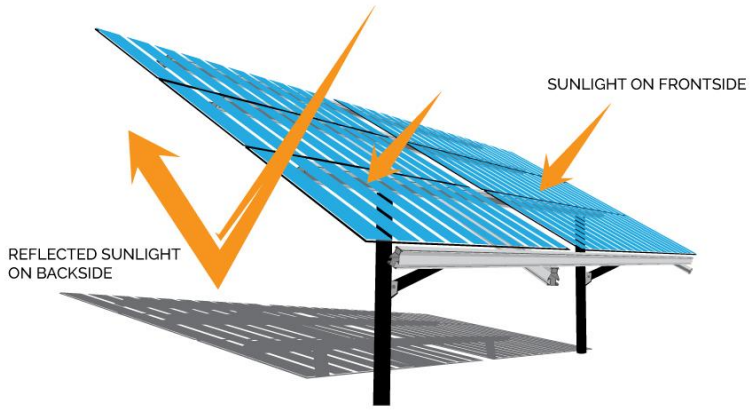


Figure 2.4: Diagram showing how bifacial Solar PV panels work (Source: https://sinovoltaics.com/learning-center/solar-cells/bifacial-solar-modules/)

Support Structures

PV panels will be fixed to a support structure. PV panels can either utilise fixed/static support structures, or single or double axis tracking support structures (refer to **Figure 2.5**). PV panels which utilise fixed/static support structures are set at an angle (fixed-tilt PV system) so as to optimise the amount of solar irradiation. With fixed/static support structures the angle of the PV panel is dependent on the latitude of the proposed

development and may be adjusted to optimise for summer and winter solar radiation characteristics. PV panels which utilise tracking support structures track the movement of the sun throughout the day so as to receive the maximum amount of solar irradiation.

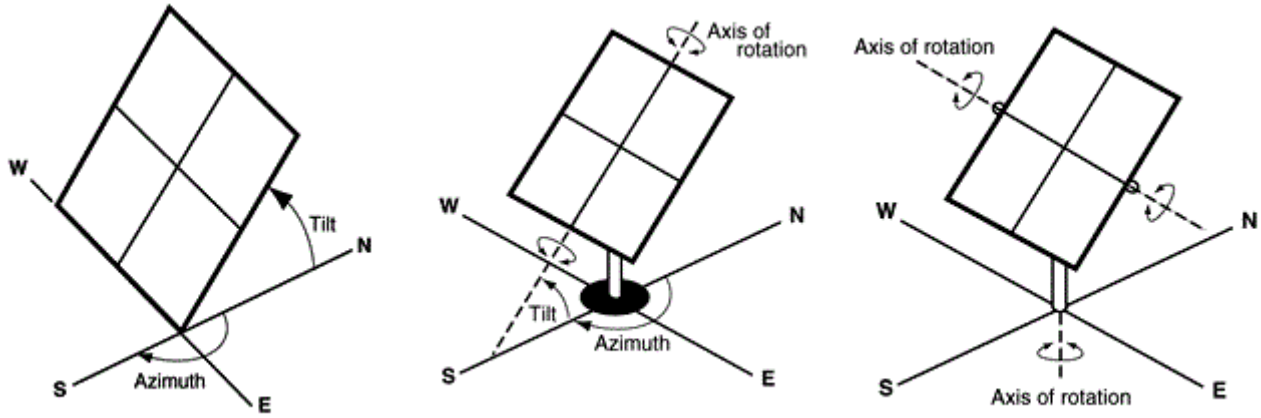


Figure 2.5: Overview of different PV tracking systems (from left to right: fixed-tilt, single-axis tracking, and double-axis tracking (Source: pveducation.com)).

PV panels are designed to operate continuously for more than 25 years, mostly unattended and with low maintenance.

2.3.1. Battery Energy Storge System (BESS)

The general purpose and utilisation of a BESS is to save and store excess electrical output as it is generated, allowing for a timed release when the capacity is required. BESS systems therefore provide flexibility in the efficient operation of the electric grid through decoupling of the energy supply and demand. **Figure 2.6 illustrates** a typical utility scale BESS system (a Lithium-Ion BESS) as applied in the context of a renewable energy facility.

Figure 2.6: Li-Ion BESS implementation for a Renewable Energy facility (Source: Enel Green Power)

Considering the nature of the project, only a solid-state technology type would be envisaged for implementation. The technology includes batteries housed within containers which are fully enclosed and self-contained.

2.3.1.1. Risks Associated with Battery Energy Storage System

A Battery Energy Storage Systems (BESS) comprising a solid-state battery system will allow for energy storage for an extended period. The general purpose and utilisation of the BESS will be to save and store excess electrical output from the facility as it is generated, allowing for a timed release to the national grid when the capacity is required. The BESS will be contained within insulated containers and will connect to the on-site facility substation via underground cabling.

The risks associated with battery technologies are generally well understood and researched. The primary risks relate to fire hazards and the potential for a condition known as 'thermal runaway'. Thermal runaway occurs in situations where an increase in temperature changes the conditions in a way that causes a further increase in temperature, often leading to a destructive result. The risks detailed in the EMPr consider only the risks associated with on-site use of battery energy storage systems.

Possible risks associated with the construction and operation of the BESS from a technical perspective within the development area are limited to health and safety aspects during the project life cycle of the BESS. The risks identified for the construction and operation of the BESS are detailed in the EMPr.

2.3.1.2 Compliance to local and international standards and Fire Prevention

The BESS will be compliant with all local laws and regulations and health and safety requirements governing battery facilities. Over and above that they will comply with international standards such as UN 38.3 (Transportation Testing for Lithium Batteries), UL 1642 (Standard for Safety – Lithium-ion Batteries) and IEC 62619 (Secondary cells and batteries containing alkaline or other non-acid electrolytes Safety requirements

for secondary lithium cells and batteries, for use in industrial applications). Furthermore, the battery facility will also comply with standards such as UL 1973 (Batteries for Use in Stationary Applications) and IEC 62619-2017 including thermal runaway non-propagation and safety zone region operation limits and a failure mode analysis. The design will be compliant with UL 9540 (Energy Storage Systems and Equipment): this standard defines the safety requirements for battery installation in industrial and grid connected applications.

The design of the BESS in compliance with all the local and international standards ensures that fire risk is minimal. Furthermore, each container has a built-in fire detection and suppression system. This system continually monitors the batteries and in an unlikely event of a fire it supresses the fire using inert gas. Each container is also spaced about 3m apart ensuring the chance of a fire spreading between containers (which are made of metal and therefore not easily flammable) is also minimal.

Figure 2.7 below provides a typical configuration of fire detection and suppression system.

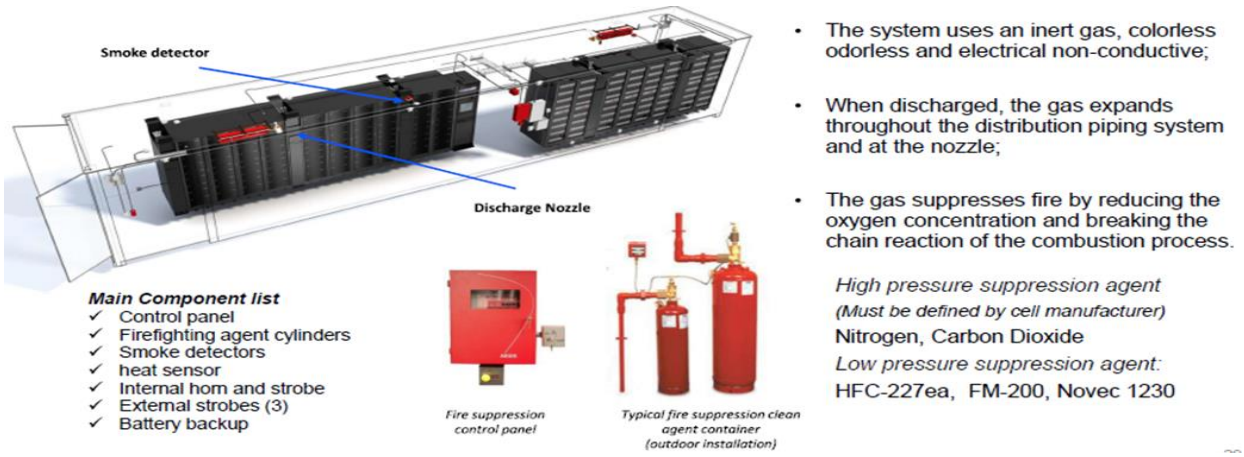


Figure 2.7: Typical configuration of fire detection and suppression system

2.4 Activities during the Project Development Stages

In order to develop the Kleinzee Solar PV Facility and its associated infrastructure, a series of activities will need to be undertaken during the design, pre-construction, construction, operation, and decommissioning phases which are discussed in more detail below.

2.4.1 Design and Pre-Construction Phase

Pre-Construction Phase	
Requirements	» Planning and design of facility
Activities to be undertaken	
Site preparation	» Confirming the integrity of site access to accommodate the required equipment. » Preparation of the site (e.g., laydown area). » Mobilisation of construction equipment.
Conduct surveys prior to construction	» Including, but not limited to a detailed geotechnical survey, site survey and confirmation of the infrastructure micro-siting footprint, survey of the security booth, O&M building, workshop, storage and site office areas to determine and confirm the locations of all associated infrastructure.

Pre-planning: Several post-authorisation factors are expected to influence the final design of the facility and could result in small-scale modifications of the PV array and/or associated infrastructure. While an objective of the Engineering, Procurement and Construction (EPC) Contractor, who will be responsible for the overall construction phase of the project, will be to comply with the approved facility design as far as possible, it should be understood that the construction process is dynamic and that unforeseen changes to the project specifications will take place. This report therefore describes the project in terms of the best available knowledge at the time. The final facility design is required to be approved by the DFFE.

Conduct surveys: Prior to initiating construction, several surveys will be required including, but not limited to, confirmation of the micro-siting footprint (i.e., the precise location of the PV panels, on-site substation, grid connection infrastructure and the facility's associated infrastructure) and a geotechnical survey. Geotechnical surveys are executed by geotechnical engineers and geologists to acquire information regarding the physical characteristics of soil and rocks underlying a proposed site. The purpose is to design earthworks and foundations for structures and to execute earthwork repairs necessitated due to changes in the subsurface environment.

2.4.2 Construction Phase

The construction phase will entail a series of activities including:

Construction Phase	
Requirements	» Project requires an Environmental Authorisation from DFFE, and a generation license issued by NERSA. » Construction expected to be >12 months in duration. » The construction phase involves installation of the solar PV panels and the 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. » Create direct construction employment opportunities. Up to 100-120 employment opportunities will be created. » No on-site labour camps. Employees to be transported to and from site on a daily basis. » Overnight on-site worker presence would be limited to security staff. » Waste removal and sanitation will be undertaken by a suitably qualified sub-contractor. Waste containers, including containers for hazardous waste, will be located at easily accessible locations on site when construction activities are undertaken. » Electricity required for construction activities will be provided by the mine. Where low voltage connections are possible, these will be utilised. » Water required for the construction phase will be sources from a water services provider. Water will be transported to site via water tankers. Water will be used for sanitation and potable water on site as well as construction works.
Activities to be undertaken	
Conduct surveys prior to construction	» Including, but not limited to a geotechnical survey, site survey and confirmation of the panel micro-siting footprint, and survey of the on-site collector substation site to determine and confirm the locations of all associated infrastructure.
Establishment of access roads to the Site	» Internal access roads within the site will be established at the commencement of construction.

	» Existing access roads will be utilised, where possible, to minimise impact. It is unlikely that access roads will need to be upgraded as part of the proposed development. » Access roads to be established for construction and/or maintenance activities within the development footprint. » Internal service road alignment will be up to 6m wide. Location is to be determined by the final micro-siting or positioning of the PV panels.
Undertake site preparation	» Including the clearance of vegetation at the footprint of PV panel supports, establishment of the laydown areas, the establishment of internal access roads and excavations for foundations. » Stripping of topsoil to be stockpiled, for use during rehabilitation. » Vegetation clearance to be undertaken in a systematic manner to reduce the risk of exposed ground being subjected erosion. » Include search and rescue of floral species of concern (where required) and the identification and excavation of any sites of cultural/heritage value (where required).
Establishment of laydown areas and batching plant on site	» A laydown area for the storage of PV panels components and civil engineering construction equipment. » The laydown will also accommodate building materials and equipment associated with the construction of buildings. » No borrow pits will be required. Infilling or depositing materials will be sourced from licenced borrow pits within the surrounding areas.
Construct foundation	» Excavations to be undertaken mechanically. » For PV array installation vertical support posts will be driven into the ground. » Depending on geological conditions, the use of alternative foundations may be considered (e.g., screw pile, helical pile, micropyle or drilled post/piles).
Transport of components and equipment to and within the site	» The components for the solar PV facility and onsite substation will be transported to site by road. Transportation will take place via appropriate National and Provincial roads, and the dedicated access/haul road to the site. » Some of the components (i.e., substation transformer) may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989) by virtue of the dimensional limitations. » Typical civil engineering construction equipment will need to be brought to the site (e.g., excavators, trucks, graders, compaction equipment, cement trucks, etc.) as well as components required for the mounting of the PV support structures, construction of the substation and site preparation. » Components for the establishment of the substation (including transformers) and the associated infrastructures to be transported to site. » Transportation will take place via appropriate National and Provincial roads, and the dedicated access/haul road to the site.
Erect PV Panels and Construct Substation, Invertors	» For array installation, typically vertical support posts are driven into the ground. Depending on the results of the geotechnical study 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.
Connection of PV panels to the substation	» PV arrays to be connected to the on-site substation via underground electrical cables. » Excavation of trenches is required for the installation of the cables. Trenches will be approximately 1.5m deep. » Underground cables are planned to follow the internal access roads, as far as possible. » On-site substation to be connected to the collector substation via underground cables.
Establishment of ancillary infrastructure	» Site offices and maintenance buildings, including workshop areas for maintenance and storage will be required. » Establishment will require the clearing of vegetation, levelling, and the excavation of foundations prior to construction.
Connect substation to the power grid	» A power line will run from the on-site substation and the switching station to the authorised Zonnequa Substation.
Undertake site rehabilitation	» Commence with rehabilitation efforts once construction completed in an area, and all construction equipment is removed. » On commissioning, access points to the site not required during the operation phase will be closed and prepared for rehabilitation.

The construction phase will entail a series of activities including:

Procurement and employment

The development, procurement, installation, maintenance, and management of renewable energy facilities have significant potential for job creation and skills development in South Africa. The construction phase will create temporary employment opportunities and the operation phase will create limited full-time employment opportunities. At its peak, the construction is likely to result in the creation of approximately 100-120 employment opportunities. Of those employment opportunities available, approximately 60% will comprise opportunities for low skilled workers, 25% for semi-skilled workers, and 15% for skilled workers. Skills developed through experience in the construction of the facility will be retained by the community members involved.

Establishment of an Access Road to the Study Area and Internal Access Roads within the Development Area

The project site can be readily accessed via the secondary DR2964. The access to the facility/ies will be via an existing (unnamed) gravel road off the DR2964 between Komaggas and Kleinsee. This gravel road is well established, however it's likely portions of this road will require upgrading to accommodate the movement of heavy vehicles. A network of internal access roads will be constructed to provide access to the various components of the facility. Within the development area itself, access will be required from new/existing roads for construction purposes (and limited access for maintenance during operation). A network of up to 6m wide internal access roads will be developed to provide access to the development area and to the various project components within the development footprint of Kleinzee Solar PV Facility.

Undertake Site Preparation

Site preparation activities will include the clearance of vegetation. These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site.

Water Usage and Waste Requirements

During the construction phase water will be required for the undertaking of the required construction activities as well as for potable use. For the duration of the construction phase (i.e., 12-18 months) ~xxxm^3 of water will be required. Water for the construction phase will be sourced directly from a Water Services Provider.

Services Required

- *Waste* - waste will be minimised, re-used, and recycled as far as practically possible. Where re-use and recycling is not possible. Waste containers, including containers for hazardous waste, will be located at easily accessible locations on site when construction activities are undertaken. Excess waste material will be removed once the construction phase is complete and will be disposed of at registered landfill site/waste facility. handling, storage and disposal of the hazardous waste components, i.e. oils and other lubricants, will be done in accordance with the relevant legislation.
- *Sanitation* – during the construction phase, mobile chemical toilets or a conservancy tank will be placed within the development area for use by contractors.
- *Electricity supply* - electricity required for construction activities will be provided by the Mine. Where low voltage connections are possible, these will be utilised.
- *Water supply* – water required for the construction phase will be sourced directly from a Water Services Provider. Water will be transported to site via water tankers. Water will be used for sanitation and potable water on site as well as construction works.

Transport of Components and Equipment to Site

The components for the solar PV facility will be transported to site by road. For the Kleinzee Solar PV and associated grid connection infrastructure, transport of the components would be via access gravel road connecting to the DR2964 secondary road. Some of the components (i.e. substation transformer) may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)[12] by virtue of the dimensional limitations. Typical civil engineering construction equipment will need to be brought to the site (e.g., excavators, trucks, graders, compaction equipment, cement trucks, etc.) as well as components required for the mounting of the PV support structures, construction of the substation and site preparation.

Establishment of Laydown Areas on Site

A laydown and storage area will be required for the typical construction equipment. The equipment construction camp serves to confine activities and storage of equipment to one designated area and to limit the potential ecological impacts associated with this phase of the project. The laydown area will be used for the storage of the PV panels and the general placement/storage of construction equipment and other component required for the operations of the facility.

Erect PV Panels and Construct Substation and Invertors

The construction phase involves installation of the solar PV panels and the 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

[12] A permit will be required for the transportation of these abnormal loads on public roads.

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.

Figure 2.3: Example of solar PV frame, structural details.

The construction of the on-site 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.

Establishment of Ancillary Infrastructure

Ancillary infrastructure will include the cabling for the connection to the Eskom national grid, 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 development area and the excavation of foundations prior to construction.

Undertake Site Remediation

Once construction is completed and all construction equipment is removed, the site must be rehabilitated where practical and reasonable. On full commissioning of the solar PV facility, any access points to the site that are not required during the operation phase must be closed and rehabilitated.

2.4.3 Operation Phase

The Kleinzee Solar PV Facility and associated Grid Connection Infrastructure is expected to be operational for a minimum of 20 years. The facility will, under normal operating conditions, operate continuously, 7 days a week.

Operation Phase	
Requirements	» Duration will be up to 25 years. » Requirements for security and maintenance of the project. » Employment opportunities relating mainly to operation activities and maintenance. » Employment opportunities will be available during the operation of the solar facility.
Activities to be undertaken	

Operation and Maintenance	» Full time security, maintenance, and control room staff. » All PV panels will be operational except under circumstances of mechanical breakdown, inclement weather conditions, or maintenance activities. » Solar PV to be subject to periodic maintenance and inspection. » It is anticipated that the PV panels will be washed twice a year during operation using clean water with no cleaning products, or non-hazardous biodegradable cleaning products. » Disposal of waste products (e.g., oil) in accordance with relevant waste management legislation. » Areas which were disturbed during the construction phase to be utilised, should a laydown area be required during operation.

Key elements of the Operation and Maintenance plan include monitoring and reporting the performance of the facility, conducting preventative and corrective maintenance, receiving visitors, and maintaining security of the project.

Water will be required for the operation phase of the Kleinzee Solar PV Facility and will be sourced directly from a Water Services Provider.

Other services required for the operation of the Kleinzee Solar PV Facility and associated Grid Connection Infrastructure include refuse material disposal and sanitation. No effluent is anticipated to be produced during the operation phase, except for normal sewage due to the presence of the operations staff. The sewage generated over this period will be collected and treated as per normal standards. Sewage will be collected by a service provider (contractor) for treatment at a licensed treatment facility.

2.4.4 Decommissioning Phase

Depending on the continued economic viability of the Kleinzee Solar PV facility and associated Grid Connection Infrastructure following the initial 20-year operation period, the solar PV facility will either be decommissioned, or the operation phase will be extended. If it is deemed financially viable to extend the operation phase, existing components would either continue to operate or be disassembled and replaced with new, more efficient technology/infrastructure available at that time. However, if the decision is made to decommission the solar PV facility, the following activities will form part of the project scope.

Decommissioning Phase	
Requirements	» Decommissioning of the infrastructure at the end of its economic life. » Potential for repowering of the facility, depending on the condition of the facility at the time. » Expected lifespan of approximately 25 years (with maintenance) before decommissioning is required. » Decommissioning activities to comply with the legislation relevant at the time. » It is expected that the areas of the project site affected by the solar facility infrastructure (development footprint) will revert back to its original land-use once the facility has reached the end of its economic life and all infrastructure has been decommissioned.
Activities to be undertaken	
Site preparation	» Confirming the integrity of site access to the site to accommodate the required decommissioning equipment. » Preparation of the site (e.g., laydown areas and construction platform). » Mobilisation of construction equipment.

Disassemble and remove PV panels	» Components to be reused, recycled, or disposed of in accordance with regulatory requirements. » Much of the above ground wire, steel, and PV panels of which the system is comprised are recyclable materials and would be recycled to the extent feasible. » Concrete will be removed to a depth as defined by an agricultural specialist and the area rehabilitated. » Cables will be excavated and removed, as may be required

Site Preparation

Site preparation activities will include confirming the integrity of the access to the site to accommodate the required decommissioning equipment.

Disassemble and Remove Existing Components

When the solar PV facility is ultimately decommissioned, the equipment to be removed will depend on the proposed future land use for the site at that time. At this time, all above ground facilities that are not intended for future use at the site will be removed. Underground equipment (e.g. foundation, wiring) will be removed, and the surface restored. Much of the above ground wire, steel, and PV panels, of which the system is comprised, are recyclable materials and would be recycled to the extent feasible. The components of the plant would be deconstructed and recycled or disposed of in accordance with regulatory requirements. The site will be rehabilitated and returned to a beneficial land use.

Future plans for the site and infrastructure after decommissioning

The capacity of the Kleinzee Solar PV Facility and associated Grid Connection Infrastructure would have degraded by ~15% over 20 years. The expectation is that the development area will be used for future renewable energy procurement as the operation phase approaches the termination date of the 20-year Power Purchase Agreement (PPA). If decommissioning were to occur, it would be 20 years (or the stated years) after the commencement of the PPA. Another option for the site after decommissioning is for a compatible land use, such as grazing, to resume following site rehabilitation.

CHAPTER 3: POLICY AND LEGISLATIVE CONTEXT

This Chapter provides an overview of the policy and legislative context within which the development of a solar PV facility is proposed. It identifies environmental legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable or have bearing on the proposed activity, and which are required to be considered in the assessment process.

3.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA Report includes the following information required in terms of Appendix 1: Content of Basic Assessment Reports:

Requirement	Relevant Section
3(e) a description of the policy and legislative context within which the development is proposed including- (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. (ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments.	A description of the policy and legislative context within which the Kleinzee Solar PV Facility is proposed is included and considered within this chapter. The regulatory and planning context has been considered at national, provincial, and local levels. A description of the policy and legislative context within which the Kleinzee Solar PV facility and associated grid connection is proposed is included in **sections 3.3, 3.4, 3.5** and **3.6.**

3.2 Strategic Electricity Planning in South Africa

The energy sector in South Africa has been, and continues to be, at the centre of the economic and social development. The industry directly affects the economy by using labour and capital to produce energy. As the country`s economy continues to grow, the Department of Mineral Resources and Energy (DMRE) is mandated to ensure that energy resources are available, and that there is access to energy services in an affordable, reliable and sustainable manner, while minimizing the associated adverse environmental impacts (Department of Energy, 2019).

The expansion of electricity generation capacity in South Africa is based on national policy and informed by on-going strategic planning undertaken by the DMRE. The hierarchy of policy and planning documentation that supports the development of renewable energy projects, such as wind energy facilities, is illustrated in **Figure 3.1**. These policies are discussed in more detail in the following sections, along with the provincial and local policies or plans that have relevance to the development of the proposed project.

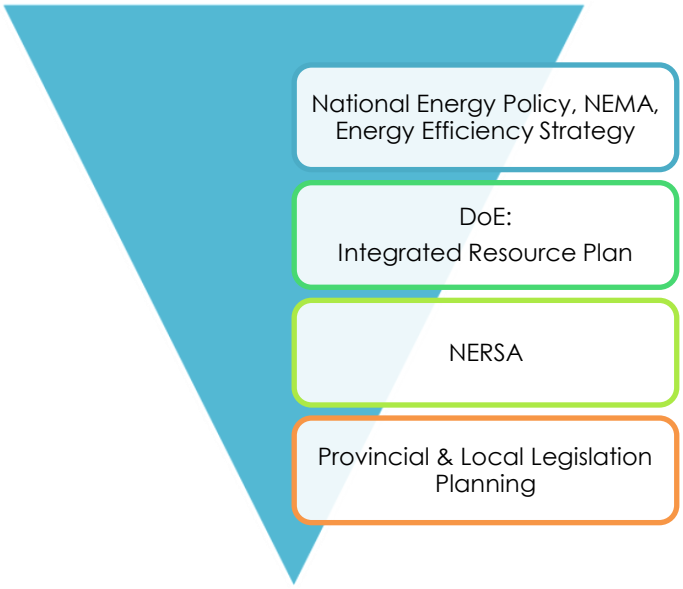


Figure 3.1: Hierarchy of electricity and planning documents

The South African energy industry is evolving rapidly, with regular changes to legislation and industry role-players. The regulatory hierarchy for an energy generation project of this nature consists of three tiers of authority who exercise control through both statutory and non-statutory instruments – that is National, Provincial and Local levels. As solar energy developments are a multi-sectoral issue (encompassing economic, spatial, biophysical, and cultural dimensions) various statutory bodies are likely to be involved in the approval process of a solar energy project and the related statutory environmental assessment process.

At **National Level**, the main regulatory agencies are:

- **Department of Mineral Resources and Energy (DMRE):** This Department is responsible for policy relating to all energy forms and for compiling and approving the Integrated Resource Plan (IRP) for electricity. Furthermore, the Department is also responsible for granting approvals for the use of land which is contrary to the objects of the Mineral and Petroleum Resource Development Act (Act No. 28 of 2002) (MPRDA) in terms of Section 53 of the Act. Therefore, in terms of the Act, approval from the Minister is required to ensure that the proposed activities do not sterilise mineral resources that may occur within the project site and development area.
- **National Energy Regulator of South Africa (NERSA):** NERSA is responsible for regulating all aspects of the electricity sector and will ultimately issue licenses for IPP projects to generate electricity.
- **Department of Forestry, Fisheries and the Environment (DFFE):** This Department is responsible for environmental policy and is the controlling authority in terms of NEMA and the EIA Regulations, 2014 (GN R326) as amended. DFFE is the Competent Authority for this project (as per GN R779 of 01 July 2016) and is charged with granting the EA for the project under consideration. Furthermore, the Department is also responsible for issuing permits for the disturbance or destruction of protected tree species listed under Section 15 (1) of the National Forest Act (No. 84 of 1998) (NFA). The Department is also responsible for permits for Threatened or Protected Species (TOPS) under the National Environmental Management: Biodiversity Act.
- **The South African Heritage Resources Agency (SAHRA):** SAHRA is a statutory organisation established under the National Heritage Resources Act (No. 25 of 1999) (NHRA), as the national administrative body responsible for the protection of South Africa's cultural heritage.

- **South African National Roads Agency Limited (SANRAL):** This Agency is responsible for the regulation and maintenance of all national road routes.
- **Department of Water and Sanitation (DWS):** This Department is responsible for effective and efficient water resource management to ensure sustainable economic and social development. This Department is also responsible for evaluating and issuing licenses pertaining to water use (i.e., Water Use License (WUL) and General Authorisation).
- **The Department of Agriculture, Land Reform and Rural Development (DALRRD):** This Department is the custodian of South Africa's agricultural resources and is primarily responsible for the formulation and implementation of policies governing the agriculture sector.

At **Provincial Level**, the main regulatory agencies are:

- **Provincial Government of the Northern Cape – Northern Cape Department of Environment and Nature Conservation (DENC):** This Department is the commenting authority for the EIA process for the project and is responsible for issuing of biodiversity and conservation-related permits.
- **Northern Cape Department of Transport, Safety and Liaison:** This Department provides effective co-ordination of crime prevention initiatives, provincial police oversight, traffic management and road safety towards a more secure environment.
- **Ngwao-Boswa Ya Kapa Bokone (NBKB):** This Department identifies, conserves and manages heritage resources throughout the Northern Cape Province.

At the **Local Level,** the local and district municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. In the Northern Cape Province, both the local and district municipalities play a role. The local municipality includes the Nama Khoi Local Municipality which forms part of the Namakwa District Municipality. In terms of the Municipal Systems Act (No. 32 of 2000), it is compulsory for all municipalities to go through an Integrated Development Planning (IDP) process to prepare a five-year strategic development plan for the area under their control.

3.3 Policy and planning on an International Level

South Africa has committed to various international policies which relate to environmental concerns, specifically that of climate change and global warming. **Table 3.1** below provides a summary of the international policies and plans that South Africa has made commitments towards, and how the proposed development of the Kleinzee Solar PV facility aligns with the thinking or commitments of these agreements. The Kleinzee Solar PV Facility is considered to be aligned with the aims of these policies, even if contributions to achieving the goals therein are only minor.

Table 3.1: International policies relevant to the Kleinzee Solar PV facility

Relevant policy	Relevance to the Kleinzee Solar PV facility and associated grid connection infrastructure
The Kyoto Protocol, 1997	The protocol calls for the reduction of South Africa's greenhouse gas emissions through actively cutting down on using fossil fuels, or by utilising more renewable resources. The development of the Kleinzee Solar PV facility will enable the evacuation of additional capacity to the renewable energy sector of the country and strengthen the commitment and action plan to achieve the requirements as set out in the protocol.
United Nations Framework Convention on Climate	The Conference of the Parties (COP), established by Article 7 of the UNFCCC, is the supreme body and highest decision-making organ of the Convention. It reviews the

Change (UNFCCC) and Conference of the Party (COP)	implementation of the Convention and any related legal instruments and takes decisions to promote the effective implementation of the Convention. The Conference of the Parties (COP) 21 was held in Paris from 30 November to 12 December 2015. From this conference, an agreement to tackle global warming was reached between 195 countries. South Africa signed the Agreement in April 2016 and ratified the agreement on 01 November 2016. The Agreement was assented to by the National Council of Provinces on 27 October 2016, and the National Assembly on 1 November 2016. South Africa's National Climate Change Response Policy (NCCRP) establishes South Africa's approach to addressing climate change, including adaptation and mitigation responses. The NCCRP formalises Government's vision for a transition to a low carbon economy, through the adoption of the 'Peak, Plateau and Decline' (PPD) GHG emissions trajectory whereby South Africa's emissions should peak between 2020 and 2025, plateau for approximately a decade, and then decline in absolute terms thereafter, and based on this the country has pledged to reduce emissions by 34% and 42% below Business As Usual (BAU) emissions in 2020 and 2025, respectively. The policy provides support for the Kleinzee Solar PV Facility which will contribute to managing climate change impacts, supporting the emergency response capacity, as well as assist in reducing GHG emissions in a sustainable manner.
The Equator Principles IV (October 2020)	The Equator Principles (EPs) IV constitute a financial industry benchmark used for determining, assessing, and managing a project's environmental and social risks. The EPs are primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. In addition, these principles are used to ensure that projects financed by the Equator Principles Financial Institutions (EPFI) are developed in a manner that is socially responsible and reflects sound environmental management practices. The EPs are applicable to infrastructure projects and apply globally to all industry sectors. Such an assessment should propose measures to minimise, mitigate, and offset adverse impacts in a manner relevant and appropriate to the nature and scale of the Project. In terms of the EPs, South Africa is a non-designated country (as at 4 March 2020), and as such the assessment process for projects located in South Africa evaluates compliance with the applicable IFC Performance Standards on Environmental and Social Sustainability, and Environmental Health and Safety (EHS) Guidelines. The Kleinzee Solar PV Facility is currently being assessed in accordance with the requirements of the EIA Regulations, 2014, as amended (GN R326), published in terms of Section 24(5) of the National Environmental Management Act (No. 107 of 1998) (NEMA), which is South Africa's national legislation providing for the authorisation of certain controlled activities. Through this assessment, all potential social and environmental risks are identified and assessed, and appropriate mitigation measures proposed.
International Finance Corporation (IFC) Performance Standards and	The International Finance Corporation's (IFC) Performance Standards (PSs) on Environmental and Social Sustainability were developed by the IFC and were last updated on 1 January 2012. The overall objectives of the IFC performance standards are to fight poverty, do no harm to people or the environment, fight climate change

Environmental and Social Sustainability (January 2012)	by promoting low carbon development, respect human rights, promote gender equality, provide information prior to project development, collaborate with the project developer in order to achieve the performance standard, provide advisory services and notify countries of trans boundary impacts. Performance Standard 1 requires that a process of environmental and social assessment be conducted, and an ESMS appropriate to the nature and scale of the project, and commensurate with the level of its environmental and social risks and impacts, be established and maintained. The above-mentioned standard is the overarching standard to which all the other standards relate. Performance Standard 2 through to 8 establish specific requirements to avoid, reduce, mitigate, or compensate for impacts on people and the environment, and to improve conditions where appropriate. While all relevant social and environmental risks and potential impacts should be considered as part of the assessment, the standards 2 and 8 describe potential social and environmental impacts that require particular attention specifically within emerging markets. Where social or environmental impacts are anticipated, the developer is required to manage them through its ESMS consistent with Performance Standard 1. Given the nature of the Kleinzee Solar PV facility, it is anticipated (at this stage of the process) that Performance Standards 1, 2, 3, 4, 6, and 8 may be applicable to the project.

3.4 Policy and planning on a National Policy

Further to the South African government's commitment in August 2011 to support the development of renewable energy capacity, the DMRE initiated the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) to procure renewable energy from the private sector in a series of rounds. According to the IPP Procurement Programme overview report (2021), as of March 2021, 6 422MW of renewable energy capacity from 112 independent power producers (IPPs), with 5 078MW operational and made available to the grid[13]. National policies have to be considered for the construction and operation of the Solar Energy Facility to ensure that the development is in line with the planning of the country.

A brief review of the most relevant national policies is provided below in **Table 3.2**. The development of the Kleinzee Solar PV Facility and associated grid connection infrastructure is considered to align with the aims of these policies, even if contributions to achieving the goals therein are only minor.

Table 3.2: Relevant national legislation and policies for the Kleinzee Solar PV facility and associated grid connection infrastructure

Relevant legislation or policy	Relevance to the Kleinzee Solar PV facility and associated grid connection infrastructure
Constitution of the Republic of South Africa, 1996	Section 24 of the Constitution pertains specifically to the environment. It states that everyone has the right to an environment that is not harmful to their health or well-being, and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation, promote conservation and secure ecologically

[13]https://www.cliffedekkerhofmeyr.com/en/news/publications/2019/Corporate/energy-alert-22-october-The-Integrated-Resource-Plan-2019-A-promising-future-roadmap-for-generation-capacity-in-South-Africa.html

Relevant legislation or policy	Relevance to the Kleinzee Solar PV facility and associated grid connection infrastructure
	sustainable development and use of natural resources while promoting justifiable economic and social development. The Constitution outlines the need to promote social and economic development. Section 24 of the Constitution therefore requires that development be conducted in such a manner that it does not infringe on an individual's environmental rights, health, or well-being. This is especially significant for previously disadvantaged individuals who are most at risk to environmental impacts. The undertaking of an EIA process for the proposed project in terms of the requirements of the EIA Regulations, 2014 (as amended) aims to minimise any impacts on the natural and social environment.
National Environmental Management Act (No. 107 of 1998) (NEMA)	This piece of legislation is South Africa's key piece of environmental legislation and sets the framework for environmental management in South Africa. NEMA is founded on the principle that everyone has the right to an environment that is not harmful to their health or well-being as contained within the Bill of Rights. The national environmental management principles state that the social, economic, and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment. The need for responsible and informed decision-making by government on the acceptability of environmental impacts is therefore enshrined within NEMA.
White Paper on the Energy Policy of the Republic of South Africa (1998)	The White Paper on Energy Policy places emphasis on the expansion of energy supply options to enhance South Africa's energy security. This can be achieved through increased use of RE and encouraging new entries into the generation market. The policy states that the advantages of renewable energy include, minimal environmental impacts during operation in comparison with traditional supply technologies, 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. Nonetheless, renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future.
White Paper on the Renewable Energy Policy of the Republic of South Africa (2003)	The White Paper on Renewable Energy Policy supplements Government's predominant policy on energy as set out in the White Paper on the Energy Policy of the Republic of South Africa (DME, 1998). The policy recognises the potential of RE and aims to create the necessary conditions for the development and commercial implementation of renewable energy technologies. The White Paper on RE sets out Government's vision, policy principles, strategic goals, and objectives for promoting and implementing RE in South Africa. The country relies heavily on coal to meet its energy needs due to its abundant, and fairly accessible and affordable coal resources. However, massive RE resources that can be sustainable alternatives to fossil fuels, have so far remained largely untapped. The White Paper on Renewable Energy of 2003 set a target of 10 000GWh to be generated from RE by 2013 to be produced mainly from biomass, wind, solar and small-scale hydro. The target was subsequently reviewed in 2009 during the RE summit

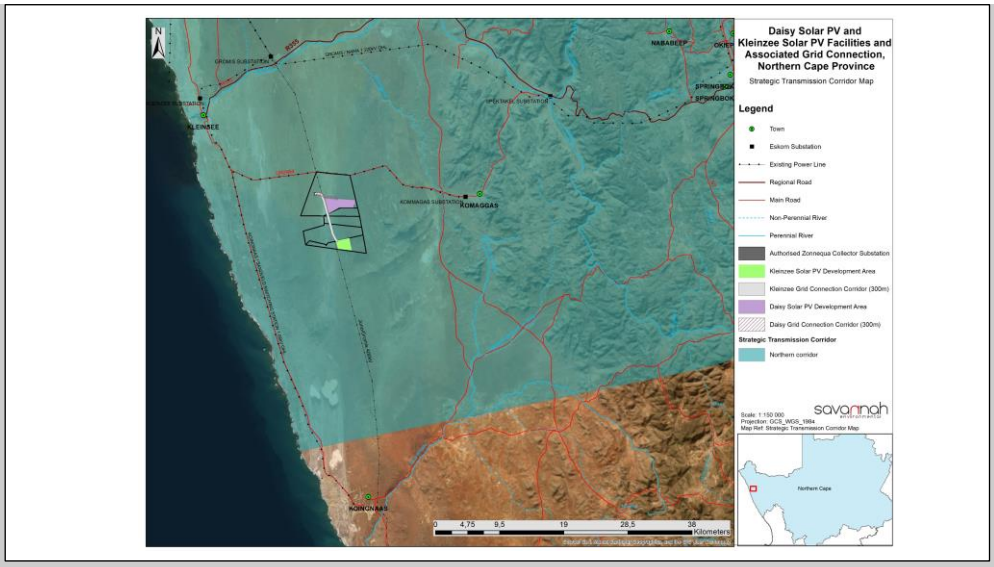
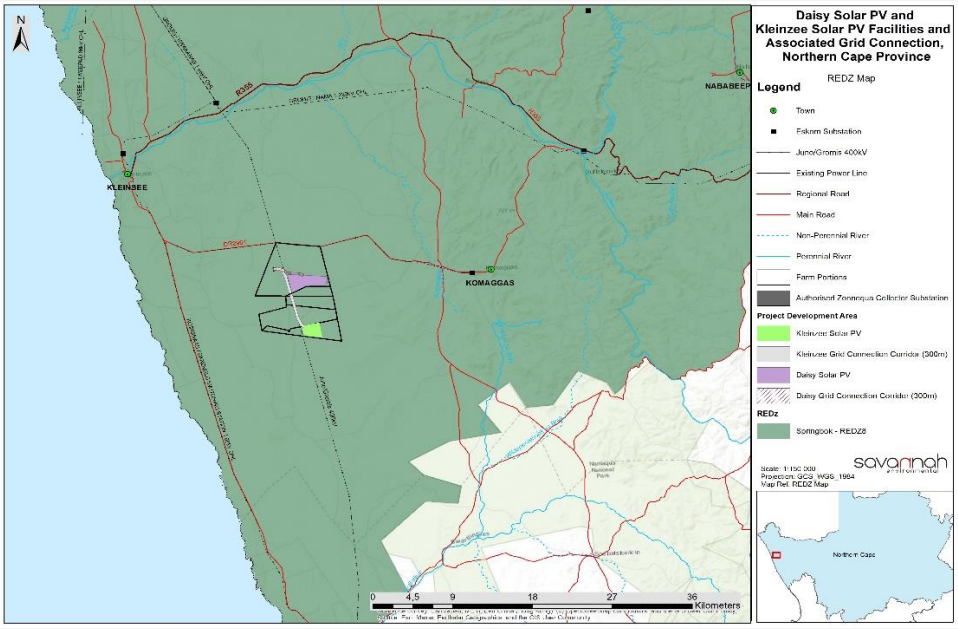
Relevant legislation or policy	Relevance to the Kleinzee Solar PV facility and associated grid connection infrastructure
	of 2009. The policy supports the investment in RE facilities as they contribute towards ensuring energy security through the diversification of energy supply, reducing GHG emissions and the promotion of RE sources.
National Energy Act (No. 34 of 2008)	The purpose of the National Energy Act (No. 34 of 2008) is 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, while taking environmental management requirements into account. In addition, the Act also provides for energy planning, and increased generation and consumption of Renewable Energies (REs). The Act provides the legal framework which supports the development of RE facilities for the greater environmental and social good and provides the backdrop against which South Africa's strategic planning regarding future electricity provision and supply takes place.
The Electricity Regulation Act (No. of 2006)	The Electricity Regulation Act of 2006, replaced the Electricity Act (No. 41 of 1987), as amended, with the exception of Section 5B, which provides funds for the energy regulator for the purpose of regulating the electricity industry. The Act establishes a national regulatory framework for the electricity supply industry and introduces the National Energy Regulator (NERSA) as the custodian and enforcer of the National Electricity Regulatory Framework. The Act also provides for licences and registration as the manner in which the generation, transmission, distribution, trading, and import and export of electricity are regulated.
Integrated Energy Plan (IEP), 2015	The Integrated Energy Plan (IEP) (which was developed under the National Energy Act (No. 34 of 2008)), recognises that energy is essential to many human activities, and is critical to the social and economic development of a country. The purpose of the IEP is essentially to ensure the availability of energy resources, and access to energy services in an affordable and sustainable manner, while minimising associated adverse environmental impacts. Energy planning therefore needs to balance the need for continued economic growth with social needs, and the need to protect the natural environment.
Integrated Resource Plan for Electricity (IRP) 2010-2030 (2019)	The Integrated Resource Plan (IRP) for Electricity 2010 – 2030 is a subset of the IEP and constitutes South Africa's National electricity plan. The primary objective of the IRP is to determine the long-term electricity demand and detail how this demand should be met in terms of generating capacity, type, timing and cost. The IRP also serves as input to other planning functions, including amongst others, economic development and funding, and environmental and social policy formulation. On 27 August 2018, the then Minister of Energy published a draft IRP which was issued for public comment. The lengthy public participation and consultation process has culminated in the issue of the overdue IRP 2019 which updates the energy forecast from the current period to the year 2030. Since the promulgated IRP 2010, the following capacity developments have taken place: » A total of 6 422MW has been procured thus far under the REIPPP Programme, with 3 876MW being currently operational and made available to the grid. In addition, IPPs have commissioned 1005MW from two (2) Open Cycle Gas Turbines (OCGT) peaking plants; and

Relevant legislation or policy	Relevance to the Kleinzee Solar PV facility and associated grid connection infrastructure
	» Under the Eskom Build Programme, 1 332MW has been procured from the Ingula Pumped Storage Project, 1 588MW and 800MW from the Medupi and Kusile power stations and 100MW from the Sere Wind Farm. Provision has been made for the following new capacity by 2030: » 1 500MW of coal; » 2 500MW of hydro; » 6 000MW of solar PV; » 14 400MW of wind; » 1 860MW of nuclear; » 2 088MW of storage; » 3 000MW of gas/diesel; and » 4 000MW from other distributed generation, co-generation, biomass and landfill technologies. Based on the IRP 2019, 1 474MW has been installed for solar PV facilities, whereas, 814MW has already been procured. In addition, 1 000MW has been allocated for solar PV facilities from 2022 to 2030. This will bring the total installed capacity of solar PV facilities by 2030 to 8 288MW. Therefore, the development of the Kleinzee Solar PV Facility is supported by the IRP 2019.
Renewable Energy Policy in South Africa	Support for the Renewable Energy Policy is guided by a rationale that South Africa has a very attractive range of renewable energy resources, particularly solar and wind, and that renewable applications are, in fact, the least cost energy service in many cases from a fuel resource perspective (i.e. the cost of fuel in generating electricity from such technology); more so when social and environmental costs are taken into account. However, the National Energy Policy acknowledges that the development and implementation of renewable energy applications has been largely neglected in South Africa. Challenges regarding the implementation of renewable energy have been identified. Through the development of renewable energy projects (including the Kleinzee Solar PV facility) additional renewable energy will be made available which will assist with the further growth and development of the renewable energy sector.
National Development Plan 2030 (2012)	The National Development Plan (NDP) 2030 is a plan prepared by the National Planning Commission in consultation with the South African public which is aimed at eliminating poverty and reducing inequality by 2030. In terms of the Energy Sectors role in empowering South Africa, the NDP envisages that, by 2030, South Africa will have an energy sector that promotes: » Economic growth and development through adequate investment in energy infrastructure. The sector should provide reliable and efficient energy service at competitive rates, while supporting economic growth through job creation. » Social equity through expanded access to energy at affordable tariffs and through targeted, sustainable subsidies for needy households. » Environmental sustainability through efforts to reduce pollution and mitigate the effects of climate change. The NDP aims to provide a supportive environment for growth and development, while promoting a more labour-absorbing economy. The development of Kleinzee PV

Relevant legislation or policy	Relevance to the Kleinzee Solar PV facility and associated grid connection infrastructure
	facility supports the NDP through the development of energy-generating infrastructure which will not lead to the generation of GHGs and will result in economic development and growth of the area surrounding the development area.
Integrated Energy Plan (IEP), November 2016	The purpose and objectives of the Integrated Energy Plan (IEP) are derived from the National Energy Act (No. 34 of 2008). The IEP takes into consideration the crucial role that energy plays in the entire economy of the country and is informed by the output of analyses founded on a solid fact base. It is a multi-faceted, long-term energy framework which has multiple aims, some of which include: » To guide the development of energy policies and, where relevant, set the framework for regulations in the energy sector. » To guide the selection of appropriate technologies to meet energy demand (i.e., the types and sizes of new power plants and refineries to be built and the prices that should be charged for fuels). » To guide investment in and the development of energy infrastructure in South Africa. » To propose alternative energy strategies which are informed by testing the potential impacts of various factors such as proposed policies, introduction of new technologies, and effects of exogenous macro-economic factors. A draft version of the IEP was released for comment on 25 November 2016. The purpose of the IEP is to provide a roadmap of the future energy landscape for South Africa which guides future energy infrastructure investments and policy development. The development of the IEP is an ongoing continuous process. It is reviewed periodically to take into account changes in the macroeconomic environment, developments in new technologies and changes in national priorities and imperatives, amongst others. The 8 key objectives of the integrated energy planning process are as follows: » Objective 1: Ensure security of supply. » Objective 2: Minimise the cost of energy. » Objective 3: Promote the creation of jobs and localisation. » Objective 4: Minimise negative environmental impacts from the energy sector. » Objective 5: Promote the conservation of water. » Objective 6: Diversify supply sources and primary sources of energy. » Objective 7: Promote energy efficiency in the economy. » Objective 8: Increase access to modern energy. Integrated Resource Plan for Electricity (IRP) 2010-2030
Strategic Integrated Projects (SIPs)	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, 9 and the additional SIP 20 (which are established by the Department of Public Works and infrastructure) of the energy SIPs supports the development of the

Relevant legislation or policy	Relevance to the Kleinzee Solar PV facility and associated grid connection infrastructure
	renewable energy facilities and embedded generation, while SIP 10 supports the development of the Kleinzee Solar PV 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 six renewable energy facilities are 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. 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. » SIP10: Electricity transmission and distribution for all: the development of the Kleinzee Solar PV facility and associated grid connection infrastructure will enable the evacuation of renewable energy to the national grid. » SIP20: Energy (gazetted in GG 43547 on 24 July 2020). Includes 3 sub-projects: a. Emergency/Risk Mitigation Power Purchase Procurement Programme (2000MW): National b. Small IPP Power Purchase Procurement Programme (100MW): National c. Embedded Generation Investment Programme (EGIP)-400MW: National The Kleinzee Solar PV Facility could be registered as a SIP project once it is under development. The project would then contribute to the above-mentioned SIPs.
National Climate Change Response Policy, 2011	The Conference of the Parties (COP) 21 was held in Paris from 30 November to 12 December 2015. From this conference, an agreement to tackle global warming was reached between 195 countries. This Agreement is open for signature and subject to ratification, acceptance or approval by States and regional economic integration organisations that are Parties to the Convention from 22 April 2016 to 21 April 2017. Thereafter, this Agreement shall be open for accession from the day following the date on which it is closed for signature. The agreement can only be sanctioned once it has been ratified by 55 countries, representing at least 55% of emissions. South Africa signed the Agreement in April 2016 and ratified the agreement on 01 November 2016. The Agreement was assented to by the National Council of Provinces on 27 October 2016, and the National Assembly on 1 November 2016. The Agreement was promulgated on 04 November 2016, thirty days after the date on which at least 55 Parties to the Convention, which account for at least 55% of the total global greenhouse gas emissions have deposited their instruments of ratification, acceptance, approval or accession with the Depositary. South Africa's National Climate Change Response Policy (NCCRP) establishes South Africa's approach to addressing climate change, including adaptation and mitigation responses. The NCCRP formalises Government's vision for a transition to a low carbon economy, through the adoption of the 'Peak, Plateau and Decline' (PPD) GHG emissions trajectory whereby South Africa's emissions should peak between 2020 and 2025, plateau for approximately a decade, and then decline in absolute terms thereafter, and based on this the country has pledged to reduce emissions by 34% and 42% below Business As Usual (BAU) emissions in 2020 and 2025, respectively.

Relevant legislation or policy	Relevance to the Kleinzee Solar PV facility and associated grid connection infrastructure
	The policy provides support for the Kleinzee Solar PV facility, which will contribute to managing climate change impacts, supporting the emergency response capacity, as well as assist in reducing GHG emissions in a sustainable manner.
New Growth Path (NGP) Framework, 2010	The purpose of the New Growth Path (NGP) Framework is to provide effective strategies towards accelerated job-creation through the development of an equitable economy and sustained growth. The target of the NGP is to create 5 million jobs by 2020; with economic growth and employment creation as the key indicators identified in the NGP. The framework seeks to identify key structural changes in the economy that can improve performance in terms of labour absorption and the composition and rate of growth. To achieve this, government will seek to, amongst other things, identify key areas for large-scale employment creation, as a result of changes in conditions in South Africa and globally, and to develop a policy package to facilitate employment creation in these areas. The Kleinzee Solar PV facility will assist with the creation of both temporary and permanent employment opportunities during the construction and operation phases, which will contribute, albeit to a limited extent, to the economy and sustainable growth.
Climate Change Bill, 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 Kleinzee Solar PV facility and associated grid connection infrastructure consists of a renewable energy generation facility and would not result in the generation or release of emissions during its operation.
Strategic Transmission Corridors (GNR 113 of February 2018)	The Strategic Environmental Assessment for Electricity Grid Infrastructure has identified five Strategic Transmission Corridors that are of strategic importance for large-scale electricity transmission and distribution infrastructure, in terms of Strategic Integrated Project (SIP) 10: Electricity Transmission and Distribution. The Kleinzee Solar PV facility and associated grid connection infrastructure is located within the Northern Strategic Transmission Corridor (**Figure 3.3**).

Relevant legislation or policy	Relevance to the Kleinzee Solar PV facility and associated grid connection infrastructure
	 **Figure 3.3:** Location of the project site within the Northern Strategic Transmission corridor (shown in light blue).
Renewable Energy Development Zones (REDz) (GNR 114 of February 2018)	The Strategic Environmental Assessment for large-scale wind and solar photovoltaic facilities has identified eight renewable energy development zones that are of strategic importance for large-scale wind and solar photovoltaic facilities, in terms of Strategic Integrated Project (SIP) 8: Green energy in support of the South African economy in terms of the Infrastructure Development Act (Act 23 of 2014) and the Spatial Planning and Land Use Management Act (SPLUMA) (Act 13 of 2013) that allow for the streamlining of development in geographical areas associated with SIPs. The Kleinzee Solar PV facility and associated grid connection infrastructure is located within the Springbok renewable energy development zone (**Figure 3.4**).  **Figure 3.4:** Location of the project site within the Springbok renewable energy development zone (REDZ shown in dark green).

3.5 Policy and planning at a Provincial Level

A brief review of the most relevant provincial policies is provided below in **Table 3.3**. The proposed development is considered to align with the aims of these policies, even if contributions to achieving the goals therein are only minor.

Table 3.3: Relevant provincial legislation and policies for the Kleinzee Solar PV facility

Relevant policy	Relevance to the Kleinzee Solar PV facility
Northern Cape Provincial Spatial Development Framework (PSDF) 2012	The Northern Cape Provincial Spatial Development Framework (PSDF) 2012 states that the overarching goal for the province is to enable sustainability through sustainable development. The province considers social and economic development as imperative in order to address the most significant challenge facing the Northern Cape, which is poverty. The PSDF identifies key sectoral strategies and plans which are considered to be the key components of the PSDF. Sectoral Strategy 19 refers to a provincial renewable energy strategy. Within the PSDF a policy has been included which states that renewable energy sources (including the utilisation of solar energy) are to comprise 25% of the province's energy generation capacity by 2020. The overall energy objective for the province also includes promoting the development of renewable energy supply schemes which are considered to be strategically important for increasing the diversity of domestic energy supply and avoiding energy imports, while also minimising the detrimental environmental impacts. The implementation of sustainable renewable energy is also to be promoted within the province through appropriate financial and fiscal instruments. The development of the Kleinzee Solar PV facility supports the overall energy objective of the province to have 25% of its electricity from renewable energy sources.
Northern Cape Provincial Spatial Development Framework (PSDF) 2018 Review	The review of the Northern Cape PSDF (2018) refers to infrastructure investment and that a balance must be maintained between investments aimed at meeting the social needs of communities and investment aimed at promoting economic development and job creation. The Spatial Development Strategy identified in the PSDF for basic infrastructure includes the achieving the provision of green infrastructure which includes renewable energy. As part of the Vision 2040 of the PSDF key opportunities are identified for the Province. The strengthening of the development triangle that is formed by the linking of Kimberley, Vryburg, Upington and De Aar. The development triangle sustains a diverse economy with strong mining, agricultural and renewable energy sectors. It is stated in the PSDF that a sustainable and viable economic network must be driven within the development triangle to improve the return of public investment in the Province. The development of the Kleinzee Solar PV facility will contribute to the economic network of the province specifically in terms of the renewable sector, albeit it does not fall within the development triangle.
The Northern Cape Climate Change Response Strategy	The key aspects of the Northern Cape Climate Change Response Strategy (NCCCRS) Report are summarised in the MEC's (NCPG: Environment and Nature Conservation) 2011 budget speech: "*The Provincial Climate Change Response Strategy will be underpinned by specific critical sector climate change adaptation and mitigation strategies that*

Relevant policy	Relevance to the Kleinzee Solar PV facility
	include the Water, Agriculture and Human Health sectors as the 3 key Adaptation Sectors, the Industry and Transport alongside the Energy sector as the 3 key Mitigation Sectors with the Disaster Management, Natural Resources and Human Society, livelihoods and Services sectors as 3 remaining key. Sectors to ensure proactive long-term responses to the frequency and intensity of extreme weather events such as flooding and wildfire, with heightened requirements for effective disaster management". Key points from the MEC address include the NCPG's commitment to develop and implement policy in accordance with the National Green Paper for the National Climate Change Response Strategy (2010), and an acknowledgement of the NCP's extreme vulnerability to climate-change driven desertification. The development and promotion of a provincial green economy, including green jobs, and environmental learnership is regarded as an important provincial intervention in addressing climate change. The renewable energy sector, including solar and wind energy (but also biofuels and energy from waste), is explicitly indicated as an important element of the Provincial Climate Change Response Strategy. The MEC further indicated that the NCP was involved in the processing 7 wind energy facility and 11 solar energy facility EIA applications (March 2011) The development of the Kleinzee Solar PV facility will assist in achieving (although only to a limited extent) the promotion of the provincial green economy of the Northern Cape.
Northern Cape Provincial Growth and Development Strategy	The Northern Cape Provincial Growth and Development Strategy (NCPGDS) identifies poverty reduction as the most significant challenge facing the government and its partners. All other societal challenges that the province faces emanate predominantly from the effects of poverty. The NCPGDS notes that the only effective way to reduce poverty is through long-term sustainable economic growth and development. The sectors where economic growth and development can be promoted include: » Agriculture and Agro-processing. » Fishing and Mariculture. » Mining and mineral processing. » Transport. » Manufacturing. » Tourism. However, the NCPGDS also notes that economic development in these sectors also requires: » Creating opportunities for lifelong learning. » Improving the skills of the labour force to increase productivity. » Increasing accessibility to knowledge and information. The achievement of these primary development objectives depends on the achievement of a number of related objectives that, at a macro-level, describe necessary conditions for growth and development. These are: » Developing requisite levels of human and social capital. » Improving the efficiency and effectiveness of governance and other development institutions. » Enhancing infrastructure for economic growth and social development. The NCPGDS makes reference to the need to ensure the availability of inexpensive energy. The section notes that in order to promote economic growth in the Northern Cape, the availability of electricity to key industrial users at critical localities at rates that enhance the competitiveness of their industries must be ensured. At the same time, the

Relevant policy	Relevance to the Kleinzee Solar PV facility
	development of new sources of energy through the promotion of the adoption of energy applications that display a synergy with the province's natural resource endowments must be encouraged. In this regard the NCPGDS notes "the development of energy sources such as solar energy, the natural gas fields, bio-fuels, etc., could be some of the means by which new economic opportunity and activity is generated in the Northern Cape". The NCPGDS also highlights the importance of close co-operation between the public and private sectors in order for the economic development potential of the Northern Cape to be realised. The NCPGDS also highlights the importance of enterprise development and notes that the current level of private sector development and investment in the Northern Cape are low. In addition, the province also lags in the key policy priority areas of SMME Development and Black Economic Empowerment. The development of the Kleinzee Solar PV facility therefore has the potential to create employment opportunities, promote skills development, create opportunities to promote private sector investment and the development of SMMEs in the Northern Cape Province.
Northern Cape Province Green Document	The NCP Green Document (2017-2018) was prepared by the Northern Cape Department of Economic Development and Tourism and provides an impact assessment of IPPs on the communities in the province located within a 50km radius from existing facilities. The document notes that the NCP is nationally a leader in commercial-scale renewable energy projects. By 2018, a total of 23 IPP projects in the province had been integrated into the national grid. These projects include Solar PV, Concentrated Solar, and Wind Energy Facilities. The document notes that through their economic development obligations, these projects have already made a significant positive contribution to affected communities. Much of the effort has been directed at supporting local education. The document also notes that, as these projects are committed to 20-year minimum lifespans, they collectively hold a tremendous potential for socio-economic upliftment. The development of the Kleinzee Solar PV facility will contribute towards further socio-economic upliftment in the Northern Cape Province.

3.6 Policy and planning at a Local Level

The local tiers of government within which the Kleinzee Solar PV facility and associated grid connection infrastructure is located are the Nama Khoi Local Municipality and the Namakwa District Municipality. The development instruments or policies at both the district and local level contain objectives which are in line with the development of the Kleinzee Solar PV facility and associated grid connection infrastructure. These include, economic growth, job creation, community upliftment and poverty alleviation.

Table 3.4: Relevant district and local legislation and policies for the Kleinzee Solar PV facility and associated grid connection infrastructure

Relevant policy	Relevance to the Kleinzee Solar PV facility and associated grid connection infrastructure
Namakwa District Municipality Rural Development Plan (RDP), 2017	Renewable energy developments are considered to be development priorities within the RDP. The need to evaluate localisation possibilities for all renewable energy technologies is emphasised in the plan. The development of renewable energy projects (including the Kleinzee Solar PV facility and associated grid connection infrastructure) will contribute to

Relevant policy	Relevance to the Kleinzee Solar PV facility and associated grid connection infrastructure
	the achievement of the need for the development of renewable energy developments within the province.
Namakwa District Municipality (NDM) Integrated Development Plan (2017-2022)	The mission statement for the NDM is summarised by the following aspects: » The stimulation of radical economic and social transformation; » The fostering of partnership with relevant role-players; » Supporting and capacitating of local municipalities; » Transparent and accountable processes; and » Providing of local leadership. The key priority issues listed in the Namakwa District Municipality's Integrated Development Plan (NDM:IDP) include: » Basic service delivery; » Municipal institutional development and transformation; » Local economic development; » Municipal financial viability and management; and » Good governance and public participation. The development goals listed in the IDP that are relevant to the development of the Kleinzee Solar PV facility include: » To deliver a positive contribution to the sustainable growth and development within its boundaries and the rest of the Northern Cape; » The creation of a healthy and environmentally friendly environment within and outside of the Councils' district boundaries, must be attempted; and » The promotion of human resources within and outside the organisation through training and the implementation of new technological aids. Linked to the developmental goals are a number of developmental objectives. The following objectives are relevant to the development of the Kleinzee Solar PV facility: » Promotion of SMMEs in order to strengthen the Local Economic Sector; and » Promote the infrastructure development, including electricity.
Namakwa District Municipality Integrated Development Plan (IDP), 2022-2027	The plan identifies the need for support to the local municipalities to deliver basic services such as water, sanitation, housing, electricity and waste management. The IDP also seeks to establish good governance by enforcing the climate change response plan. The development of the Kleinzee Solar PV facility may contribute to the delivery of basic services, however only to a limited extent. The proposed PV facility will contribute to the application of the climate change response plan through zero production of greenhouse gas emissions during the operation of the facility.
Nama Khoi Municipality Draft Integrated Development Plan (IDP), 2022/2023	The IDP seeks to provide sustainable delivery of services such as water and sanitation, electricity, and solid waste management amongst others. The plan also identifies possible high solar energy generation zones to the south of Vioolsdrift, and around Springbok and Koingnaas, and proposes an analysis of the areas for the development of solar farms. The development of the Kleinzee Solar PV facility may contribute to the delivery of basic services, however only to a limited extent. The Kleinzee Solar PV facility is located near Kleinsee which is located west of Springbok, and which is considered to be the area in the Local Municipality suitable for the development of a PV facility.

CHAPTER 4: NEED AND DESIRABILITY & ALTERNATIVES

One of the objectives of the EIA process is to motivate for "*the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint*". The need and desirability of a development needs to consider whether it is the right time and right place for locating the type of land-use/activity being proposed. Need and desirability is therefore equated to the wise use of land and should be able to answer the question of what the most sustainable use of land may be.

This Chapter provides an overview of the suitability of the Kleinzee Solar PV Facility being developed at the preferred project location from an international, national, regional, and site-specific perspective. It provides an overview of the need and desirability, and perceived benefits of the project specifically. This Chapter provides an overview of the various alternatives considered for Kleinzee Solar PV Facility as part of the BA Process.

4.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA Report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of Basic Assessment Reports:

Requirement	Relevant Section
3(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.	The need and desirability of the Kleinzee Solar PV Facility is included and discussed as a whole within this chapter. The need and desirability for the development of the Kleinzee Solar PV Facility has been considered from an international, national, regional and site-specific perspective.
3(h)(i) a full description of the process followed to reach the proposed development footprint within the approved site, including details of the development footprint alternatives considered	The details of all alternatives considered as part of the Kleinzee Solar PV Facility is included in **Section 4.7.**
3(h)(ix) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such	The details of the alternatives considered as part of the Kleinzee Solar PV Facility have been included in **Section 4.7**. Where no alternatives are being considered a motivation has been included.

4.2 Need and Desirability from an International Perspective

The need and desirability of the Kleinzee Solar PV Facility, from an international perspective, can be described through the project's alignment with internationally recognised and adopted agreements, protocols, and conventions. South Africa is signatory to a number of international treaties and initiatives, including the United Nation's Development Programme's (UNDP's) Sustainable Development Goals (SDGs). The SDGs address social and economic development issues such as poverty, hunger, health, education, climate change, gender equality, water, sanitation, energy, urbanization, environment and social justice. The SDGs comprise 17 global goals set by the United Nations. The 17 SDGs are characterised by 169 targets, and 304 indicators.

Goal 7 of the SGDs relates to "Affordable and Clean Energy", with the aim of the goal being to ensure access to affordable, reliable, sustainable and modern energy for all. The following targets and indicators have been set for Goal 7:

Targets		Indicators	
7.1	By 2030, ensure universal access to affordable, reliable and modern energy services.	7.1.1 7.1.2	Proportion of population with access to electricity. Proportion of population with primary reliance on clean fuels and technology.
7.2	By 2030, increase substantially the share of renewable energy in the global energy mix.	7.2.1	Renewable energy share in the total final energy consumption.
7.3	By 2030, double the global rate of improvement in energy efficiency.	7.3.1	Energy intensity measured in terms of primary energy and GDP.
7.A	By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.	7.A.1	Mobilised amount of United States dollars per year starting in 2020 accountable towards the $100 billion commitment.
7.B	By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support.	7.B.1	Investments in energy efficiency as a percentage of GDP and the amount of foreign direct investment in financial transfer for infrastructure and technology to sustainable development services.

The development of the Kleinzee Solar PV Facility would contribute positively towards achieving Goal 7 (and specifically 7.2.1) of the SGDs through the following means:

- By generating up to 200MW of affordable and clean energy.
  - A study published by the CSIR on 14 October 2016 ("Cost of new power generators in South Africa Comparative analysis based on recent IPP announcements", Dr Tobias Bischof-Niemz and Ruan Fourie) which took into consideration the results of the cost prices bid successfully under the DoE's REIPPP and Coal Baseload IPP Procurement (CBIPPP) Programmes found that solar PV and wind were 40% cheaper than new baseload coal (i.e. R0.62/kWh for PV and wind vs R1.03 for coal).
  - PV technology is one of the cleanest electricity generation technologies, as it is not a consumptive technology and does not result in the release of emissions during its operation.
- By contributing towards South Africa's total generation capacity, specifically through the utilisation of renewable energy resources.

4.3 Need and Desirability from a National Perspective

4.3.1 Policy and Planning

The National Development Plan (NDP) envisages that, by 2030, South Africa will have an energy sector that provides reliable and efficient energy service at competitive rates; that is socially equitable through expanded access to energy at affordable tariffs; and that is environmentally sustainable through reduced

emissions and pollution. Historically, coal has provided the primary fuel resource for baseload electricity generation in South Africa. Consequently, Eskom, who is the main electricity generating company in the country, generates approximately 85% of the country's electricity from coal resources (Stats SA, 2016), resulting in a large carbon footprint. Taking into consideration the need to ensure adequate supply of electricity and meet international obligations in terms of addressing climate change, Government has identified the need to diversify the energy mix within the country.

The Kleinzee Solar PV Facility is proposed in specific response to the identified energy mix of South Africa as per the requirements set out in the IRP with regards to renewable energy targets. As a result, the need and desirability of the project from a national perspective can largely be assimilated from the project's alignment with national government policies, plans, and programmes which have relevance to energy planning and production (as discussed in detail in Chapter 3). The following key policies have been developed by Government to take into account South Africa's current energy production and projected future demands, and provides the necessary framework within which energy generation projects can be developed:

» Integrated Energy Plan (IEP)
» Integrated Resource Plan (IRP)

The abovementioned energy plans have been extensively researched and are updated on an ongoing basis to take into consideration changing scenarios, new information, developments in new technologies, and to reflect updated demands and requirements for energy production within the South African context. These plans form the basis of South Africa's energy generation sector and dictate national priorities for energy production.

The IEP is intended to provide a roadmap of South Africa's future energy landscape and guides future energy infrastructure investments and policy development. South Africa has a good wind and solar resource for the development and generation of wind and solar energy. In terms of electricity generation, the IEP states that South Africa should continue to pursue a diversified energy mix which reduces reliance on a single or a few primary energy sources. The Plan considered the three pillars of sustainable development, and list the following as the eight key energy planning objectives:

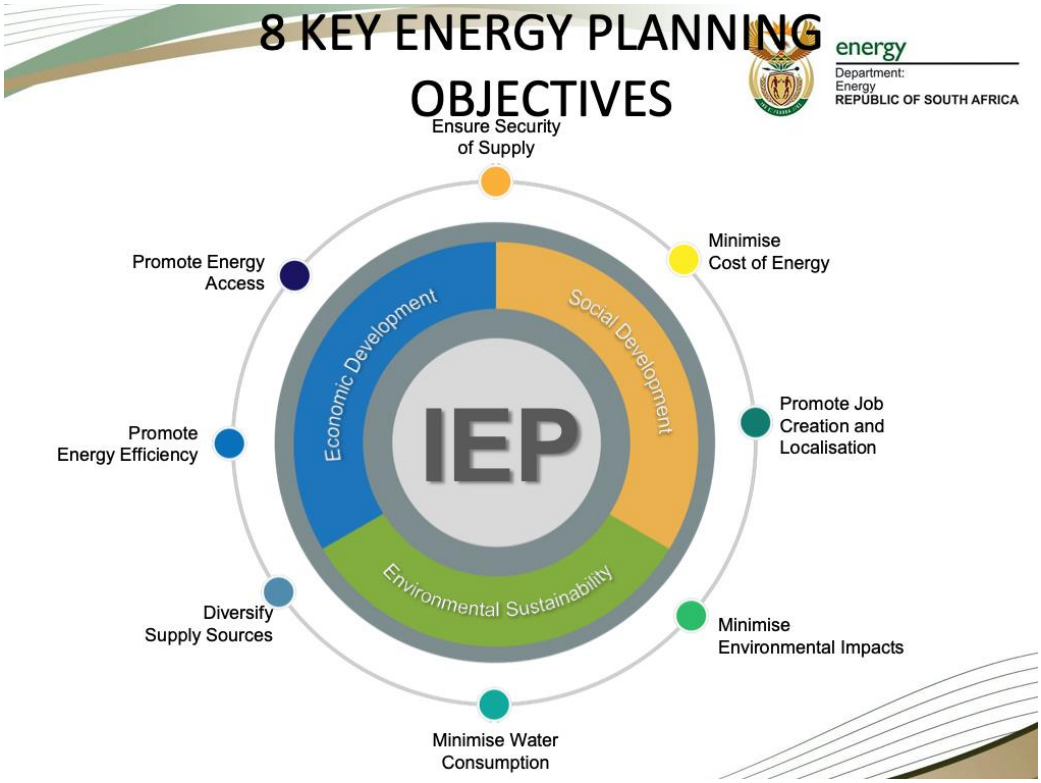


Figure 4.1: Eight key energy objectives as listed in the IEP, 2016 (extract from DOE presentation, December 2016)

The latest iteration of the IEP (25 November 2016) contained the following statement regarding solar power in South Africa:

"*South Africa experiences some of the highest levels of solar radiation in the world and this renewable resource holds great potential for the country. The daily solar radiation in South Africa varies between 4.5 and 6.5 kilowatt hours per square meter (kWh/m²) (16 and 23 megajoules per square meter [MJ/m²]) (Stassen, 1996), compared to about 3.6kWh/m² in parts of the United States and about 2.5kWh/m² in Europe and the United Kingdom. The total area of high radiation in South Africa amounts to approximately 194 000km². With electricity production per square kilometre of mirror surface in a solar thermal power station being 30.2MW, and just 1% of the high radiation area in the country being made available for solar power generation, the generation potential is approximately 64GW. Solar energy has the potential to contribute quite substantially to South Africa's future energy needs. This would, however, require large investments in transmission lines from the areas of high radiation to the main electricity consumer centres*."

In terms of electricity generation, the IEP states that South Africa should continue to pursue a diversified energy mix which reduces reliance on a single or a few primary energy sources, and includes the following statement regarding solar energy's contribution to the diversified energy mix:

» *Solar should play a much more significant role in the electricity generation mix than it has done historically, and constitutes the greatest share of primary energy (in terms of total installed capacity) by 2050. The contribution of solar in the energy mix comprises both CSP and solar PV. Solar PV includes large scale installations for power generation which supply to the grid and individual, off-grid solar home systems and rooftop panels.*

- *A thorough solar resource assessment for South Africa should continue to be undertaken in the North West Province and extended to other provinces deemed to have high solar radiation levels.*
- *Investments should be made to upgrade the grid in order to accommodate increasing solar and other renewable energy contributions.*

The Integrated Resource Plan 2019 is South Africa's current gazetted energy plan. The purpose of the plan is to ensure sustainable electricity development which takes into consideration technical, economic, and social constraints, and identifies investments in the electricity sector which are required to meet the country's forecasted electricity demands at minimum costs. The consideration of GHG emissions in the determination of the energy generation mix indicates government's commitment to international obligations under the Paris Agreement.

Besides capacity additions, a number of assumptions changed since the promulgation of IRP 2010–2030. Key assumptions that changed include the electricity demand projection, Eskom's existing plant performance, as well as new technology costs. In addition, environmental considerations such as South Africa's contribution to Greenhouse gases which contribute to climate change, local air quality and water availability have come to the fore. These considerations necessitated the review and update of the IRP and ultimately the promulgation of a revised plan in October 2019. In terms of the IRP 2019, South Africa continues to pursue a diversified energy mix that reduces reliance on a single or a few primary energy sources. In the period prior to 2030, the system requirements are largely for incremental capacity addition (modular) and flexible technology, to complement the existing installed inflexible capacity. South Africa is a signatory to the Paris Agreement on Climate Change and has ratified the agreement. In line with NDCs (submitted to the UNFCCC in November 2016), South Africa's emissions are expected to peak, plateau and from year 2025 decline. The IRP 2019 provides for the development of 6000MW of new capacity from large scale PV.

In addition to the policy considerations detailed above, Government has prioritised turnaround plans in terms of renewable energies within the Just Energy Transition (JET), coupled with key development objectives of the various spheres of government. These policies share the same ideals, such as:

- The utilisation, application and investment in renewable energy resources in South Africa is considered to be an essential means of reducing the carbon footprint of the country,
- Diversifying the national economy,
- Reducing poverty, and
- Providing critical additional energy to that of Eskom.

Government has compiled an Economic Reconstruction and Recovery Plan which was presented to Parliament in October 2020. According to this plan, the economic survey will rely on a massive investment in infrastructure, including energy, telecommunications, ports and rail. The core elements of the Economic Reconstruction and Recovery Plan are as follows:

1. Priority interventions for economic recovery: the plan sets out eleven priority interventions that will ignite South Africa's recovery and reconstruction effort. These are the flagship initiatives that all of society will rally around to build a new economy (**Figure 4.2**).
2. Enabling conditions for growth: these are growth-enhancing reforms and other preconditions for an inclusive, competitive and growing economy.
3. Macroeconomic framework: economic reconstruction and recovery requires careful mobilisation of resources to ensure fiscal sustainability.

4. Institutional arrangements: the plan focuses on execution, and is supported by enhanced institutional arrangements to ensure implementation and accountability.

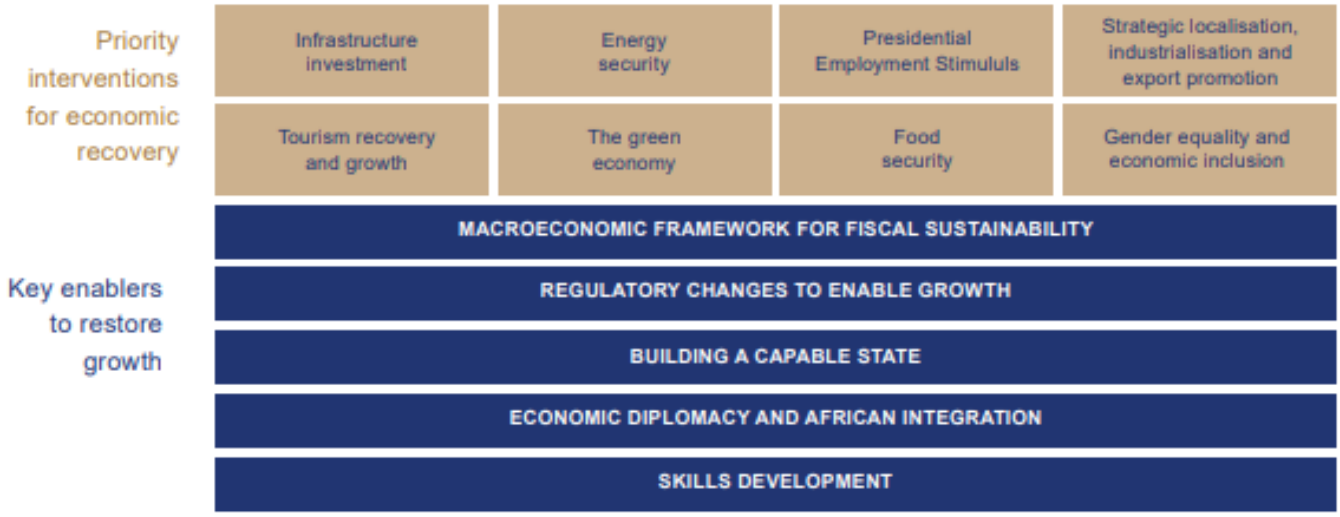


Figure 4.2: Core elements of the Economic Reconstruction and Recovery Plan (source: Building a new economy - Highlights of the Reconstruction and Recovery Plan, Presidency of the Republic of South Africa)

The plan recognises energy security as the most important prerequisite for the recovery agenda and states that renewed investment in a diversified energy mix can be achieved within a short time horizon, while alleviating a crippling energy crisis and facilitating a necessary transition to a less carbon-intensive economy. One of the key commitments of the plan is, therefore, to implement the IRP 2019 without delay to provide a substantial increase in the contribution of renewable energy sources by 2030, alongside other sources including battery storage, gas and clean coal. The transition to green energy is recognised as contributing towards the realisation of the low-carbon, climate-resilient and inclusive economy envisaged by the National Development Plan. The development of the Kleinzee Solar PV Facility is identified as a mechanism for securing additional power generation capacity as part of the REIPPP programme or for private off-takers, reducing the reliance for electricity on Eskom.

The need for new power generation from solar PV facilities has been identified and assessed by government at a national scale considering the national energy requirements as well as international commitments under the Paris Agreement; therefore, provision has been made for the inclusion of new PV power generation capacity in South Africa's energy mix. The implementation of the Kleinzee Solar PV Facility has the potential to contribute positively towards the identified need, while simultaneously contributing to job creation and socio-economic development, identified as a need for the country within the National Development Plan (NDP).

The Kleinzee Solar PV Facility will make use of renewable energy technology and would contribute positively towards reducing South Africa's GHG emissions and ensure compliance with all applicable legislation and permitting requirements. In addition, by making use of PV technology, the Kleinzee Solar PV Facility would have reduced water requirements when compared with some other generation technologies in alignment with one of the vision 2030 themes of the then-Department of Water and Sanitation's (now the Department of Human Settlements, Water and Sanitation) National Water Resource Strategy 2 (2013) (i.e. transitioning to a low carbon economy through stimulating renewable energy and retrofitting buildings).

4.3.2 Renewable Energy Development Zones (REDZ)

The DFFE has committed to contribute to the implementation of the NDP, the National Infrastructure Plan (NIP) and the undertaking of Strategic Environmental Assessments (SEAs) to identify adaptive processes that streamline the regulatory environmental requirements for Strategic Integrated Projects (SIPs) while safeguarding the environment.

The solar photovoltaic (PV) and wind SEA was accordingly commissioned by the DFFE in support of SIP 8, which aims to facilitate the implementation of sustainable green energy initiatives. This SEA identifies areas where large-scale solar PV and wind 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 (REDZ).

The procedure to be followed in applying for environmental authorisation for a large-scale project in a REDZ was formally gazetted on 16 February 2018 (GN R114). The aim of the zones is to streamline the regulatory process, identifying geographical areas where wind and solar PV technologies can be incentivised. These REDZ will ensure a transition to a low carbon economy, accelerating infrastructure development and contributing to a more coherent and predictable regulatory framework.

As illustrated in **Figure 4.3**, the complete extent of the development area of the Kleinzee Solar PV Facility falls within the Springbok REDZ, which was selected by the DFFE as an area highly suitable for the development of solar energy facilities given a range of factors considered, including environmental sensitivities. This alignment with the REDZ area provides further support for the selection of the specific site chosen for this project.

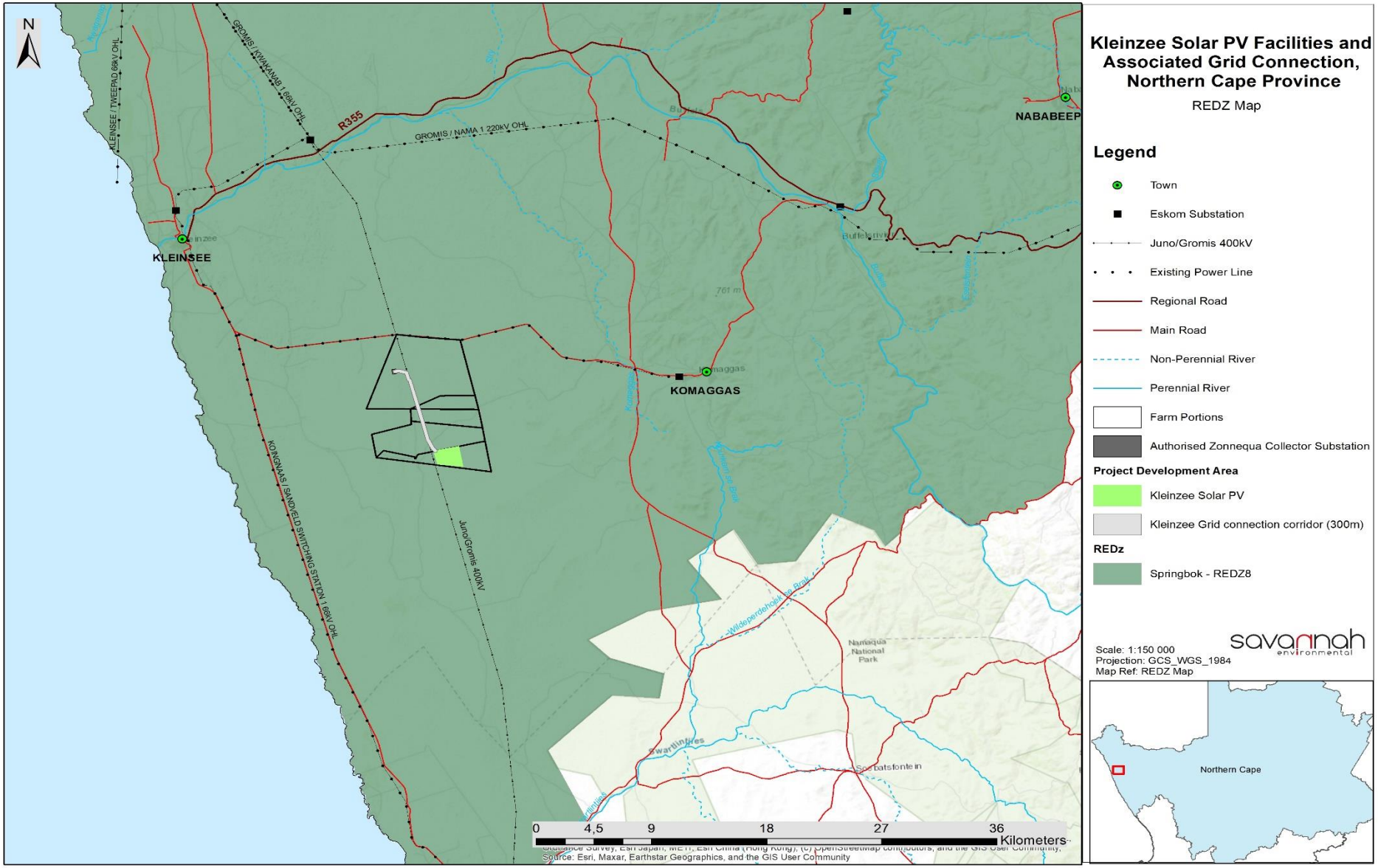


Figure 4.3: The Kleinzee Solar PV Facility is located within the Springbok REDZ area (zone 8)

4.3.3 Strategic Transmission Corridors

The Strategic Transmission Corridors related to **electricity transmission and distribution infrastructure** were first identified in 2018. The Corridors are described as being of strategic importance when planning for the development of electricity transmission and distribution infrastructure. From a planning perspective, the proposed grid connection solution (i.e., the proposed 132kV overhead power line and a collector substation, with switching station components) of the Kleinzee Solar PV Facility is also considered to be appropriately located within the Northern Corridor of the Strategic Transmission Corridors (refer to **Figure 4.4** and **Figure 4.5**).

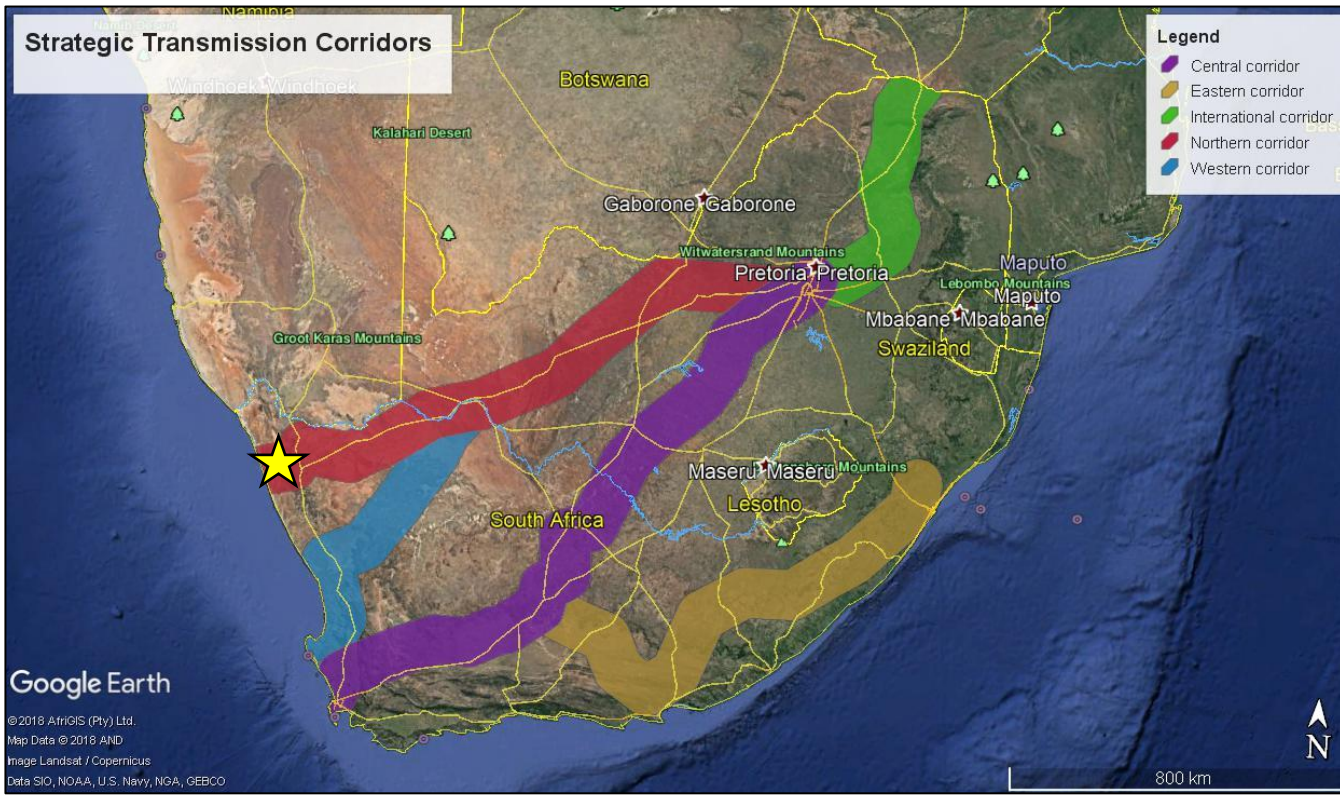


Figure 4.4: Strategic Power Corridors identified as the optimal locations where power infrastructure expansion is needed to enable the balancing of future demand and supply requirements, while minimising negative impacts to the environment. The location of the development area and study area for the Kleinzee Solar PV facility is indicated with a star.

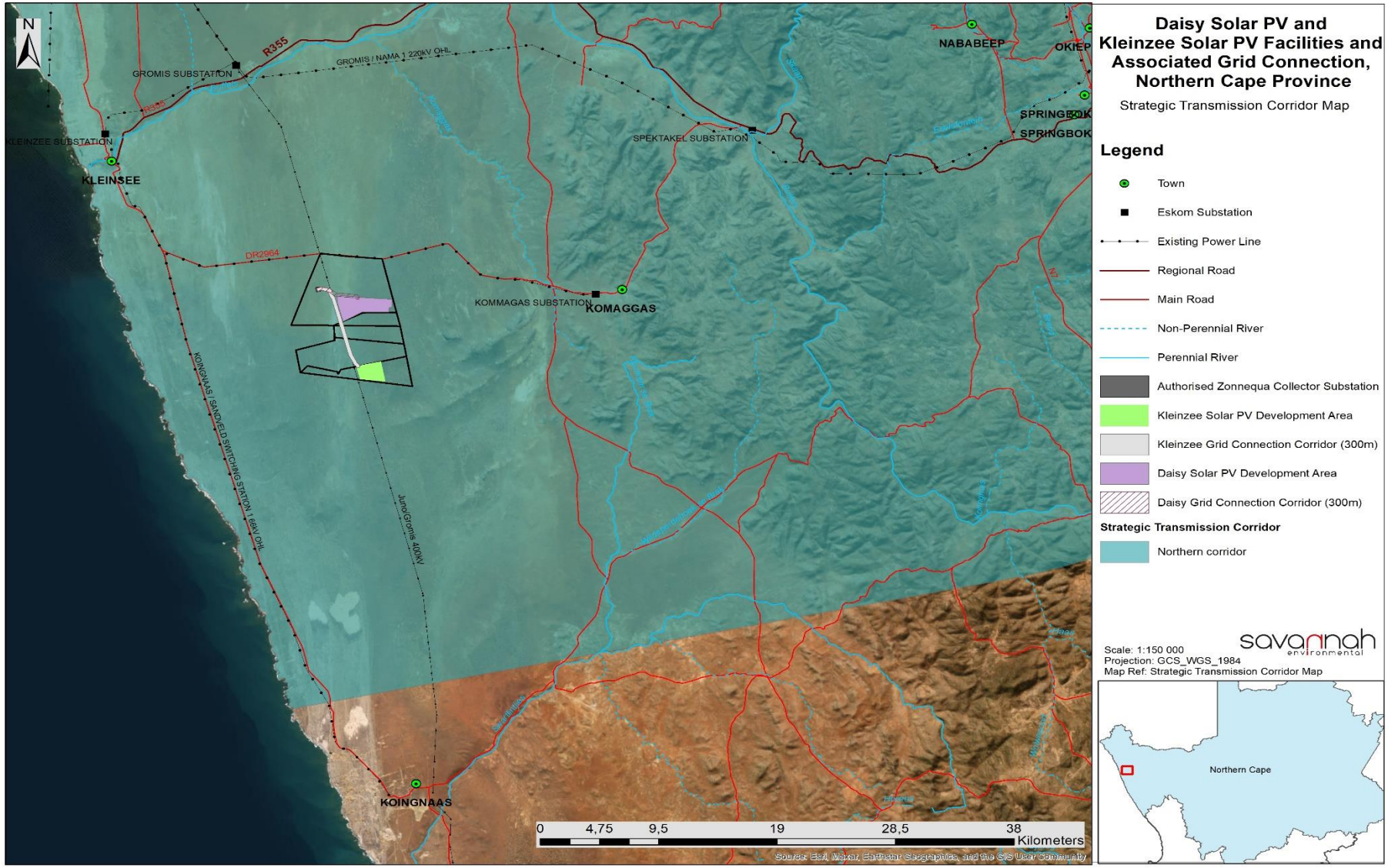


Figure 4.5: Kleinzee Solar PV Facility is located in the Northern Strategic Transmission Corridor

4.4 Need and Desirability from a Regional Perspective

South Africa's electricity generation mix has historically been dominated by coal. However, up to 2030 a new capacity demand will be driven by the decommissioning of existing coal-fired power stations. A further 24 100MW (**Figure 4.6**) of coal power is expected to be decommissioned in the period 2030 to 2050. Therefore, additional capacity will be required from renewable energy sources, particularly solar with 6 000MW being allocated for the period up to 2030.

	Coal	Coal (Decommis-sioning)	Nuclear	Hydro	Storage	PV	Wind	CSP	Gas & Diesel	Other (Distributed Generation, CoGen, Biomass, Landfill)
Current Base	37,149		1 860	2,100	2 912	1 474	1 980	300	3 830	499
2019	2,155	-2,373					244	300		Allocation to the extent of the short term capacity and energy gap.
2020	1,433	-557				114	300			
2021	1,433	-1403				300	818			
2022	711	-844			513	400 1,000	1,600			
2023	750	-555				1000	1,600			500
2024			1,860				1,600		1000	500
2025						1000	1,600			500
2026		-1,219					1,600			500
2027	750	-847					1,600		2000	500
2028		-475				1000	1,600			500
2029		-1,694			1575	1000	1,600			500
2030		-1,050		2,500		1000	1,600			500
TOTAL INSTALLED CAPACITY by 2030 (MW)	33,364		1,860	4,600	5,000	8,288	17,742	600	6,380	
% Total Installed Capacity (% of MW)	43		2.36	5.84	6.35	10.52	22.53	0.76	8.1	
% Annual Energy Contribution (% of MWh)	58.8		4.5	8.4	1.2*	6.3	17.8	0.6	1.3	

Installed Capacity
Committed/Already Contracted Capacity
Capacity Decommissioned
New Additional Capacity
Extension of Koeberg Plant Design Life
Includes Distributed Generation Capacity for own use

- 2030 Coal Installed Capacity is less capacity decommissioned between years 2020 and 2030.
- Koeberg power station rated/installed capacity will revert to 1,926MW (original design capacity) following design life extension work.
- Other/ Distributed generation includes all generation facilities in circumstances in which the facility is operated solely to supply electricity to an end-use customer within the same property with the facility.
- Short term capacity gap is estimated at 2,000MW.

Figure 4.6: A snapshot of the updated Energy Mix as per the IRP 2019

Although the majority of South Africa's electricity generation infrastructure (coal-fired power stations) is currently located within Mpumalanga due to the location of coal resources within this province, the Northern Cape Province has been identified as an area where electricity generation from solar energy facilities is highly feasible and a viable option. The location of the study area and project site within the Northern Cape Province is therefore considered to support the Province/Region's generation targets.

The Kleinzee area has been earmarked as a hub for the development of solar energy projects due to the viability of the solar resource for the area. This is further supported by the Springbok REDZ, which was selected by the DFFE as an area highly suitable for the development of large-scale solar energy facilities. This alignment of the Kleinzee Solar PV facility site within the REDZ area provides further support for the selection of the specific site chosen for this project.

The overarching objective for the solar energy facility is to maximise electricity production through exposure to the solar resource, while minimising infrastructure, operational and maintenance costs, as well as social and environmental impacts. From a regional site selection perspective, this region is considered to be preferred for solar energy development by virtue of its annual solar irradiation values.

4.5 Receptiveness of the proposed development area for the establishment of the Kleinzee Solar PV Facility

The placement of a solar PV facility is strongly dependent on several factors including climatic conditions (solar irradiation levels), topography, the location of the site, and in particular the location in a node for renewable projects, availability of grid connection, the extent of the site and the need and desirability for the project. From a local level perspective, the project site and development area have specifically been identified by the proponent as being highly desirable from a technical perspective for the development of a solar PV facility due to the following site characteristics:

» **Solar resource**: The economic viability of a solar PV facility is directly dependent on the annual direct solar irradiation values. The Global Horizontal Irradiation (GHI) GHI for the area derived from the World Bank Group's Global Solar Atlas is approximately 2264 kWh/m^2/annum, some of the highest GHI values in the country (refer to **Figure 4.7**).

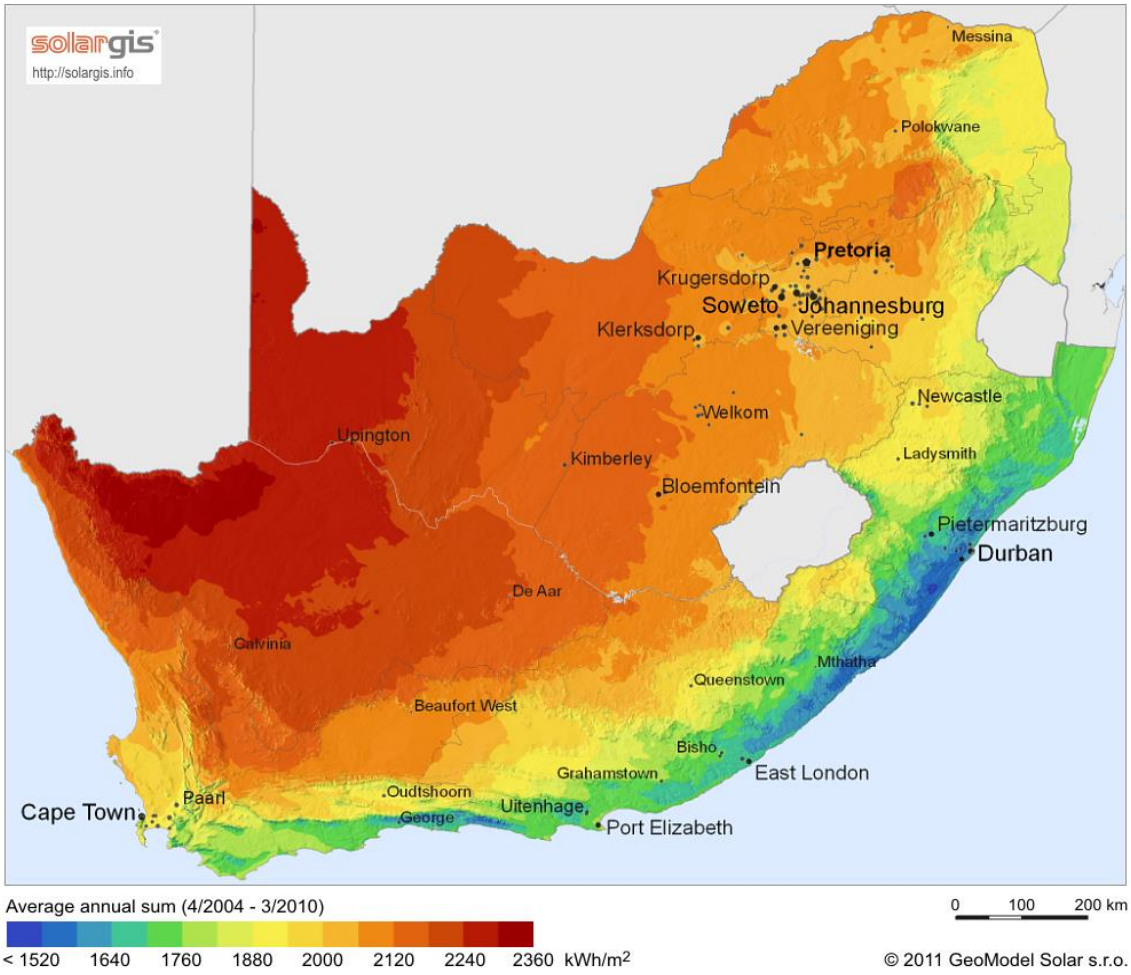


Figure 4.7: Solar irradiation map for South Africa, with the position of the Kleinzee Solar PV Facility shown by the white star (Source: GeoModel Solar)

» **Topography**: Sites that facilitate easy construction conditions, (i.e., relatively flat topography, lack of major rock outcrops, watercourse features, etc.) are favoured by developers during the site selection process. The terrain surrounding the proposed site is generally flat, sloping gently westwards towards the coastline. The terrain type of the region is described as *slightly undulating plains*. The development area for the Kleinzee Solar PV Facility consists of a slightly undulating topography, with slopes of less than 5% over most of the area, and with an average elevation of ~165m above sea level. There are no prominent hills within the project site. These characteristics are preferred for the development of a solar PV facility as construction efforts and costs are minimised, and therefore the study area is considered to be preferable and acceptable for the development of the Kleinzee Solar PV Facility.

» **Site extent and land availability:** Availability of relatively level land of sufficient extent can be a restraining factor to PV development, as a 200MW solar PV development and associated infrastructure requires sufficient land space. The development area, within which the project development area will be located, is ~300ha. This area is considered to be sufficient for the planned 200MW PV facility. The land is available for a PV facility, and the site for the Kleinzee Solar PV Facility falls within the already authorised development area of the Namas Wind Energy Facility. The compatibility of land use is therefore supported.

» **Access to Road Infrastructure and Site access**: Access to the development area is considered as an important characteristic as easy access is required for the transportation of project related infrastructure and heavy machinery during construction. Access to the study area and development area is provided via the current existing gravel road that connect to the DR2964 located to the north of the site. This existing road traverses only Farm Zonnkewa 326. The existing access road (4km in length) turning off from the DR2964 towards the PV facility can be upgraded up to 8m in width. From this point, a planned access road up to ~7.5km in length and up to 8m in width located within the 300m grid connection corridor will traverse Farm Zonnkewa 326, Portion 1 of Farm Zonnekwa 326, Portions 2, 3 and 4 of Farm Zonnkewa 328. Considering the readily available site access to the study area and development area, the location of the Kleinzee Solar PV Facility is considered to be suitable and appropriate.

» **Grid access:** A key factor in the siting of any solar PV project is that the project must have a viable grid connection. Following the confirmation of sufficient available land for the development of the PV Facility, the developer considered the possible grid connection points in order to evacuate the generated electricity into the national grid. This was considered as a vital aspect by the developer for the project. The developer consulted with the Eskom network planners to understand the future demand centres and the strategic plans to upgrade and strengthen the local networks in the area. Through this consultation it was confirmed that Eskom are in the process of constructing the Gromis-Juno 400kV power line, and that Eskom plans to upgrade the existing Gromis Substation located ~26km north of the project site. Considering these developments in line with the local grid infrastructure, the developer identified the authorised Zonnequa Substation as the preferred grid connection point for the facility. The developer identified a 300m power line corridor parallel to the Eskom Gromis-Juno 400kV power line, within which the 132kV grid connection line for the Solar PV Facility will be constructed.

» **Land suitability and land use activities:** The current land use of the development area is an important consideration in site selection in terms of limiting disruption to existing land use practices. The project site is currently used for grazing, which is generally preferred for developments of this nature as the grazing activities can continue on the project site in tandem with the operation of the solar PV facility. There is no cultivated agricultural land in the project site or directly adjacent to it which could be impacted upon by the proposed development. The proposed development is compatible with the surrounding land uses and does not present a conflicting land use. The land is available for a PV facility, and the site for the Kleinzee Solar PV Facility falls within the already authorised development area of the Namas Wind Energy Facility. The compatibility of land use is therefore supported.

The site is located on the northern edge of the NPAES Focus Areas and potential expansion area of the Namakwa National Park (Namaqua National Park: Park Management Plan for the period 2013-2023) and is indicated in **Figure 4.8**. The priority area includes areas important to both biodiversity pattern and processes, and does not imply any loss of existing land use rights, but rather aims to ensure the Park's survival in a living landscape[14]. The area is currently privately owned, and has not been secured for inclusion in the Park. Other renewable energy projects have been authorised in this area, and the site is

[14] NNP MP 2013-2023, page 72

located within a REDZ, and renewable energy infrastructure is, therefore, considered to be part of the living landscape of this area south of Kleinsee.

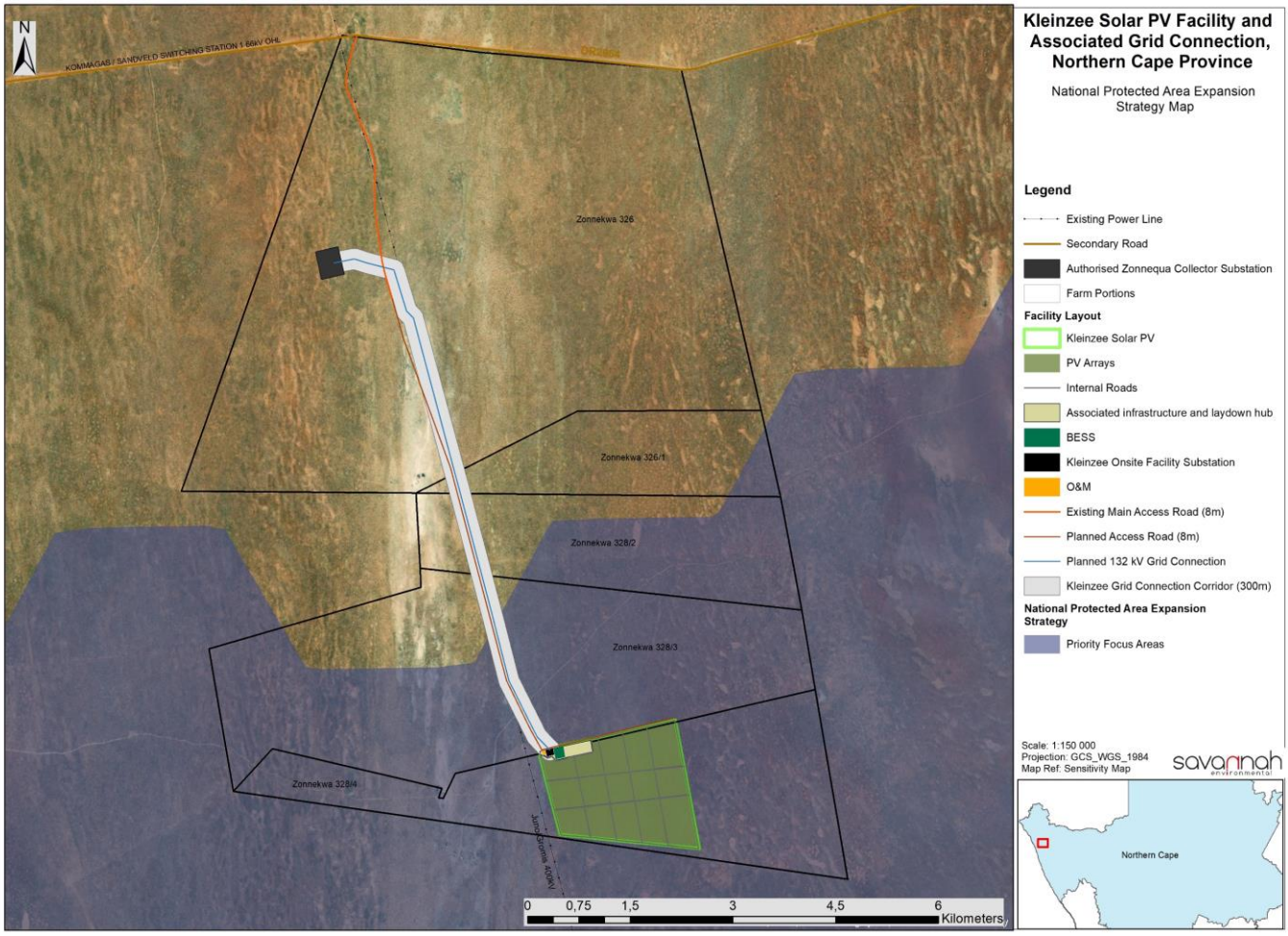


Figure 4.8: Kleinzee Solar PV Facility in relation to NPAES

» **Landowner Support:** The selection of a site where the landowner is supportive of the development of a renewable energy facility is essential for ensuring the success of the project. The affected property is owned by a private landowner. Energy Team (Pty) Ltd has entered into a notarial lease agreement with the landowner. The landowner is therefore in favour of the development and does not view the establishment of the solar PV facility as a conflict with their current or future land use.

Taking into consideration the solar resource, grid access, land suitability, landowner support, access to road infrastructure, the current land use of the project site and development area, in conjunction with other large-scale Wind Energy Facility projects that have been authorised within the vicinity of the project site, the development of the Kleinzee Solar PV Facility is therefore considered to be desirable and will ultimately contribute to, and further develop the successful power generation activities already being undertaken within the area.

Therefore, the development of the Kleinzee Solar PV Facility within the project site and development area is considered to be desirable considering the characteristics of the area.

4.6 Benefits of Renewable Energy and the Need and Desirability

The generation of electricity from renewable energy resources offers a range of potential socio-economic and environmental benefits for South Africa; these include:

Socio-economic upliftment of local communities: The Kleinzee Solar PV Facility has the potential to create much needed employment for unskilled locals during the construction phase. Training opportunities will also be afforded to qualified local people who can be upskilled to undertake certain roles during the construction and operation phases. In terms of the needs of the local community, the Local and District municipality IDPs identified the need to facilitate economic development by creating an environment that is conducive for business development, economic growth, sustainable employment opportunities and growth in personal income levels of communities; unlock opportunities to increase participation amongst all sectors of society in the mainstream economy to create decent job opportunities; promote Local Economic Development; and enhance rural development and agriculture. A study undertaken by the Department of Mineral Resource and Energy (DMRE), National Treasury and the Development Bank of Southern Africa (DBSA) in June 2017 found that employment opportunities created during the construction phase of the projects implemented to date had created 40% more jobs for South African citizens than anticipated. The study also found that significantly more people from local communities were employed during construction than was initially planned, confirming the potential benefits for local communities associated with the implementation of renewable energy projects.

The Kleinzee Solar PV facility also has the potential to make a positive contribution towards the identified community needs. In terms of the economic development requirements of the REIPPP Programme, the project will commit benefits to the local community, in the form of job creation, localisation, and community ownership. In accordance with the DoE's bidding requirements of the REIPPP Programme, a percentage of the revenue generated per annum during operation will be made available to local communities through a social beneficiation scheme. Therefore, the potential for creation of employment and business opportunities, and the opportunity for skills development for local communities is significant. Secondary social benefits can be expected in terms of additional spend in nearby towns due to the increased demand for goods and services. These socio-economic benefits would include an increase in the standard of living for local residents within the area as well as overall financial and economic upliftment.

Increased energy security: Given that renewables can often be deployed in a short timeframe and in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply quality in the short-term, while reducing expensive distribution losses. As a result of the power constraints in the first half of 2015, power generators meant to be the "barely-ever-used" safety net for the system (diesel-fired gas turbines) were running at >30% average load factor in the first half of 2015. Load shedding occurred during 82 days in the first half of 2015 (out of 181 days). Results of a CSIR Energy Centre study for the period January to June 2015 (CSIR, August 2015), concluded that the already implemented renewable projects (wind and solar) within the country avoided 203 hours of so-called 'unserved energy'. During these hours the supply situation was such that some customers' energy supply would have had to be curtailed ('unserved') had it not been for the renewables. The avoidance of unserved energy cumulated into the effect that for 15 days, from January to June 2015, load shedding was avoided entirely, delayed, or a higher stage of load shedding

prevented due to the contribution of renewable wind and PV projects[15]. More recently, power generated from renewable energy sources have assisted Eskom in alleviating the need for rolling black-outs when aging power stations have been offline for maintenance.

Resource saving: It is estimated that the achievement of the targets in the Renewable Energy White Paper will result in water savings of approximately 16.5 million kilolitres per annum. As an already water-stressed nation, it is critical that South Africa engages in a variety of water conservation measures, particularly due to the detrimental effects of climate change on water availability. Renewable energy also translates into revenue savings, as fuel for renewable energy facilities is free, while compared to the continual purchase of fuel for conventional power stations.

Exploitation of significant renewable energy resource: At present, valuable renewable resources including biomass by-products, solar radiation and wind power remain largely unexploited. The use of these energy flows will strengthen energy security through the development of a diverse energy portfolio in South Africa.

By the end of March 2019, the REIPPPP had made the following significant impacts in terms of energy supply:

- 6 422MW of electricity had been procured from 112 Renewable Energy Independent Power Producers (IPPs) in seven bid rounds;
- 3 976 MW of electricity generation capacity from 64 IPP projects has been connected to the national grid;
- 35 669 GWh6 of energy has been generated by renewable energy sources procured under the REIPPPP since the first project became operational. Renewable energy IPPs have proved to be very reliable. Of the 64 projects that have reached COD, 62 projects have been operational for longer than a year. The energy generated over the past 12 month period for these 62 projects is 10 648 GWh, which is 96% of their annual energy contribution projections of 11 146 GWh over a 12 month delivery period. Twenty- eight (28) of the 62 projects (45%) have individually exceeded their projections.

Economics: As a result of the available renewable energy resources and the competitive renewable energy procurement process, both wind power and solar PV power have now been proven as cheaper forms of energy generation in South Africa than fossil fuel (coal) generated power. The IRP 2019 gazetted by the Minister of Mineral Resources and Energy in October 2019, updates the energy forecast for South Africa from the current period until the year 2030 and has made an allocation of 6000MW in addition to the already installed/committed capacity of 2 288MW from solar PV facilities which will be developed from 2022 – 2030.

Pollution reduction: The release of by-products through the burning of fossil fuels for electricity generation have a particularly hazardous impact on human health and contribute to ecosystem degradation. The use of solar irradiation or wind for power generation is a non-consumptive use of a natural resource which produces zero emissions during its operation.

The overview of the Independent Power Producers Procurement Report (March 2019) indicates that carbon emission reductions of 36.2 Mton CO_2 has been realised by the IPP programme from inception to date, of which 2.91 Mton is in this 2019 reporting quarter.

Climate friendly development: The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner and thereby allows South Africa to contribute towards mitigating climate change through the reduction of GHG emissions. South Africa is estimated to currently be responsible for approximately 1% of global GHG emissions (and circa half of those for which Africa is

[15] (http://ntww1.csir.co.za/plsql/ptl0002/PTL0002_PGE157_MEDIA_REL?MEDIA_RELEASE_NO=7526896)

responsible) and is currently ranked 9th worldwide in terms of per capita carbon dioxide emissions. The renewable energy sector saved South Africa 1.4 million tons of carbon emissions over the first 6 months of 2015[16].

Support for international agreements: The effective deployment of renewable energy provides a tangible means for South Africa to demonstrate its commitment to its international agreements under and for cementing its status as a leading player within the international community.

Employment creation: The development, procurement, installation, maintenance and management of renewable energy facilities have significant potential for job creation and skills development in South Africa. In the short 8-year period, the REIPPPP has attracted R209.4 billion in committed private sector investment, resulting in 38 701 jobs for the youth and women from surrounding communities[17].

The overview of the Independent Power Producers Procurement Report (March 2019) indicates that all IPP projects to date have created 40 134 job years for South African citizens.

Acceptability to society: Renewable energy offers a number of tangible benefits to society including reduced pollution concerns, improved human and ecosystem health and climate friendly development.

Support to a new industry sector: The development of renewable energy offers the opportunity to establish a new industry within the South African economy, which will create jobs and skill local communities which have potential for further renewable energy projects and result in community upliftment for the affected areas.

Protecting the natural foundations of life for future generations: Actions to reduce our disproportionate carbon footprint can play an important part in ensuring our role in preventing dangerous anthropogenic climate change, thereby securing the natural foundations of life for generations to come; this is the basis of sustainable development. The development of renewable energy facilities contributes to the protection of the foundations.

4.7 Alternatives considered during the BA Process

In accordance with the requirements of Appendix 1 of the 2014 Environmental Impact Assessment (EIA) Regulations (GNR 326), reasonable and feasible alternatives including but not limited to site and technology alternatives, as well as the "do-nothing" alternative should be considered. A BA Report must contain a motivation for the preferred site (i.e., study and development area), activity and technology alternative.

The DFFE Guidelines for determining alternatives states that the key criteria for consideration when identifying alternatives are that they should be "practicable", "feasible", "relevant", "reasonable" and "viable". Essentially there are two types of alternatives:

» Incrementally different (modifications) alternatives to the project.
» Fundamentally (totally) different alternatives to the project.

[16] http://www.iol.co.za/capetimes/renewable-energy-saving-sa-billions-csir-1.1903409#.VkNjdJq6FeU
[17] https://www.sanews.gov.za/south-africa/renewable-energy-programme-attracts-r2094-billion-sa-economy

In this instance, 'the project' refers to the Kleinzee Solar PV Facility, a solar energy facility with capacity of up to 200MW, and associated infrastructure proposed to be developed by an Independent Power Producer (IPP) and intended to provide electricity to private off takers.

The identified study and development area for the Kleinzee Solar PV Facility is located within the Springbok Renewable Energy Development Zone (REDZ) which is a strategic area identified by the DFFE for the development of large-scale renewable energy projects. The Kleinzee Solar PV Facility is proposed within an area where an authorised Namas Wind Farm and Zonnequa Wind Farm will be constructed.

A site selection process undertaken for the identification of the Kleinzee Solar PV Facility development area was undertaken by the developer. This process consisted of identifying a number of characteristics deemed to be essential for development of a competitive solar PV facility. The characteristics considered include the extent of land available, favourable solar radiation levels, lack of environmentally sensitive features, land availability of the area considered for development, availability and ease of site access, existing and proposed land use activities, grid connection infrastructure within the area and the ease of access to the infrastructure. The study and development areas and directly surrounding areas are considered to contain the necessary characteristics as identified by the developer for the proposed solar PV facility and provides opportunity for a development of this nature.

4.7.1 Consideration of Fundamentally Different Alternatives

Fundamentally different alternatives are usually assessed at a strategic level and, as a result, project specific environmental impact assessments (including BA processes) are therefore limited in scope and ability to address fundamentally different alternatives. At a strategic level, electricity generating alternatives have been addressed as part of the DMRE's current Integrated Resource Plan for Electricity 2010 – 2030 (IRP)[18], and will continue to be addressed as part of future revisions thereto. In this regard, the need for renewable energy power generation from solar energy facilities has been identified as part of the technology mix for power generation in the country for the next 20 years. The Kleinzee Solar PV Facility will contribute to the national grid for use and therefore supports the development of renewable energy projects.

The fundamental energy generation alternatives were assessed and considered within the development of the IRP and the need for the development of renewable energy projects has been defined. Therefore, fundamentally different alternatives to the proposed project are not considered within this BA process.

4.7.2 Consideration of Incrementally Different Alternatives

Incrementally different alternatives relate specifically to the project under investigation. "Alternatives", in relation to a proposed activity, means different ways of meeting the general purposes and requirements of the activity, which may include alternatives for:

- The property on which, or location where the activity is proposed to be undertaken.
- The type of activity to be undertaken.
- The design or layout of the activity.
- The technology to be used in the activity.
- The operational aspects of the activity.

[18] The Integrated Resource Plan (IRP) is legislated policy which regulates power generation planning.

In addition, the option of not implementing the activity (i.e., the 'do-nothing' alternative) must also be considered.

The sections below describe the incrementally different alternatives being considered as part of the Kleinzee Solar PV Facility. Where no alternative is being considered, a motivation has been provided as required by the EIA Regulations, 2014 (as amended).

i. Property or Location Alternatives

The placement of a solar PV facility is dependent on several other factors including land suitability, climatic conditions (solar irradiation levels), topography, the location and extent of the study area, availability of grid connection infrastructure and the need and desirability of the project. Energy Team (Pty) Ltd as the Applicant considers the preferred development area placed within the study area as being highly favourable and suitable for the establishment of a solar PV facility.

The development area is located within the Springbok REDZ, which is a node identified by DFFE for the development of renewable energy projects. The land is available for a PV facility, and the site for the Kleinzee Solar PV Facility falls within the already authorised development area of the Namas Wind Energy Facility. The compatibility of land use is therefore supported.

The site is located on the northern edge of the NPAES Focus Areas and potential expansion area of the Namakwa National Park (Namaqua National Park: Park Management Plan for the period 2013-2023). It is understood that the priority area does not imply any loss of existing land use rights, but rather aims to ensure the Park's survival in a living landscape[19]. The area is currently privately owned, and has not been secured for inclusion in the Park. Other renewable energy projects have been authorised in this area, and the site is located within a REDZ, and renewable energy infrastructure is, therefore, considered to be part of the living landscape of this area south of Kleinsee.

Based on those site-specific attributes discussed in Section 4.5, the Applicant considers the development area located within the study area as highly preferred in terms of the development of a solar PV facility. The project site is within a developing hub of renewable energy project, and the Kleinzee Solar PV Facility will be able to draw on synergies with the projects proposed and/or currently authorised within the vicinity of the study area. As a result, no property/location alternatives have been assessed further as part of this BA process.

ii. Design and Layout Alternatives

The affected properties for the solar PV development area, plus the grid connection corridor (i.e., Farm Zonnkewa 326, Portion 1 of Farm Zonnekwa 326, Portions 2, 3 and 4 of Farm Zonnkewa 328) is approximately ~1115.11ha in extent, which is sufficient for the installation of a solar PV facility with a contracted capacity of up to 200MW, while allowing for the avoidance of environmental site sensitivities. The development footprint for the Kleinzee Solar PV array plus associated infrastructure will be located) has been demarcated as an area of ~300ha.

Specialist field surveys and assessments were undertaken as part of the BA process in order to provide the proponent with site specific information regarding the study area and the development area considered for the project (refer to **Appendices D-I**). Prior to the finalisation of the layout assessed in this BA Report, the

[19] NNP MP 2013-2023, page 72

proponent undertook extensive consultations with the ecological specialist to delineate areas of environmental sensitivity within the development area in order to ensure that the placement of the solar PV facility and the associated infrastructure does not have a significant and negative impact on the environment.

As a result, the preferred development footprint (300ha) within the affected property is considered as the most feasible and appropriate location for the Kleinzee Solar PV Facility, based on the following considerations:

i) Energy Team has entered into an option to lease agreement with the landowners; and
ii) The development area is considered suitable for the development of a solar PV facility from a technical perspective to ensure the success of the development.

Based on the ecological sensitivities identified within the development area, the proponent was able to place the development footprint for the Kleinzee Solar PV Facility in order to ensure avoidance of sensitive environmental features (i.e., high ecological sensitivities). In addition, this approach is in accordance with the mitigation hierarchy to ensure that avoidance is the first priority for development.

Considering the process undertaken above, which includes the consideration of sensitive environmental features within the development area, a reduction in the on-ground impacts and the opportunity that the development area presents for the development of Kleinzee Solar PV Facility, no layout alternative is proposed for assessment.

» *Access Road Alternatives*

During the construction, operation and the decommissioning phase of the proposed project, the site can be access through the current existing gravel road that connect to the DR2964 to the North of the site. No other access road alternatives are considered for the development of the Kleinzee Solar PV Facility. The existing gravel road will need upgrade to accommodate construction vehicles and activities.

4.7.3 Technology Alternatives

4.7.3.1 PV Technology Alternatives

As Energy Team is an IPP, only renewable energy technologies are being considered for the generation of up to 200MW (contracted capacity). Considering the local resources available (i.e., wind and solar irradiation) for such technologies, the footprint requirements for such developments and the current land use in the project site, the project site is considered suitable for the establishment of a PV Solar PV facility. This has been confirmed through technical characteristics available within the surrounding areas of the project site.

The Kleinzee area has been identified for the development of solar energy renewable facilities. Few technology options are available for solar facilities, and the use of those that are considered are usually differentiated by weather and temperature conditions that prevail in the area, so that optimality is obtained by the final site selection. Solar energy is considered to be the most suitable renewable energy technology for this area, based on the site location, ambient conditions and energy resource availability.

Solar PV was determined as the most suitable option for further assessment. The Integrated Resource Plan (IRP) 2019, excludes the procurement of power from CSP facilities until 2030; whereas new additional capacity

of approximately 6 000MW will be required from solar PV facilities. Therefore, PV technology was identified as being the preferred option for the study area and consists of a lower visual profile and limited water requirements when compared to the CSP technology option. The development area of the Kleinzee Solar PV Facility in close proximity to the Zonnequa Wind Farm and Namas Wind Farm provides an opportunity to optimally use a site that is currently used for energy generation through making use of solar technology, but with reduced visual intrusion and/or cumulative visual impacts, and reduced water use requirements.

Therefore, considering the above, no other technology alternatives are being assessed for the development of the Kleinzee Solar PV Facility and the development of solar PV on the site is considered as the best option for the area considering the current installed technology on the site, the ample solar resource available and the potential resource saving in terms of water requirements in an area experiencing extreme drought conditions. When considering PV as a technology choice, several types of panels are available, including *inter alia*:

- Bifacial PV panels
- Monofacial PV panels
- Fixed mounted PV systems (static / fixed-tilt panels).
- Single-axis tracking or double-axis tracking systems (with solar panels that rotate around a defined axis to follow the sun's movement).

The primary difference between PV technologies available relate to the extent of the facility, as well as the height of the facility (visual impacts), however the potential for environmental impacts remain similar in magnitude. Fixed mounted PV systems are able to occupy a smaller extent and have a lower height when compared to tracking PV systems, which require both a larger extent of land, and are taller in height. However, both options are considered to be acceptable for implementation from an environmental perspective. Bifacial solar PV panels offer many advantages over monofacial PV panels, as power can be produced on both sides of the module, increasing total energy generation. The preference will therefore be determined on the basis of technical considerations and the site conditions.

The PV panels are designed to operate continuously for more than 20 years, mostly unattended and with low maintenance. The impacts associated with the construction, operation, and decommissioning of the facility are anticipated to be the same irrespective of the PV panel selected for implementation.

4.7.3.2 Battery Energy Storge System (BESS) technology alternatives

The general purpose and utilisation of a Battery Energy Storage System (BESS) is to save and store excess electrical output as it is generated, allowing for a timed release when the capacity is required. BESS systems therefore provide flexibility in the efficient operation of the electric grid through decoupling of the energy supply and demand. **Figures 4.9, 4.10, and 4.11** below illustrate a typical utility scale BESS system (a Lithium-Ion BESS) as applied in the context of a renewable energy facility.

Figure 4.9: Li-Ion BESS containerised modules located within the BESS enclosure footprint (Source: Enel Green Power)

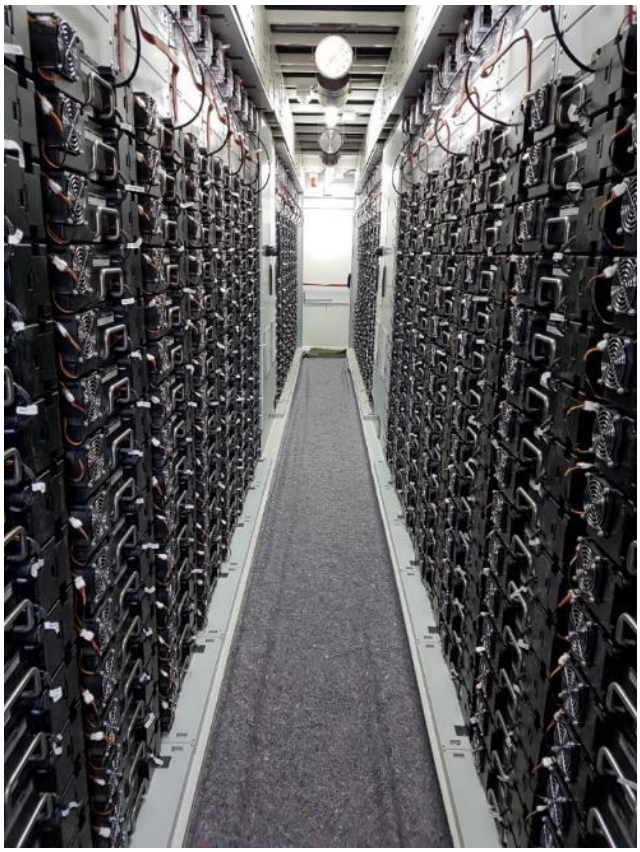


Figure 4.10: Li-Ion BESS internal design and implementation of a container used within a BESS. The image shows a series of sealed battery cell packs within a containerised module (Source: Enel Green Power)

Figure 4.11: Illustration of battery storage units installed by Tesla (Source: fastcompany.com)

As technological advances within battery energy storage systems (BESS) are frequent, two BESS technology alternatives are considered:

» Solid state battery electrolytes typically consist of Lead Acid (Pb), Nickel Cadium (NiCad), Lithium-Ion (Li-ion), Sodium Sulphur (NaS) or Sodium Nickle Chloride (Zebra) (NaNiCl) and use solid electrodes and electrolytes. As a result of the declining costs, Li-ion technology now accounts for more than 90% of battery storage additions globally (IRENA, 2019); and
» Redox-flow technology (e.g. vanadium flow battery, or similar technology and chemistries). Flow batteries use solid electrodes and liquid electrolytes. The most used flow battery is the Vanadium Redox Flow Battery (VRFB), which is a type of rechargeable flow battery that employs vanadium ions in different oxidative states to store chemical potential energy.

Considering the nature of the project, only a solid-state technology type would be envisaged for implementation. The technology includes batteries housed within containers which are fully enclosed and self-contained. Therefore, the assessment proposes all solid-state technologies for authorisation to allow the proponent to determine the precise technology when the project is implemented, on the understanding that further investigation into the specific technologies available at the time of being awarded preferred bidder status will allow for one of two to be selected and ultimately developed.

4.7.4 The 'Do-Nothing' Alternative

The 'do-nothing' alternative is the option of Energy Team (Pty) Ltd not constructing the Kleinzee Solar PV Facility on the proposed site and assumes the site remains in its current state. This would result in no environmental or social impacts (positive or negative) as a result of the development of a solar facility within the preferred development area. This alternative will be used as a baseline against which the impacts will be assessed and compared in detail within Chapter 7 of this BA Report. The 'Do-Nothing' alternative has been assessed as part of the BA process (refer to **Chapter 8** of this BA Report).

CHAPTER 5: APPROACH TO UNDERTAKING THE BASIC ASSESSMENT PROCESS

In terms of the EIA Regulations of December 2014 (as amended in April 2017) published in terms of the NEMA (Act No. 107 of 1998) as amended, the construction and operation of the Kleinzee Solar PV facility and associated grid connection infrastructure is a listed activity requiring environmental authorisation. In terms of GN R114 of February 2018, the application for environmental authorisation is required to be supported by a BA process based on the location of the study area and the development area within the Springbok REDZ and the Northern Strategic Transmission Corridor.

The BA process aims at identifying and describing potential environmental issues associated with the development of the proposed solar PV facility and the associated infrastructure. In order to ensure that a comprehensive assessment is provided to the competent authority and I&APs regarding the impacts of the facility, detailed independent specialist studies were undertaken as part of the Basic Assessment process.

5.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA report includes the following information required in terms of Appendix 1: Content of the BA Report:

Requirement	Relevant Section
3(d)(i) a description of the scope of the proposed activity, including all listed and specified activities triggered and being applied for.	All listed activities triggered as a result of the development of the Kleinzee Solar PV facility and associated grid connection infrastructure have been included in **section 5.2**, **Table 5.1**. The specific project activity relating to the relevant triggered listed activity has also been included in **Table 5.1**.
3(h)(ii) details of the public participation process undertaken in terms of Regulation 41 of the Regulations, including copies of the supporting documents and inputs.	The details of the public participation process undertaken for the Kleinzee Solar PV facility and associated grid connection infrastructure have been included and described in **section 5.3.2**.
3(h)(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.	All comments received from the commencement of the BA process have been included and responded to in the Basic Assessment Process. All comments raised during the 30-day review and comment period of the BA Report and through on-going consultation with I&APs will be included as part of a C&R report (**Appendix C8**) to be submitted as part of the Final BA Report to DFFE for decision-making.
3(h)(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.	The methodology used to assess the significance of the impacts of the Kleinzee Solar PV facility and associated grid connection infrastructure has been included in **section 5.4**.
(o) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed.	The assumptions and limitations of the BA process being undertaken for the Kleinzee Solar PV facility and associated grid connection infrastructure is included in **section 5.6**.

5.2 Relevant legislative permitting requirements

The legislative permitting requirements applicable to the Kleinzee Solar PV facility and associated grid connection infrastructure, as identified at this stage in the process, are described in more detail under the respective sub-headings.

5.2.1 National Environmental Management Act (No. 107 of 1998) (NEMA)

NEMA is South Africa's key piece of national environmental legislation that provides for the authorisation of certain controlled activities known as "listed activities". In terms of Section 24(5) of NEMA, the potential impact on the environment associated with listed activities must be considered, investigated, assessed and reported on to the competent authority (the decision-maker) charged by NEMA with granting of the relevant EA. Due to the fact that the Kleinzee Solar PV facility and associated grid connection infrastructure is a power generation project and therefore relates to the IRP 2010 – 2030, the National DFFE has been determined as the Competent Authority in terms of GN R779 of 01 July 2016. The Provincial Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARD & LR) is the Commenting Authority on the project.

The need to comply with the requirements of the EIA Regulations published under the NEMA ensures that proponents are provided the opportunity to consider the potential environmental impacts of their activities early in the project development process, and also allows for an assessment to be made as to whether environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required to be undertaken in accordance with the EIA Regulations to provide the competent authority with sufficient information in order for an informed decision to be taken regarding the project and Application for Environmental Authorisation.

The BA process being conducted for the Kleinzee Solar PV facility and associated grid connection infrastructure located in the Northern Cape Province is undertaken in accordance with Section 24(5) of the NEMA, which defines the procedure to be followed in applying for Environmental Authorisation, and requires that the potential consequences for, or impacts of, listed or specified activities on the environment be considered, investigated, assessed, and reported on to the competent authority. Listed Activities are activities identified in terms of Section 24 of the NEMA which are likely to have a detrimental effect on the environment, and which may not commence without an EA from the competent authority subject to the completion of an environmental assessment process (either a Basic Assessment (BA) or full Scoping and EIA).

As the proposed development is located within Zone 8 of the Renewable Energy Development Zones (REDZ) (also known as the Springbok REDZ), one of the eight (8) designated REDZ areas, the EIA (Environmental Impact Assessment) process to be followed for the Kleinzee Solar PV facility and associated grid connection infrastructure will be as per GN R114, as formally gazetted on 16 February 2018. The Kleinzee Solar PV facility and associated grid connection infrastructure is now subject to a Basic Assessment process and not a full EIA process, as well as a shortened timeframe of 57 days for the processing of an application for environmental authorisation.

Table 5.1 details the listed activities in terms of the EIA Regulations, 2014 (as amended) that apply to the Kleinzee Solar PV facility and associated grid connection infrastructure, and for which an application for Environmental Authorisation has been submitted to the DFFE. The table also includes a description of the specific project activities that relate to the applicable listed activities.

Table 5.1: Listed activities as per the EIA regulations that are triggered by the Kleinzee Solar PV facility and associated grid connection infrastructure

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice):	Describe each listed activity as per project description
GN R327, 08 December 2014 (as amended on 07 April 2017)	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. ***The Kleinzee Solar PV facility and associated grid connection infrastructure entails the construction of a new 132kV power line within a 300m corridor to facilitate the connection between the PV facility and the authorised Zonnequa collector substation. The power line and the on-site substation will have a capacity of 132kV and will be located outside of an urban area.***
GN R327, 08 December 2014 (as amended on 07 April 2017)	14	The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic meters or more but not exceeding 500 cubic meters. ***The construction and operation of the Kleinzee Solar PV facility and associated grid connection infrastructure will require a combined capacity exceeding 80 cubic metres but not exceeding 500 cubic meters for the storage of dangerous goods, which will include flammable and combustible liquids such as oils associated with the on-site facility substation transformers, lubricants and solvents.***
GN R327, 08 December 2014 (as amended on 07 April 2017)	24	The development of a road – (ii) with a reserve wider than 13.5m, or where no reserve exists where the road is wider than 8m. ***The construction of the Kleinzee Solar PV facility will require the construction of new access roads > 8m in width to provide access to the facility.***
GN R327, 08 December 2014 (as amended on 07 April 2017)	28(ii)	Residential, mixed, retail, commercial, industrial, or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare. ***The total area of land to be developed for the Kleinzee Solar PV facility and associated grid infrastructure is larger than 1 hectare. The site is currently used for agricultural purposes. The total extent of the development envelope is 300ha and outside an urban area.***
GN R327, 08 December 2014 (as amended on 07 April 2017)	56(ii)	The widening of a road by more than 6 m, or lengthening of a road by more than 1 km – (ii) where no reserve exists, where the existing road is wider than 8 metres; ***Existing gravel roads to access and within the project site will be widened to >8m and/or lengthened by more than 1km to provide access to the Kleinzee Solar PV facility.***

GN R325, 08 December 2014 (as amended on 07 April 2017)	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. ***The project comprises a renewable energy generation facility, which will utilise solar power technology and will have a contracted capacity of up to 200MW.***
GN R325, 08 December 2014 (as amended on 07 April 2017)	15	The clearance of an area of 20 hectares or more of indigenous vegetation. ***The facility is located on agricultural land where the predominant land use is livestock grazing and is therefore likely to comprise indigenous vegetation. The project would therefore result in the clearance of an area of land greater than 20ha of indigenous vegetation.***
Listing Notice 3 (GNR 325) 08 December 2014 (as amended on 07 April 2017)	4(g)(ii)(ee)	The development of a road wider than 4 metres with a reserve less than 13.5 metres. g. Northern Cape ii. Outside urban areas: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans. ***The construction of the solar PV facility will require the construction of new access roads (main access road >8m in width) to provide access to the facility. Internal access roads will also be constructed. The development area is located outside of any urban areas and contains areas identified as CBA2 as per the Northern Cape Critical Biodiversity Areas map and/or Namakwa Bioregional Plan Draft 1, published by the Namakwa District Municipality.***
Listing Notice 3 (GNR 325) 08 December 2014 (as amended on 07 April 2017)	12(g)(ii)	The clearance of an area of 300 square metres or more of indigenous vegetation g. Northern cape ii. Within critical biodiversity areas identified in bioregional plans. iv. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open spaces, conservation or had an equivalent zoning. ***The development of the Kleinzee Solar PV facility will require the clearance of an area of land greater than 300m² of indigenous vegetation. The development area contains areas identified as CBA2 as the Northern Cape Critical Biodiversity Areas map and/or Namakwa Bioregional Plan Draft 1, published by the Namakwa District Municipality***
GN R324, 08 December 2014 (as amended on 07 April 2017)	18(g)(ii)(ee)	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. (g) Northern Cape (ii) Outside urban areas (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.

		The construction of the solar PV facility will require the widening of existing roads to provide access to and within the facility. The development area is located outside of any urban areas and contains areas identified as CBA2 as per the Northern Cape Critical Biodiversity Areas map and/or Namakwa Bioregional Plan Draft 1, published by the Namakwa District Municipality.

5.2.2 National Heritage Resources Act (No. 25 of 1999) (NHRA)

The National Heritage Resources Act (No. 25 of 1999) (NHRA) provides an integrated system which allows for the management of national heritage resources and to empower civil society to conserve heritage resources for future generations. Section 38 of NHRA provides a list of activities which potentially require the undertaking of a Heritage Impact Assessment.

Section 38: Heritage Resources Management

1). Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as –

a. the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

b. the construction of a bridge or similar structure exceeding 50m in length;

c. any development or other activity which will change the character of a site –

i). exceeding 5 000m² in extent; or

ii). involving three or more existing erven or subdivisions thereof; or

iii). involving three or more erven or divisions thereof which have been consolidated within the past five years; or

iv). the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

Must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

In terms of Section 38(8), approval from the heritage authority is not required if an evaluation of the impact of such development on heritage resources is required in terms of any other legislation (such as NEMA), provided that the consenting authority ensures that the evaluation of impacts fulfils the requirements of the relevant heritage resources authority in terms of Section 38(3) and any comments and recommendations of the relevant resources authority with regard to such development have been taken into account prior to the granting of the consent. However, should heritage resources of significance be affected by the Kleinzee Solar PV facility and associated grid connection infrastructure, a permit is required to be obtained prior to disturbing or destroying such resources as per the requirements of Section 48 of the NHRA, and the SAHRA Permit Regulations (GN R668).

5.3 Overview of the Basic Assessment Process for the Kleinzee Solar PV facility and associated grid connection infrastructure

Key tasks undertaken for the BA included:

- Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
- Submission of the completed Application for Environmental Authorisation to the competent authority (i.e. DFFE) in terms of Regulations 5 and 6 of the EIA Regulations, 2014 (GNR 326), as amended.
- Undertaking a public participation process in accordance with Chapter 6 of GNR326, and the Department of Environmental Affairs (2017), Public Participation guidelines in terms of NEMA EIA Regulations, Department of Environmental Affairs, Pretoria, South Africa (hereinafter referred to as "the Guidelines") in order to identify issues and concerns associated with the proposed project.
- Undertaking of independent specialist studies in accordance with Appendix 6 of the EIA Regulations, 2014 (GNR326), as amended.
- Preparation of a BA Report and EMPr in accordance with the requirements of Appendix 1 and Appendix 4 of GN R326.
- 30-day public and authority review period of the BA report.
- Compilation of a C&R report detailing the comments raised by I&APs, addressing these comments in detail and finalisation of the BA report.
- Submission of a final BA report to the DFFE for review and decision-making.

The tasks are discussed in detail in the sub-sections below.

5.3.1. Authority Consultation and Application for Authorisation in terms of the 2014 EIA Regulations (as amended)

In terms of Government Notice 779 of 01 July 2016, the National Department of Environmental Affairs (DFFE) is the competent authority for all projects related to the IRP. As the project is located within the Northern Cape Province, the Northern Cape Department of Environment and Nature Conservation (DENC) is the commenting authority. As the project is located within the Northern Cape Province, the Northern Cape DAEARD & LR are the commenting authorities. Consultation with the regulating authorities (i.e., DFFE and Northern Cape DAEARD & LR) as well as with all other relevant Organs of State will continue throughout the BA process. To date, this consultation has included the following:

- Submission of the project-application meeting request and application form for Environmental Authorisation to the DFFE.
- Submission of the BA Report for review and comment by:
  - The competent and commenting authorities.
  - State departments that administer laws relating to a matter affecting the environment relevant to an application for Environmental Authorisation.
  - Organs of State which have jurisdiction in respect of the activity to which the application relates.

The submissions, as listed above, were undertaken electronically, as required by the DFFE (in line with the directions for new Applications for Environmental Authorisations provided for in GNR650 of 05 June 2020).

A record of all authority correspondence undertaken during the BA process is included in **Appendix B** and **Appendix C**.

5.3.2. Public Participation Process

Public participation is an essential and regulatory requirement for an environmental authorisation process and is guided by Regulations 41 to 44 of the EIA Regulations 2014 (GN R326) (as amended). The purpose of public

participation is clearly outlined in Regulation 40 of the EIA Regulations 2014 (GN R326) (as amended) and is being followed for this proposed project.

The sharing of information forms the basis of the public participation process and offers the opportunity for I&APs to become actively involved in the BA process from the outset. The public participation process is designed to provide sufficient and accessible information to I&APs in an objective manner. The public participation process affords I&APs opportunities to provide input into and receive information regarding the BA process in the following ways:

During the BA process:
» Provide an opportunity to submit comments regarding the project;
» Assist in identifying reasonable and feasible alternatives;
» Contribute relevant local information and knowledge to the environmental assessment;
» Allow registered I&APs to verify that their comments have been recorded, considered and addressed, where applicable, in the environmental investigations;
» Foster trust and co-operation;
» Generate a sense of joint responsibility and ownership of the environment; and
» Comment on the findings of the environmental assessments.

During the decision-making phase:
» To advise I&APs of the outcome of the competent authority's decision, and how and by when the decision can be appealed.

The public participation process therefore aims to ensure that:
» Information containing all relevant facts in respect of the application is made available to potential stakeholders and I&APs for their review.
» The information presented during the public participation process is presented in such a manner, i.e. local language and technical issues, that it avoids the possible alienation of the public and prevents them from participating.
» Public participation is facilitated in such a manner that I&APs are provided with a reasonable opportunity to comment on the project.
» Various ways are provided to I&APs to correspond and submit their comments i.e. fax, post, email.
» An adequate review period is provided for I&APs to comment on the findings of the BA Report.

In terms of the requirement of Chapter 6 of the EIA Regulations of December 2014, as amended, the following key public participation tasks are required to be undertaken:

» Fix a notice board at a place conspicuous to the public at the boundary or on the fence of—
    (i) the site where the activity to which the application relates is or is to be undertaken; and
    (ii) any alternative site mentioned in the application;
» Give written notice to:
    (i) the owner or person in control of that land if the applicant is not the owner or person in control of the land;
    (ii) the occupiers of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
    (iii) owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;

(iv) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;
(v) the municipality which has jurisdiction in the area;
(vi) any organ of state having jurisdiction in respect of any aspect of the activity; and
(vii) any other party as required by the competent authority.

» Place an advertisement in one local newspaper.
» Open and maintain a register of I&APs and Organs of State.
» Release of a BA Report for a 30-day review and comment period.
» Prepare a Comments and Responses (C&R) report which documents the comments received on the BA process and during the 30-day review period and the responses provided by the project team.

The Public Participation Process for Kleinzee Solar PV has been run concurrently with the public consultation for Daisy Solar PV, located north of the project site. The benefit to the stakeholder is that all information relevant to all related applications has been made available for review together, and not only for comments to be raised across both applications at one time, but also provided a complete picture of the potential for impacts and/or benefits related to the suite of projects located in close proximity to one another.

In compliance with the requirements of Chapter 6: Public Participation of the EIA Regulations, 2014 (as amended), and the approved Public Participation Plan, the following summarises the key public participation activities implemented. The schematic below provides an overview of the tools that are available to I&APs and stakeholders to access project information and interact with the public participation team to obtain project information and resolve any queries that may arise, and to meet the requirements for public participation.

i. Stakeholder identification and register of I&APs	•Register as an I&AP on the online platform or via completion of a form and provison of contact information, by responding to an advert, or sending a 'please call me' which will be responded to with a telephone call. •State interest in the project. •Receive all project related information via email, post or other appropriate means.
ii. Advertisments and notifications	•Advertisements, site notices and radio announcements and notifications provide information and details on the projects and where to access project information. •Notifications regarding the BA process and availability of project report for public review to be sent via email, post or SMS notifications.
iii. Public Involvement and consultation	•Distribution of a BID providing details on the project and how I&APs can become involved in the process. •Submission of comments or queries via the online platform, email or post to the PP team. •Virtual presentations available via the online platform. •Availability of project information via the online platform, email, post and telephonic platforms such as WhatsApp, and including telephonic discussions to provide description of information verbally. •An opportunity for I&APs and stakeholders to request virtual meetings with the project team.
iv. Comment on the BA Report	•Availability of the project report via the online platform for 30-day comment period. Hard copies to be avaiable only where sanitary conditions can be assured, or on request. •Submission of comments via the online platform, email or post to the PP team. •Comments recorded and responded to, as part of the process.
v. Identification and recording of comments	•Comments and Responses Report, including all comments received to be included in the reporting. •Comments received prior to report release for review to be included in draft reports. •Comments received during full process to be included within the final Report for decision-making.

i. <u>Stakeholder identification and Register of Interested and Affected Parties and the creation of an electronic database</u>

42. A proponent or applicant must ensure the opening and maintenance of a register of I&APs and submit such a register to the competent authority, which register must contain the names, contact details and addresses of –
    (a) All persons who, as a consequence of the public participation process conducted in respect of that application, have submitted written comments or attended meetings with the proponent, applicant or EAP;
    (b) All persons who have requested the proponent or applicant, in writing, for their names to be placed on the register; and

(c) All organs of state which have jurisdiction in respect of the activity to which the application relates.

I&APs have been identified through a process of networking and referral, obtaining information from Savannah Environmental's existing stakeholder database, liaison with potentially affected parties in the greater surrounding area and a registration process involving the completion of a reply form. Key stakeholders and affected and surrounding landowners have been identified and registered on the project database. Other stakeholders are required to formally register their interest in the project. An initial list of key stakeholders identified and registered is listed in **Table 5.3**.

Table 5.3: Initial list of Stakeholders identified for the inclusion in the project database during the public participation process for the Kleinzee Solar PV facility and associated grid connection infrastructure

Organs of State
National Government Departments
Department Forestry, Fisheries and the Environment (DFFE)
Department of Mineral Resources and Energy (DMRE)
Department of Agriculture, Land Reform, and Rural Development (DALRRD)
Department of Water and Sanitation (DWS)
Department of Communications and Digital Technologies
Government Bodies and State-Owned Companies
Eskom Holdings SOC Limited
National Energy Regulator of South Africa (NERSA)
Air Traffic Navigation Services (ATNS)
South African Civil Aviation Authority (SACAA)
South African Heritage Resources Agency (SAHRA)
South African National Roads Agency Limited (SANRAL)
South African Radio Astronomy Observatory (SARAO)
Telkom SA SOC Limited
Transnet SA SOC Limited
South African National Parks (SANParks)
South African Weather Services
Provincial Government Departments
Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARD&LR)
Northern Cape Department of Economic Development and Tourism
Northern Cape Department of Roads and Public Works
Ngwao Boswa Kapa Bokone (NBKB) – provincial Heritage Authority
Local Government Departments
Namakwa District Municipality
Nama Khoi Local Municipality
Commenting Stakeholders
Agri SA and Agri Northern Cape
BirdLife South Africa
Endangered Wildlife Trust (EWT)
National Khoi Council
National SA San Council
SENTECH
Wildlife and Environment Society of South Africa (WESSA)

Namaqua National Park (SANParks)
Affected landowners, tenants, and occupiers
Neighbouring landowners, tenants, and occupiers

As per Regulation 42 of the EIA Regulations, 2014 (as amended), all relevant stakeholder and I&AP information has been recorded within a register of I&APs (refer to **Appendix C1** for a listing of the recorded parties). In addition to the above-mentioned EIA Regulations, point 4.1 of the Public Participation Guidelines has also been followed. The register of I&APs contains the names[20] of:

- all persons who requested to be registered on the database in writing and disclosed their interest in the project;
- all Organs of State which hold jurisdiction in respect of the activity to which the application relates; and
- all persons who submitted written comments or attended meetings during the public participation process.

I&APs have been encouraged to register their interest in the BA process from the onset of the project, and the identification and registration of I&APs will be on-going for the duration of the BA process. The database of I&APs will be updated throughout the BA process and will act as a record of the I&APs involved in the public participation process.

ii. Advertisements and Notifications

40.(2)(a)	Fixing a notice board at a place conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of – (i) The site where the activity to which the application or proposed application relates is or is to be undertaken; and (ii) Any alternative site.
40.(2)(b)	Giving written notice, in any of the manners provided for in section 47Dof the Act, to – (i) The occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken; (ii) Owners, persons in control of, and occupiers of land adjacent to the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken; (iii) The municipal councillor of the ward in which the site and alternative site is situated and any organisation of ratepayers that represent the community in the area; (iv) The municipality which has jurisdiction in the area; (v) Any organ of state having jurisdiction in respect of any aspect of the activity; and (vi) Any other party as required by the competent authority.
40.(2)(c)	Placing an advertisement in – (i) One local newspaper; or (ii) Any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;
40.(2)(d)	Placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official Gazette referred to in paragraph (c)(ii); and

[20] Contact details and addresses have not been included in the I&AP database as this information is protected by the Protection of Personal Information Act (No 4 of 2013).

40.(2)(e) Using reasonable alternative methods, as agreed to by the competent authority, in those instances where a person is desirous of but unable to participate in the process due to –
(i) Illiteracy;
(ii) Disability; or
(iii) Any other disadvantage.

The BA process was announced with an invitation to the Organs of State, potentially affected and neighbouring landowners (including occupiers) and general public to register as I&APs and to actively participate in the process. This was achieved via the following:

» Compilation of a background information document (BID) (refer to **Appendix C3**) providing technical and environmental details on the project and how to become involved in the BA process. The BID and the BA process notification letters announcing the BA process, notifying Organs of State, potentially affected and neighbouring landowners, as well as registered stakeholders/IAPs of the Kleinzee Solar PV facility and associated grid connection infrastructure, and providing background information of the project and inviting I&APs to register on the project database were distributed via email on 19 January 2023. The evidence of the distribution is contained in **Appendix C** of the BA Report. The BID is also available electronically on the Savannah Environmental website (http://www.savannahsa.com/public-documents/energy-generation).
» Placement of site notices announcing the BA process at visible points along the boundary of the study area (i.e. the boundaries of two affected properties), in accordance with the requirements of the EIA Regulations on 20 January 2023. Photographs and the GPS co-ordinates of the site notices are contained in **Appendix C2**.
» Placement of an advertisement in the Gemsbok Newspaper on **28 April 2023** prior to the commencement of the 30-day review and comment period. This advert announced the project, the BA process, as well as the availability of the BA report, and invited comments on the BA Report. This advert also included the details on the review period for the BA report and where the report can be accessed. A copy of the newspaper advert as sent to the newspaper is included in **Appendix C2** of the BA Report. The newspaper advert tear sheet will be included in **Appendix C2.**
» The BA Report has been made available for review by I&APs for a 30-day review and comment period from **03 May 2023** to **02 June 2023.** The BA Report has been made available on the Savannah Environmental website and all registered I&APs have been notified of the availability on **03 May 2023** via email, which included the link to access the report on the Savannah Environmental website. The evidence of distribution of the BA Report will be included in the final BA Report, which will be submitted to the DFFE.

I&APs were offered the opportunity to contact the public participation office by the following means, and in the language of their choice:
» telephone (landline or on the dedicated public participation mobile number);
» fax; or
» E-mail

iii. Public Involvement and Consultation

In order to accommodate the varying needs of stakeholders and I&APs within the surrounding area, as well as capture their views, comments, issues and concerns regarding the project, various opportunities have been and will continue to be provided to I&APs to note their comments and issues. I&APs are being consulted through the following means:

Table 5.4: Public involvement for the Kleinzee Solar PV facility and associated grid connection infrastructure

Activity	Date
Distribution of the BID, process notification letters and stakeholder reply form announcing the EIA process and inviting I&APs to register on the project database. The BID and electronic reply form was also made available on the online stakeholder engagement platform.	19 January 2023
Placement of site notices along the affected property boundary at a visible and accessible location.	20 January 2023
Announcement of the availability of the BA Report for a 30-day review and comment period, including details on how to access the BA Report via the online stakeholder engagement platform, in one local newspaper: » Gemsbok Newspaper (Afrikaans advertisement)	28 April 2023
Distribution of notification letters announcing the availability of the BA Report for a 30-day review and comment period. These letters were distributed to Organs of State, Government Departments, Ward Councillors, landowners within the surrounding area (including neighbouring landowners), registered I&APs and key stakeholder groups.	03 May 2023
30-day review and comment period of the BA Report.	03 May 2023 – 02 June 2023
Virtual meetings through the use of virtual platforms as determined through discussions with the relevant stakeholder group: » Landowners, occupiers or persons in control of the land » Authorities and key stakeholders (including Organs of State, local municipality and official representatives of community-based organisations). » Where an I&AP does not have access to a computer and/or internet to participate in a virtual meeting telephonic discussions (including WhatsApp video call) will be set-up and minuted for inclusion. The preferred language of the I&AP has been considered when setting up these discussions.	Focus group meetings will be held with key stakeholders during the 30-day review and comment period of the BA Report. A FGM was held with SANParks on 19 January 2023.
On-going consultation (i.e., telephone liaison; e-mail communication) with all I&APs.	Throughout BA process

iv. <u>Registered I&APs entitled to Comment on the BA Report</u>

43.(1) A registered I&AP 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.

(2) In order to give effect to section 24O of the Act, any State department that administers a law relating to a matter affecting the environment must be requested, subject to regulation 7(2), to comment within 30 days.

44.(1) The applicant must ensure that the comments of interested and affected parties are recorded in reports and plans and that such written comments, including responses to such comments and records of meetings, are attached to the reports and plans that are submitted to the competent authority in terms of these Regulations.

(2) Where a person desires but is unable to access written comments as contemplated in subregulation (1) due to –

(a) A lack of skills to read or write;
(b) Disability; or
(c) Any other disadvantage;

Reasonable alternative methods of recording comments must be provided for.

I&APs registered on the database have been notified by means of a notification letter of the release of the BA Report for a 30-day review and comment period, invited to provide comment on the BA Report, and informed of the manner in which, and timeframe within which such comment must be made.

The BA Report has been made available on the Savannah Environmental website (https://www.savannahsa.com/public-documents/energy-generation/). The notification was distributed prior to commencement of the 30-day review and comment period, on **03 May 2023**. Where I&APs were not able to provide written comments, other means of consultation, such telephonic discussions were used to provide the I&APs with a platform to verbally raise their concerns and comments on the proposed development. The comments raised during the discussion have been recorded and included in **Appendix C8** of the BA Report.

v. Identification and Recording of Comments

Comments raised by I&APs over the duration of the BA process has been synthesised into a Comments and Responses (C&R) Report which is included in **Appendix C8** of the BA Report. The C&R Report includes detailed responses from members of the BA project team and/or the developer to the issues and comments raised.

Meeting notes from all focus group meetings held during the BA process are included in **Appendix C7**.

The C&R Report will be updated with all comments received during the 30-day review and comment period and will be included as **Appendix C8** in the final BA Report that will be submitted to the DFFE for decision-making.

vi. I&AP Consultation and Meetings

Throughout the BA process, the public participation team was in either telephonic or e-mail consultation with I&APs. The evidence of consultation is included in **Appendices C4** and **C5** of the BA Report.

A series of Focus Group Meetings (FGM) are planned with the following stakeholders during the review period of the BAR report. Both face-to-face meetings and virtual meetings are to be held to accommodate the varying needs of stakeholders. The details of the meetings planned to be held are included below:

» National Government Departments
» Government Bodies and State-Owned Companies
» South African National Parks (SANParks)
» Provincial Government Departments
» Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARD&LR)
» Local Government Departments, including Namakwa District Municipality and Nama Khoi Local Municipality
» Key Stakeholder Meeting
» Affected landowners, occupiers, tenants meeting
» Adjacent landowners meeting

All meetings will be recorded, and meeting notes drafted and distributed to the attendees for their verification of comments and inputs raised during the meetings. Meeting notes of all virtual and face-to-face meetings

undertaken during the 30-day review and comment period will be included in Appendix C of the Final BA Report.

5.4 Assessment of Issues Identified through the BA Process

Issues identified as requiring investigation, as well as the specialist consultants involved in the assessment of these impacts are indicated in **Table 5.5** below.

Table 5.5: Specialist consultants appointed to evaluate the potential impacts associated with the Kleinzee Solar PV facility and associated grid connection infrastructure

Specialist Name	Specialist Company	Field of Study	Appendices
Simon Todd	3Foxes Biodiversity Consulting	Terrestrial Ecology[21]	Appendix D
Rob Simmons and Marlei Martins	Birds and Bats Unlimited	Avifauna	Appendix E
Marinè Pienaar	TerraAfrica	Soils and Agricultural Potential	Appendix F
Jenna Lavin	CTS Heritage	Heritage (including archaeology and palaeontology)	Appendix G
Lourens du Plessis	LOGIS	Visual Impact	Appendix H
Brogan Geldenhuys	Eco Thunder	Social Environment	Appendix I

Specialist studies considered direct and indirect environmental impacts associated with the development of all components of the Kleinzee Solar PV facility and associated grid connection infrastructure. Issues were assessed in terms of the following criteria:

- The **nature**, a description of what causes the effect, what will be affected, and how it will be affected;
- The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high);
- The **duration**, wherein it is indicated whether:
  - The lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  - The lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  - Medium-term (5–15 years) – assigned a score of 3;
  - Long term (> 15 years) - assigned a score of 4;
  - Permanent - assigned a score of 5.
- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
  - 0 is small and will have no effect on the environment;
  - 2 is minor and will not result in an impact on processes;
  - 4 is low and will cause a slight impact on processes;
  - 6 is moderate and will result in processes continuing but in a modified way;
  - 8 is high (processes are altered to the extent that they temporarily cease);
  - 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability of occurrence**, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:
  - Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
  - Assigned a score of 2 is improbable (some possibility, but low likelihood);
  - Assigned a score of 3 is probable (distinct possibility);

[21] This includes a Terrestrial Biodiversity Study, a plant species assessment and an animal species compliance statement.

- Assigned a score of 4 is highly probable (most likely);
- Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).

» The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high;
» The **status**, which is described as either positive, negative or neutral;
» The degree to which the impact can be reversed;
» The degree to which the impact may cause irreplaceable loss of resources;
» The degree to which the impact can be mitigated.

The **significance** is determined by combining the criteria in the following formula:

S = (E+D+M) P; where

S = Significance weighting.
E = Extent.
D = Duration.
M = Magnitude.
P = Probability.

The **significance weightings** for each potential impact are as follows:

» **< 30 points:** Low (i.e. where this impact would not have a direct influence on the decision to develop in the area);
» **30-60 points:** Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated);
» **> 60 points:** High (i.e. where the impact must have an influence on the decision process to develop in the area).

Specialist studies also considered cumulative impacts associated with similar developments in the vicinity of the proposed project. The purpose of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e. whether the addition of the proposed project in the area will increase the impact). In this regard, specialist studies considered whether the construction of the proposed development will result in:

» Unacceptable risk
» Unacceptable loss
» Complete or whole-scale changes to the environment or sense of place
» Unacceptable increase in impact

A conclusion regarding whether the proposed development will result in any unacceptable loss or impact considering all the projects proposed in the area is included in the respective specialist reports.

As the Applicant has the responsibility to avoid or minimise impacts and plan for their management (in terms of the EIA Regulations, 2014 (as amended)), the mitigation of significant impacts is discussed. An assessment of impacts with mitigation is made in order to demonstrate the effectiveness of the proposed mitigation measures. An Environmental Management Programme (EMPr) that includes all the mitigation measures recommended by the specialists for the management of significant impacts is included as **Appendix L1**. The

Generic Environmental Management Programme (EMPr) for the Development and Expansion of Substation Infrastructure for the Transmission and Distribution of Electricity (as gazetted in GNR 435 of March 2019) is included for the on-site facility substation (**Appendix L2**), and the Grid line (**Appendix L3**)

5.5 Outcomes of the DFFE Web-Based Screening Tool

In terms of GN R960 (promulgated on 5 July 2019) and Regulation 16(1)(b)(v) of the 2014 EIA Regulations (as amended), the submission of a Screening Report generated from the national web based environmental screening tool is compulsory for the submission of applications in terms of Regulations 19 and 21 of the EIA Regulations.

The requirement for the submission of a Screening Report (included as **Appendix L** of the BA Report) and the Site Sensitivity Verification Report (**Appendix K**) for the Kleinzee Solar PV facility and associated grid connection infrastructure is applicable as it triggers Regulation 19 of the EIA Regulations, 2014 (as amended). **Table 6.6** provides a summary of the specialist assessments identified in terms of the screening tool and responses to each assessment from the project team considering the development area under consideration.

Table 5.6: Sensitivity ratings from the DFFE's web-based online Screening Tool associated with the development of the Kleinzee Solar PV facility and associated grid connection infrastructure

Specialist Assessment	Sensitivity/Risk Rating as per the Screening Tool (relating the to need for the study)	Project Team Response
Agricultural Impact Assessment	Screening tool: Medium Required an agricultural impact assessment (in accordance with the protocol prescribed in GNR 320). Verified Sensitivity by Specialist: **Low**	The Kleinzee Solar PV Facility is mostly characterised with Low land capability and land potential sensitivities. It is anticipated that the construction and operation of the Kleinzee Solar PV Facility will have impacts that range from medium to low. Through the consistent implementation of the recommended mitigation measures, most of the impacts can be reduced to low significance. It is of the specialist's opinion that this project be considered favourably, permitting that the mitigation measures are followed to prevent soil erosion and soil pollution. A Soils and Agricultural Potential Impact Assessment is included as **Appendix F** of the BA Report.
Landscape/Visual Impact Assessment	Screening tool: Very High (General Assessment Protocols) Verified Sensitivity by Specialist: **Medium to Low**	The visual impacts associated with the Kleinzee Solar PV facility range from high to low. Post mitigation significance to be reduced to range from moderate to low as a result of the generally undeveloped character of the landscape and the remote location of the project infrastructure. There are a limited number of potential sensitive visual receptors within a 3km radius of the proposed structures, although the possibility does exist for visitors to the region to venture into closer proximity to the PV facility structures. These observers may consider visual exposure to this type of infrastructure to be intrusive.

		If mitigation is undertaken as recommended, it is the specialist's opinion that the significance of most of the anticipated visual impacts will remain at or be managed to acceptable levels. As such, the Kleinzee Solar PV facility and associated grid connection infrastructure would be considered to be acceptable from a visual impact perspective and can therefore be authorised. A Visual Impact Assessment has been undertaken for the Kleinzee Solar PV Facility and is included in this BA Report as **Appendix H.**
Archaeological and Cultural Heritage Impact Assessment	Screening tool: Low Verified Sensitivity by Specialist: **Low**	While infrastructure associated with the Namaqualand Copper Mining Cultural Landscape is known to exist in this area, the proposed development is located well-away from the heart of the Cultural Landscape as described in the tentative listing. Furthermore, no resources of heritage significance were identified within the area proposed for development. The specialist does not anticipate that the proposed development will negatively impact on significant cultural landscape resources, A Heritage Impact Assessment (which covers both archaeological and cultural aspects of the study area and the development area) has been undertaken for Kleinzee Solar PV facility and associated grid connection infrastructure and is included in this BA Report as **Appendix G**.
Palaeontology Impact Assessment	Screening tool: Very High Verified Sensitivity by Specialist: **Low**	According to the SAHRIS Palaeosensitivity Map, the area proposed for development is underlain by scree/talus/alluvium grading into piedmont gravel of low palaeontological sensitivity. Pether (2011, SAHRIS NID 16355) conducted a PIA for a proposed development located approximately 10km away from the proposed development area. Similar geology is present at this site. Pether (2011) noted that terrestrial deposits blanket the area. He goes on to note that "These deposits comprise the loose, surficial coversands and the underlying, older, "dorbank" compact, clayey deposits that also are chiefly aeolian sands, with the soils and pedocretes that have formed in them. Fossil bones are sparsely distributed on the palaeosurfaces within these deposits but are locally abundant in contexts such as interdune deposits, carnivore bone accumulations in burrows and buried Stone Age sites. Trace fossils are ubiquitous and important palaeoenvironmental indicators. The significance rating is low for fossil potential as a consequence of

		the low probability of finding fossils in the terrestrial deposits. With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of impacts of the Kleinzee Solar PV Facility palaeontological resources will be low. A Heritage Impact Assessment (which covers the paleontological aspects of the development area) has been undertaken for the Kleinzee Solar PV Facility and is included in this BA Report as **Appendix G**. The PIA complies with the requirements of the NHRA.
Terrestrial Biodiversity Impact Assessment	Screening tool: Very high Required a terrestrial biodiversity impact assessment and a plant species assessment (Terrestrial Biodiversity Assessment Protocols) Verified Sensitivity by Specialist: **Low**	The DFFE Screening Tool for the site indicates that for the combined Terrestrial Biodiversity Theme, the site consists entirely of Very High sensitivity areas due to the presence of areas of CBA2, ESAs, Protected Areas Expansion Strategy area. The footprint of the Kleinzee PV Facility falls entirely within the Namaqualand Strandveld vegetation type which has been impacted to a relatively limited extent by transformation to date and is classified as Least Threatened. Based on the field assessment, the site has been determined to have relatively low abundance of SCC and no significant biodiversity features. Similar Strandveld habitat is widely available in the area and is also well-represented within the Namakwa National Park. The development is therefore considered highly unlikely to compromise the ecological functioning of the affected CBA2, given that it has not been identified as being of particular significance for broad-scale ecological processes. Consequently, the overall impact of the development on CBAs and broader scale ecological processes is considered to be relatively low. An Ecological Impact Assessment (including flora and fauna) has been undertaken for the Kleinzee Solar PV facility and associated grid connection infrastructure and is included as **Appendix D** of the BA Report.
Avian Impact Assessment	Screening tool: Low Verified Sensitivity: **Low**	The small development footprint, low passage rates of the Red Data birds and the medium-low reporting rates of all five Priority species, points to this solar site as of low risk to the birds there. The greatest threat to avian species around a solar PV site are:

		» Displacement from the area used for the panels; » Loss of foraging habitat for threatened or Priority species. » Wetland species perceiving the panels as open water and colliding with panels. » Collisions with the power lines. The presence of only two threatened (Red Data) Priority species, and their low Passage Rates, and their relatively low likelihood of occurring, indicates that this site does not require any specific mitigations as the risks to the birds, or the loss of habitat, are both insignificant for this development. It is the specialist opinion that if the predicted impacts can be mitigated, there is no reason why the site should not be granted environmental authorisation from an avian perspective. An Avifauna Impact Assessment Report has been undertaken for the Kleinzee Solar PV facility and associated grid connection infrastructure and included as **Appendix E** of the BA Report.
Civil Aviation Assessment	Screening tool: Low Verified Sensitivity: **Low**	The Civil Aviation Authority (CAA) has been consulted throughout the EIA process to obtain input and details of any requirements for further studies. No comments or objections to the project have been received. The project site is not located within close proximity of any aerodromes, landing strips or infrastructure. The low sensitivity rating is supported, and no study is required in this regard.
Defence Assessment	Screening tool: Low Verified Sensitivity: **Low**	The project site is not located within close proximity of any military base or infrastructure. The low sensitivity rating is supported, and no study is required in this regard.
RFI Assessment	Screening tool: Low Verified Sensitivity: **Low**	The project site under consideration for the development of the Kleinzee Solar PV Facility is located outside of an Astronomy Advantage Area and within an area that as classified as having low sensitivity for telecommunication. The low sensitivity rating is supported, and no study is required in this regard. No comments or objections have been received during the public participation process.
Socio-Economic Assessment	Screening Report did not include a rating for this theme; however, the specialist assessment was identified.	A Social Impact Assessment has been undertaken and is included in the BA Report as **Appendix I**.
Plant Species Assessment	Screening tool: Medium	The DFFE Screening Tool indicates that the Kleinzee PV Facility development area is mapped as Medium Sensitivity due to the possible presence of several

	Verified Sensitivity by Specialist: **Medium**	plant species of concern. In addition to the species identified by the Screening Tool, the field assessment confirmed the presence of other plant SCC on the site, one of which is *Wahlenbergia asparagoides*, which is classified as Near Theatened. *Wahlenbergia asparagoides* occurs within the Kleinzee PV Facility site at a low density and is a common species in the wider area. Although the development would result in the loss of approximately 2.5% of the local population this is estimated to represent less than 0.2% of the global population. The development is therefore considered unlikely to compromise the local of regional population of this species. The impact of the Kleinzee PV Facility on *W.asparagoides* is considered acceptable and the development is not opposed. A Plant Species Assessment has been undertaken and is included in the BA Report as **Appendix D3.**
Animal Species Assessment	Screening tool: Medium Necessitating an animal species assessment (in accordance with Animal Species Assessment Protocols prescribed in GN 43855) Verified Sensitivity by Specialist: **Low**	The DFFE Screening Tool identified the entire site as having a medium animal sensitivity theme due to the potential presence of the Black Harrier well as Sensitive Species 32 and the orthopteran *Brinckiella mauerbergerorum*. In terms of the site verification, the presence of the Sensitive Species 32 can definitively be excluded from the site as this species shows a particular preference for rocky terrain, which is not present within or near the site. In terms of the *Brinckiella mauerbergerorum*, the presence or absence of this species on the site is less definitive, but based on the amount of time spent on site and in the area which amounts to several weeks across different seasons and years and the failure to detect this species on the site, it is concluded that this species is absent from the site. As such, the site is considered low sensitivity for this species. The footprint of the Kleinzee Solar PV Facility is restricted to low sensitivity areas with no observed faunal species of conservation concern present or likely to be present. As such, from a faunal species perspective there are no reasons to oppose the Kleinzee Solar PV Facility. An Animal Compliance Statement has been undertaken and is included in the BA Report as **Appendix D2.**

5.6 Assumptions and Limitations of the BA Process

The following assumptions and limitations are applicable to the studies undertaken within this BA process:

- All information provided by the developer and I&APs to the environmental team was correct and valid at the time it was provided.
- It is assumed that the development area and development footprint for the solar PV facility identified by the developer represents a technically suitable site for the establishment of the Kleinzee Solar PV facility and associated grid connection infrastructure which is based on the design undertaken by technical consultants for the project.
- This report and its investigations are project-specific, and consequently the environmental team did not evaluate any other power generation alternatives.

Refer to the specialist studies in **Appendices D – I** for specialist study specific limitations.

5.7 Legislation and Guidelines that have informed the preparation of this Basic Assessment Report

The following legislation and guidelines have informed the scope and content of this BA Report:

- National Environmental Management Act (Act No. 107 of 1998);
- EIA Regulations of December 2014, published under Chapter 5 of NEMA (as amended);
- Department of Environmental Affairs (2017), Public Participation guidelines in terms of NEMA EIA Regulations;
- Department of Environmental Affairs (2017), Integrated Environmental Management Guideline: Guideline on Need and Desirability.
- Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for environmental authorisation; and
- International guidelines – the Equator Principles, the IFC Performance Standards, the Sustainable Development Goals, World Bank Environmental and Social Framework, and the and World Bank Group Environmental, Health, and Safety Guidelines (EHS Guidelines).

Table 5.7 provides an outline of the legislative permitting requirements applicable to the Kleinzee Solar PV facility and associated grid connection infrastructure as identified at this stage in the project process.

Table 5.7: Applicable Legislation, Policies and/or Guidelines associated with the development of the Kleinzee Solar PV facility and associated grid connection infrastructure

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Legislation			
Constitution of the Republic of South Africa (No. 108 of 1996)	In terms of Section 24, the State has an obligation to give effect to the environmental right. The environmental right states that: "*Everyone has the right –* » *To an environment that is not harmful to their health or well-being, and* » *To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:* * *Prevent pollution and ecological degradation,* * *Promote conservation, and* * *Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development*."	Applicable to all authorities	There are no permitting requirements associated with this Act. The application of the Environmental Right however implies that environmental impacts associated with proposed developments are considered separately and cumulatively. It is also important to note that the "right to an environment clause" includes the notion that justifiable economic and social development should be promoted, through the use of natural resources and ecologically sustainable development.
National Environmental Management Act (No 107 of 1998) (NEMA)	The 2014 EIA Regulations have been promulgated in terms of Chapter 5 of NEMA. Listed activities which may not commence without EA are identified within the Listing Notices (GNR 327, GNR 325 and GNR 324) which form part of these Regulations (GNR 326). In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation. Considering the location of the project site within the Upington Renewable Energy Development Zone (REDZ 7) and the requirements GNR114 of 16 February 2018, a	DFFE – Competent Authority Northern Cape DAEARD&LR – Commenting Authority	The listed activities triggered by the proposed project have been identified and are being assessed as part of the BA process currently underway for the project. The BA process will culminate in the submission of a final BA Report to the competent authority in support of the application for EA.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	Basic Assessment Process is required to be undertaken for the proposed project. All relevant listing notices for the project (GN R327, GN R325 and GN R324) will be applied for		
National Environmental Management Act (No 107 of 1998) (NEMA)	In terms of the "Duty of Care and Remediation of Environmental Damage" provision in Section 28(1) of NEMA every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment. In terms of NEMA, it is the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.	DFFE Northern Cape DAEARD&LR	While no permitting or licensing requirements arise directly by virtue of the proposed project, this section finds application through the consideration of potential cumulative, direct, and indirect impacts. It will continue to apply throughout the life cycle of the project.
Environment Conservation Act (No. 73 of 1989) (ECA)	The Noise Control Regulations in terms of Section 25 of the ECA contain regulations applicable for the control of noise in the Provinces of Limpopo, North West, Mpumalanga, Northern Cape, Eastern Cape, and KwaZulu-Natal Provinces. The Noise Control Regulations cover the powers of a local authority, general prohibitions, prohibitions of disturbing noise, prohibitions of noise nuisance, use of measuring instruments, exemptions, attachments, and penalties. In terms of the Noise Control Regulations, no person shall make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, machine, device or apparatus or any combination thereof (Regulation 04).	DFFE Northern Cape DAEARD&LR	Noise impacts are expected to be associated with the construction phase of the project. Minimal noise is expected during operation. As the site is located away from noise sensitive receptors and communities, construction noise is unlikely to present a significant intrusion to the local community. There is therefore no requirement for a noise permit in terms of the legislation.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Water Act (No. 36 of 1998) (NWA)	A water use listed under Section 21 of the NWA must be licensed with the Regional DWS, unless it is listed in Schedule 1 of the NWA (i.e. is an existing lawful use), is permissible under a GA, or if a responsible authority waives the need for a licence. Water use is defined broadly, and includes consumptive and non-consumptive water uses, taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation. Consumptive water uses may include taking water from a water resource (Section 21(a)) and storing water (Section 21(b)). Non-consumptive water uses may include impeding or diverting of flow in a water course (Section 21(c)), and altering of bed, banks or characteristics of a watercourse (Section 21(i)).	Regional Department of Water and Sanitation	No wetlands or freshwater features are present within the development footprint for the Kleinzee Solar PV Facility as indicated in the Ecological Impact Assessment (**Appendix D**).
Minerals and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA)	In accordance with the provisions of the MPRDA a mining permit is required in accordance with Section 27(6) of the Act where a mineral in question is to be mined, including the mining of materials from a borrow pit.	Department of Mineral Resources and Energy (DMRE)	Any person who wishes to apply for a mining permit in accordance with Section 27(6) must simultaneously apply for an Environmental Authorisation in terms of NEMA. No borrow pits are expected to be required for the construction of the project, and as a result a mining permit or EA in this regard is not required to be obtained.
	Section 53 of the MPRDA states that any person who intends to use the surface of any land in any way which may be contrary to any object of the Act, or which is likely		In terms of Section 53 of the MPRDA approval is required from the Minister of Mineral Resources and Energy to ensure

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	to impede any such object must apply to the Minister for approval in the prescribed manner.		that the proposed development does not sterilise a mineral resource that might occur on site.
National Environmental Management: Air Quality Act (No. 39 of 2004) (NEM:AQA)	The National Dust Control Regulations (GNR 827) published under Section 32 of NEM:AQA prescribe the general measures for the control of dust in all areas, and provide a standard for acceptable dustfall rates for residential and non-residential areas. In accordance with the Regulations (GNR 827) any person who conducts any activity in such a way as to give rise to dust in quantities and concentrations that may exceed the dustfall standard set out in Regulation 03 must, upon receipt of a notice from the air quality officer, implement a dustfall monitoring programme. Any person who has exceeded the dustfall standard set out in Regulation 03 must, within three months after submission of the dustfall monitoring report, develop and submit a dust management plan to the air quality officer for approval.	Northern Cape DAEARD&LR / Namakwa District Municipality	In the event that the project results in the generation of excessive levels of dust the possibility could exist that a dustfall monitoring programme would be required for the project, in which case dustfall monitoring results from the dustfall monitoring programme would need to be included in a dust monitoring report, and a dust management plan would need to be developed. However, with mitigation measures implemented, the Kleinzee PV facility and associated grid connection infrastructure is not anticipated to result in significant dust generation.
National Heritage Resources Act (No. 25 of 1999) (NHRA)	Section 07 of the NHRA stipulates assessment criteria and categories of heritage resources according to their significance. Section 35 of the NHRA provides for the protection of all archaeological and palaeontological sites, and meteorites. Section 36 of the NHRA provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority.	South African Heritage Resources Agency (SAHRA) Ngwao Boswa Kapa Bokone (NBKB) – provincial heritage authority	A full Heritage Impact Assessment (HIA) (with field work) has been undertaken as part of the BA process (refer to **Appendix H** of this BA Report). No sites of heritage significance were identified within the development area of the Kleinzee Solar PV facility and associated grid connection infrastructure Should a heritage resource be impacted upon, a permit may be required from SAHRA or Ngwao Boswa Kapa Bokone (NBKB) in accordance with of Section 48 of

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	Section 38 of the NHRA lists activities which require developers or any person who intends to undertake a listed activity to notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development. Section 44 of the NHRA requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction.		the NHRA, and the SAHRA Permit Regulations (GN R668). This will be determined as part of the final walk-through survey once the final location of the development footprint and its associated infrastructure within the development area has been determined.
National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)	Section 53 of NEM:BA provides for the MEC / Minister to identify any process or activity in such a listed ecosystem as a threatening process. Three government notices have been published in terms of Section 56(1) of NEM:BA as follows: » Commencement of TOPS Regulations, 2007 (GNR 150). » Lists of critically endangered, vulnerable and protected species (GNR 151). » TOPS Regulations (GNR 152). It provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), and vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (NEM:BA: National list of ecosystems that are threatened	DFFE Northern Cape DAEARD&LR	Under NEM:BA, a permit would be required for any activity that is of a nature that may negatively impact an already threatened ecosystem. A Terrestrial Ecology Impact Assessment has been undertaken as part of the BA process. The field assessment confirmed the presence of *Wahlenbergia asparagoides as well as several other plant SCC*. Should any species be affected by the project, a permit would be required to be obtained.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	and in need of protection, (Government Gazette 37596, GNR 324), 29 April 2014).		
National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)	Chapter 5 of NEM:BA pertains to alien and invasive species, and states that a person may not carry out a restricted activity involving a specimen of an alien species without a permit issued in terms of Chapter 7 of NEM:BA, and that a permit may only be issued after a prescribed assessment of risks and potential impacts on biodiversity is carried out. Applicable, and exempted alien and invasive species are contained within the Alien and Invasive Species List (GNR 864).	DFFE Northern Cape DAEAR&LR	Under NEM:BA, a permit would be required for any activity that is of a nature that may negatively impact an already threatened ecosystem. A Terrestrial Ecology Impact Assessment has been undertaken as part of the BA process. The field assessment confirmed that no species within the Alien and Invasive Species List are present on site.
Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA)	Section 05 of CARA provides for the prohibition of the spreading of weeds. Regulation 15 of GN R1048 published under CARA provides for the classification of categories of weeds and invader plants, and restrictions in terms of where these species may occur. Regulation 15E of GN R1048 published under CARA provides requirement and methods to implement control measures for different categories of alien and invasive plant species.	Department of Agriculture, Land Reform and Rural Development (DALRD)	CARA will find application throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies need to be developed and implemented. In addition, a weed control and management plan must be implemented. In terms of Regulation 15E (GN R1048) where Category 1, 2 or 3 plants occur a land user is required to control such plants by means of one or more of the following methods: » Uprooting, felling, cutting or burning. » Treatment with a weed killer that is registered for use in connection with such plants in accordance with the directions for the use of such a weed killer.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			» Biological control carried out in accordance with the stipulations of the Agricultural Pests Act (No. 36 of 1983), the ECA and any other applicable legislation. » Any other method of treatment recognised by the executive officer that has as its object the control of plants concerned, subject to the provisions of sub-regulation 4. » A combination of one or more of the methods prescribed, save that biological control reserves and areas where biological control agents are effective shall not be disturbed by other control methods to the extent that the agents are destroyed or become ineffective.
National Forests Act (No. 84 of 1998) (NFA)	According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. Notice of the List of Protected Tree Species under the National Forests Act (No. 84 of 1998) was published in GNR 734. The prohibitions provide that "no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister".	Department of Agriculture, Land Reform and Rural Development (DALRD)	A licence is required for the removal of protected trees. It is therefore necessary to conduct a survey that will determine the number and relevant details pertaining to protected tree species present in the development footprint for the submission of relevant permits to authorities prior to the disturbance of these individuals. The ecological assessment has determined that no protected species which may require a license in terms of the NFA (No. 84 of 1998) are present within the development area (refer to **Appendix D** of this BA Report).

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Veld and Forest Fire Act (No. 101 of 1998) (NVFFA)	Chapter 4 of the NVFFA places a duty on owners to prepare and maintain firebreaks, the procedure in this regard, and the role of adjoining owners and the fire protection association. Provision is also made for the making of firebreaks on the international boundary of the Republic of South Africa. The applicant must ensure that firebreaks are wide and long enough to have a reasonable chance of preventing a veldfire from spreading to or from neighbouring land, it does not cause soil erosion, and it is reasonably free of inflammable material capable of carrying a veldfire across it. Chapter 5 of the Act places a duty on all owners to acquire equipment and have available personnel to fight fires. Every owner on whose land a veldfire may start or burn or from whose land it may spread must have such equipment, protective clothing and trained personnel for extinguishing fires, and ensure that in his or her absence responsible persons are present on or near his or her land who, in the event of fire, will extinguish the fire or assist in doing so, and take all reasonable steps to alert the owners of adjoining land and the relevant fire protection association, if any.	DFFE	While no permitting or licensing requirements arise from this legislation, this Act will be applicable during the construction and operation of the Kleinzee Solar PV facility and associated grid connection infrastructure, in terms of the preparation and maintenance of firebreaks, and the need to provide appropriate equipment and trained personnel for firefighting purposes.
Hazardous Substances Act (No. 15 of 1973) (HAS)	This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger, to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products.	Department of Health (DoH)	It is necessary to identify and list all Group I, II, III, and IV hazardous substances that may be on site and in what operational context they are used, stored or handled. If applicable, a license would be required to be obtained from the Department of Health (DoH).

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	» Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared as Group I or Group II substance » Group IV: any electronic product, and » Group V: any radioactive material. The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.		
National Environmental Management: Waste Act (No. 59 of 2008) (NEM:WA)	The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. The Minister may amend the list by – » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. In terms of the Regulations published in terms of NEM:WA (GNR 912), a BA or EIA is required to be undertaken for identified listed activities. Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that: » The containers in which any waste is stored, are intact and not corroded or in » Any other way rendered unlit for the safe storage of waste.	DFFE – Hazardous Waste Northern Cape DAEARD&LR – General Waste	No waste listed activities are triggered by the Kleinzee Solar PV facility and associated grid connection infrastructure, therefore, no Waste Management License is required to be obtained. General and hazardous waste handling, storage and disposal will be required during construction and operation. The National Norms and Standards for the Storage of Waste (GNR 926) published under Section 7(1)(c) of NEM:WA will need to be considered in this regard.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	» Adequate measures are taken to prevent accidental spillage or leaking. » The waste cannot be blown away. » Nuisances such as odour, visual impacts and breeding of vectors do not arise, and » Pollution of the environment and harm to health are prevented.		
National Road Traffic Act (No. 93 of 1996) (NRTA)	The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts. The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.	South African National Roads Agency (SANRAL) – national roads Northern Cape Department of Transport, Safety and Liaison	An abnormal load / vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits required for vehicles carrying abnormally heavy or abnormally dimensioned loads. Transport vehicles exceeding the dimensional limitations (length) of 22m. Depending on the trailer configuration and height when loaded, some of the on-site substation components may not meet specified dimensional limitations (height and width) which will require a permit.

Provincial Policies / Legislation			
Northern Cape Nature Conservation Act (Act No. 9 of 2009)	This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project: » Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property; » Aquatic habitats may not be destroyed or damaged; » The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species; The Act provides lists of protected species for the Province.	Northern Cape DAEARD&LR	A collection/destruction permit must be obtained from Northern Cape Nature Conservation for the removal of any protected plant or animal species found on site. Species of conservation concern that may be present within the development area include, *Wahlenbergia asparagoides as well as several other plant SCC*. However, should these species be confirmed within the development area during any phase of the proposed development, permits will be required from the Northern Cape Department of Nature Conservation and Environment.

5.7.2 Best Practice Guidelines Birds & Solar Energy (2017)

The Best Practice Guidelines: Birds & Solar Energy (2017) proposed by the Birds and Renewable Energy Specialist Group (BARESG) (convened by BirdLife South Africa and the Endangered Wildlife Trust) contain guidelines for assessing and monitoring the impact of solar generation facilities on birds in Southern Africa. The guidelines recognise the impact that solar energy may have on birds, through for example the alteration of habitat, the displacement of populations from preferred habitat, and collision and burn mortality associated with elements of solar hardware and ancillary infrastructure, and the fact that the nature and implications of these effects are poorly understood.

The guidelines are aimed at EAPs, avifaunal specialists, developers and regulators and propose a tiered assessment process, including:

(i) Preliminary avifaunal assessment – an initial assessment of the likely avifauna in the area and possible impacts, preferably informed by a brief site visit and by collation of available data; also including the design of a site-specific survey and monitoring project should this be deemed necessary.
(ii) Data collection – further accumulation and consolidation of the relevant avian data, possibly including the execution of baseline data collection work (as specified by the preliminary assessment), intended to inform the avian impact study.
(iii) Impact assessment – a full assessment of the likely impacts and available mitigation options, based on the results of systematic and quantified monitoring if this was deemed a requisite at preliminary assessment.
(iv) Monitoring – repetition of baseline data collection, plus the collection of mortality data. This helps to develop a complete before and after picture of impacts, and to determine if proposed mitigation measures are implemented and are effective or require further refinement. Monitoring may only be necessary for projects with the potential for significant negative impacts on birds (i.e. large area affected and / or vulnerable species present).

In terms of the guidelines, the quantity and quality of baseline data required to inform the assessment process at each site should be set in terms of the size of the site and the predicted impacts of the solar technology in question, the anticipated sensitivity of the local avifauna (for example, the diversity and relative abundance of priority species present, proximity to important flyways, wetlands or other focal sites) and the amount of existing data available for the area.

Data collection could vary from a single, short field visit (Regime 1, for e.g. at a small or medium sized site with low avifaunal sensitivity), to a series of multi-day survey periods, including the collection of various forms of data describing avian abundance, distribution and movement and spread over 12 months (Regime 3, for e.g. at a large developments located in a sensitive habitat, or which otherwise may have significant impacts on avifauna). **Table 5.8** is taken from the best practise guidelines and provides a summary of the recommended assessment regimes in relation to proposed solar energy technology, project size, and likely risk).

Table 5.8: Recommended avian assessment regimes in relation to proposed solar energy technology, project size, and known impact risks.

Type of technology*	Size**	Avifaunal Sensitivity***		
		Low	Medium	High
All except CSP power tower	Small (< 30ha)	Regime 1	Regime 1	Regime 2

Type of technology*	Size**	Avifaunal Sensitivity***		
		Low	Medium	High
	Medium (30 – 150ha)	Regime 1	Regime 2	Regime 2
	Large (> 150ha)	Regime 2****	Regime 2	Regime 3
CSP power tower	All	Regime 3		

Regime 1: One site visit (peak season); minimum 1 – 5 days.
Regime 2: Pre- and post-construction; minimum 2 – 3 x 3 – 5 days over 6 months (including peak season); carcass searches.
Regime 3: Pre- and post-construction; minimum 4 – 5 x 4 – 8 days over 12 months, carcass searches.

* Different technologies may carry different intrinsic levels of risk, which should be taken into account in impact significance ratings

** For multi-phased projects, the aggregate footprint of all the phases should be used. At 3ha per MW, Small = < 10MW, Medium = 10 – 50MW, Large = > 50MW.

*** The avifaunal sensitivity is based on the number of priority species present, or potentially present, the regional, national or global importance of the affected area for these species (both individually and collectively), and the perceived susceptibility of these species (both individually and collectively) to the anticipated impacts of development. For example, an area would be considered to be of high avifaunal sensitivity if one or more of the following is found (or suspected to occur) within the broader impact zone:

1) Avifaunal habitat (e.g. a wetlands, nesting or roost sites) of regional or national significance.
2) A population of a priority species that is of regional or national significance.
3) A bird movement corridor that is of regional or national significance.
4) A protected area and / or Important Bird and Biodiversity Area.

An area would be considered to be of medium avifaunal sensitivity if it does not qualify as high avifaunal sensitivity, but one or more of the following is found (or suspected to occur) within the broader impact zone

1) Avifaunal habitat (e.g. a wetland, nesting or roost sites) of local significance.
2) A locally significant population of a priority species.
3) A locally significant bird movement corridor.

An area would be considered to be of low avifaunal sensitivity if it is does not meet any of the above criteria.

**** Regime 1 may be applied to some large sites, but only in instances where there is abundant existing data to support the assessment of low sensitivity.

5.7.3 The IFC EHS Guidelines

The IFC EHS Guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice (GIIP). The following IFC EHS Guidelines have relevance to the proposed project:

» IFC EHS General Guidelines
» IFC EHS Guidelines for Electric Power Transmission and Distribution

The General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines, however no Industry Sector EHS Guidelines have been developed for PV solar power to date. The application of the General EHS Guidelines should be tailored to the hazards and risks associated with a project and should take into consideration site-specific variables which may be applicable, such as host country context, assimilative capacity of the environment, and other project factors. In instances where host country regulations differ from the standards presented in the EHS Guidelines, whichever is the more stringent of the two in this regard should be applied.

The General EHS Guidelines include consideration of the following:

- Environmental:
  - Air Emissions and Ambient Air Quality
  - Energy Conservation
  - Wastewater and Ambient Water Quality
  - Water Conservation
  - Hazardous Materials Management
  - Waste Management
  - Noise
  - Contaminated Land
- Occupational Health and Safety:
  - General Facility Design and Operation
  - Communication and Training
  - Physical Hazards
  - Chemical Hazards
  - Biological Hazards
  - Radiological Hazards
  - Personal Protective Equipment (PPE)
  - Special Hazard Environments
  - Monitoring
- Community Health and Safety:
  - Water Quality and Availability
  - Structural Safety of Project Infrastructure
  - Life and Fire Safety (L&FS)
  - Traffic Safety
  - Transport of Hazardous Materials
  - Disease Prevention
  - Emergency Preparedness and Response
- Construction and Decommissioning:
  - Environment
  - Occupational Health and Safety
  - Community Health and Safety

5.7.4 IFC's Project Developer's Guide to Utility-Scale Solar Photovoltaic Power Plants (2015)

While no Industry Sector EHS Guidelines have been developed for PV Solar Power, the IFC has published a Project Developer's Guide to Utility-Scale Solar Photovoltaic Power Plants (IFC, 2015). Chapter 8 of the Project Developer's Guide pertains to Permits, Licensing and Environmental Considerations, and states that in order to deliver a project which will be acceptable to international lending institutions, environmental and social assessments should be carried out in accordance with the requirements of the key international standards and principles, namely the Equator Principles and IFC's Performance Standards.

Some of the key environmental considerations for solar PV power plants contained within the Project Developer's Guide include:

- Construction phase impacts (i.e. OHS, temporary air emissions from dust and vehicle emissions, noise related to excavation, construction and vehicle transit, solid waste generation and wastewater generation from temporary building sites and worker accommodation).
- Water usage (i.e. the cumulative water use requirements).
- Land matters (i.e. land acquisition procedures and the avoidance or proper mitigation of involuntary land acquisition / resettlement).
- Landscape and visual impacts (i.e. the visibility of the solar panels within the wider landscape and associated impacts on landscape designations, character types and surrounding communities).
- Ecology and natural resources (i.e. habitat loss / fragmentation, impacts on designated areas and disturbance or displacement of protected or vulnerable species).
- Cultural heritage (i.e. impacts on the setting of designated sites or direct impacts on below-ground archaeological deposits as a result of ground disturbance during construction).
- Transport and access (i.e. impacts of transportation of materials and personnel).
- Drainage / flooding (i.e. flood risk associated with the site).
- Consultation and disclosure (i.e. consultating with key authorities, statutory bodies, affected communities and other relevant stakeholders as early as possible).
- Environmental and Social Management Plan (ESMP) (i.e. compile an ESMP to ensure that mitigation measures for relevant impacts are identified and incorporated into project construction procedures and contracts).

CHAPTER 6: DESCRIPTION OF THE RECEIVING ENVIRONMENT

This chapter provides a description of the local environment. This information is provided in order to assist the reader in understanding the possible effects of the project on the environment within which it is proposed to be developed. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, the Kleinzee Solar PV Facility and grid connection have been described. This information has been sourced from both existing information available for the area as well as collected field data by specialist consultants and aims to provide the context within which this BA process is being conducted.

6.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of an Impact Assessment Report

This chapter includes the following information required in terms of Appendix 3: Content of an EIA report:

Requirement	Relevant Section
3(1)(h)(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.	The environmental attributes associated with the development of the Kleinzee Solar PV facility and Grid Connection is included as a whole within this chapter. The environmental attributes that are assessed within this chapter includes the following:
	» The regional setting of the broader study area indicates the geographical aspects associated with the Kleinzee Solar PV facility and Grid Connection. This is included in **Section 6.2**.
	» The climatic conditions for the Kleinzee area have been included in **Section 6.3**.
	» The biophysical characteristics of the project site and the surrounding areas are included in **Section 6.4**. The characteristics considered are topography and terrain, geology, soils and agricultural potential and the ecological profile which includes the vegetation patterns, listed plant species, critical biodiversity areas and broad-scale processes, freshwater resources, terrestrial fauna and avifauna.
	» The heritage and cultural aspects (including archaeology, cultural landscape and palaeontology) has been included in **Section 6.5**.
	» The social and socio-economic characteristics associated with the study area and the project site has been included in **Section 6.7**

A more detailed description of each aspect of the affected environment is included in the specialist reports included in **Appendices D to I** of this BA report.

6.2. Regional Setting

The broader study area and the project site proposed for the development of the Kleinzee Solar PV Facility is located along the west coast in the Northern Cape Province. The province is situated in the north-western corner of South Africa and has a land area of 372,889 km^2, therefore occupying approximately 30% of South Africa's land area and making it the largest province in South Africa even though it has the smallest population.

The Kleinzee Solar PV Facility will be located on Farm Zonnekwa 328, portion 4. The development is located approximately 24km south-east of the town of Kleinsee within the Nama Khoi Local Municipality, and within the Namakwa District Municipality.

The project site is located within Ward 8 of the Nama Khoi Local Municipality. The Nama Khoi local Municipality is a Category B municipality, which means it shares executive and legislative authority with a Category C municipality. The Namakwa District Municipality is a Category C municipality, which denotes that the municipality has executive and legislative authority in an area that includes more than one municipality. Namakwa is the largest of the five district municipalities in the Northern Cape. It is comprised of six local municipalities, namely Nama Khoi, Hantam, Khâi-Ma, Kamiesberg, Karoo Hoogland, and Richtersveld.

The major towns located within the study area, and within the surrounding areas of the project site includes Kleinsee, Port Nolloth, Koingnaas, Komaggas, Springbok and Nigramoep. The towns of Kleinsee, Port Nolloth and Koingnaas are coastal towns located on the west coast. Komaggas is the town closest to the project site and is located ~20km to east.

Kleinsee was previously viewed as one of the flourishing mining towns, solely managed by De Beers. By 2007, the diamond production decreased, which led to retrenchment of workers in the same year. By 2008 mining operations ceased completely. The population of the town began decreasing as people sought employment in other places within and outside the Province, and foreigners employed in the area returned to their homes. To avoid total loss, the mining town was proclaimed as a public town in 2012 under the Nama Khoi Local Municipality to allow people to continue living in the area. Currently, the region has a very low population density of 3 people per km^2.

Kleinsee was previously visited often by tourists as a part of the diamond route, however, now it is included in the 'shipwreck and daisies route'. The town holds and is located near various tourist attractions such as the Buffels River estuary and a Nature Reserve. Other attractions within the district include among others the Molyneux Nature Reserve, Namaqua National Park, Gariep River, Blue Mine, and the Goegap Nature Reserve. None of these areas of conservation are present within the Kleinzee Solar PV Facility project site.

The area is also well-known for its scenic natural beauty (West Coast as a whole) and annual wild flower displays (Namaqualand). This occurs once a year between July and October.

The mining activities along the coastline have significantly disturbed the area due to the scale and nature of the surface-based mining. Other than the mining and prospecting activities, industrial infrastructure within the region includes a network of distribution power lines, a distribution substation in Kleinsee and the Gromis Transmission Substation. The study area is traversed by the Gromis-Juno 400kV overhead power lines, as well

as the the existing Sandveld/Kommagas 1 66kV overhead line is directly adjacent to (to the north) of the development and runs in line with the unnamed road.

The directly affected surrounding areas are largely undeveloped, the area has large stretches vacant land with some parcels every so often showing evidence for small stock grazing. Agricultural activity in the area is severely restricted by the arid nature of the climate and livestock rearing (sheep and cattle) is the dominant activity. There are no areas of cultivation present within the assessment area and as such, the natural vegetation has been retained across much of the study area (of which could be observed). Other human influence is visible in the area in the form of secondary roads which traverse the study area. These are gravel roads which are predominantly used by local farmers to access the nearby towns of Komaggas and Kleinsee. The only infrastructure present consists of sparsely distributed farmhouses, farm tracks and fences and a number of stock posts. Roads in the immediate area are all gravel. Access to the site is likely to be from the existing gravel roads in the study area, as well as the proposed internal access roads. Within the site itself, access will be required between the PV panels for construction purposes (and later limited access for maintenance).

Province	**Northern Cape Province**
District Municipality	Namakwa District Municipality
Local Municipality	Nama Khoi Local Municipality
Nearest town(s)	~20km south of the town of Komaggas and ~28km south east of Kleinsee
Current Zoning	Agriculture
Access	The site can be readily accessed via an existing gravel access road (Unnamed Rd Komaggas, Northern Cape)

Northern Cape Province

The proposed Solar PV Facility is located in the Northern Cape Province, which covers an area of 372 889km^2 and has a population of close to 1.3 million. It is bordered by Namibia and Botswana to the north, and by the North West, Free State, Eastern Cape and Western Cape provinces. The capital city is Kimberley, and other important towns include Upington, Springbok, Kuruman and De Aar, and Sutherland. The province is rich in minerals, such as alluvial diamonds, iron ore, copper, asbestos, manganese, fluorspar, semi-precious stones and marble, and fertile agricultural land in the Gariep River Valley. The interior Karoo relies on sheep farming.

The Northern Cape is divided into five district municipalities and further subdivided into 26 local municipalities (refer to **Figure 6.1**).

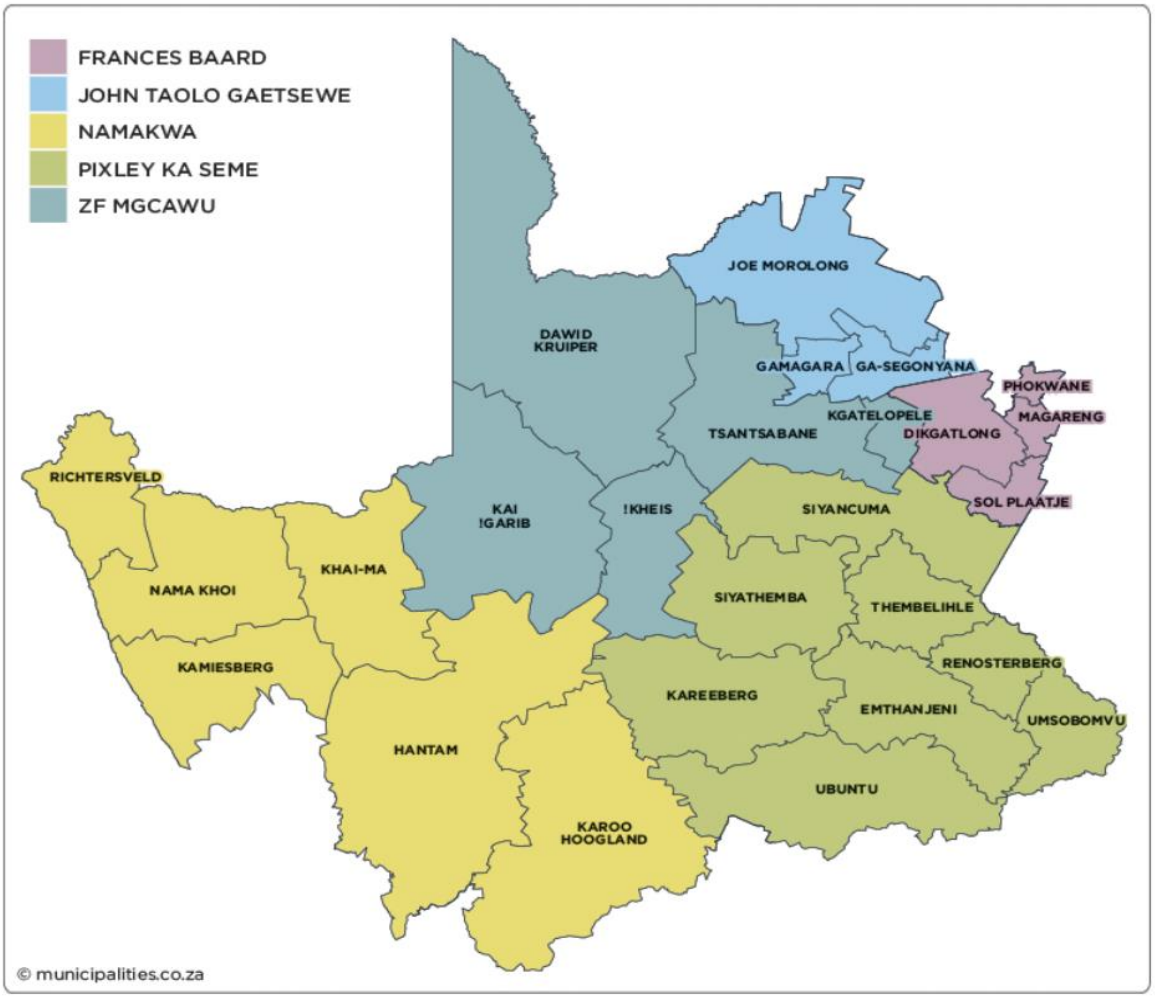


Figure 6.1: District municipalities of the Northern Cape Province (Source: Municipalities of South Africa)

Namakwa District Municipality

The Namakwa District Municipality (NDM) is located in the north western corner of South Africa, bordered to the west by the Atlantic Ocean, to the north by Namibia, to the east by the ZF Mgcawu District Municipality, and to the south by the Western Cape Province. It has an area of 126 836km^2, making it the largest in South Africa. The main economic sectors contributing to the district are agriculture, mining, mari-culture, tourism, industry and electricity. The agriculture industry includes animal farming and the production of different fruits along the Gariep River. Mining is a significant economic contributor to the NDM, with operations taking place in four of the six local municipalities.

Several mines have reached the end of their economic lives, resulting in a number of mines that have either closed or are set to shut. The NDM has the greatest intensity of solar radiation in Southern Africa, making it an attractive site for solar installations. Wind, wave, and nuclear energy have also been considered as viable renewable energy sources.

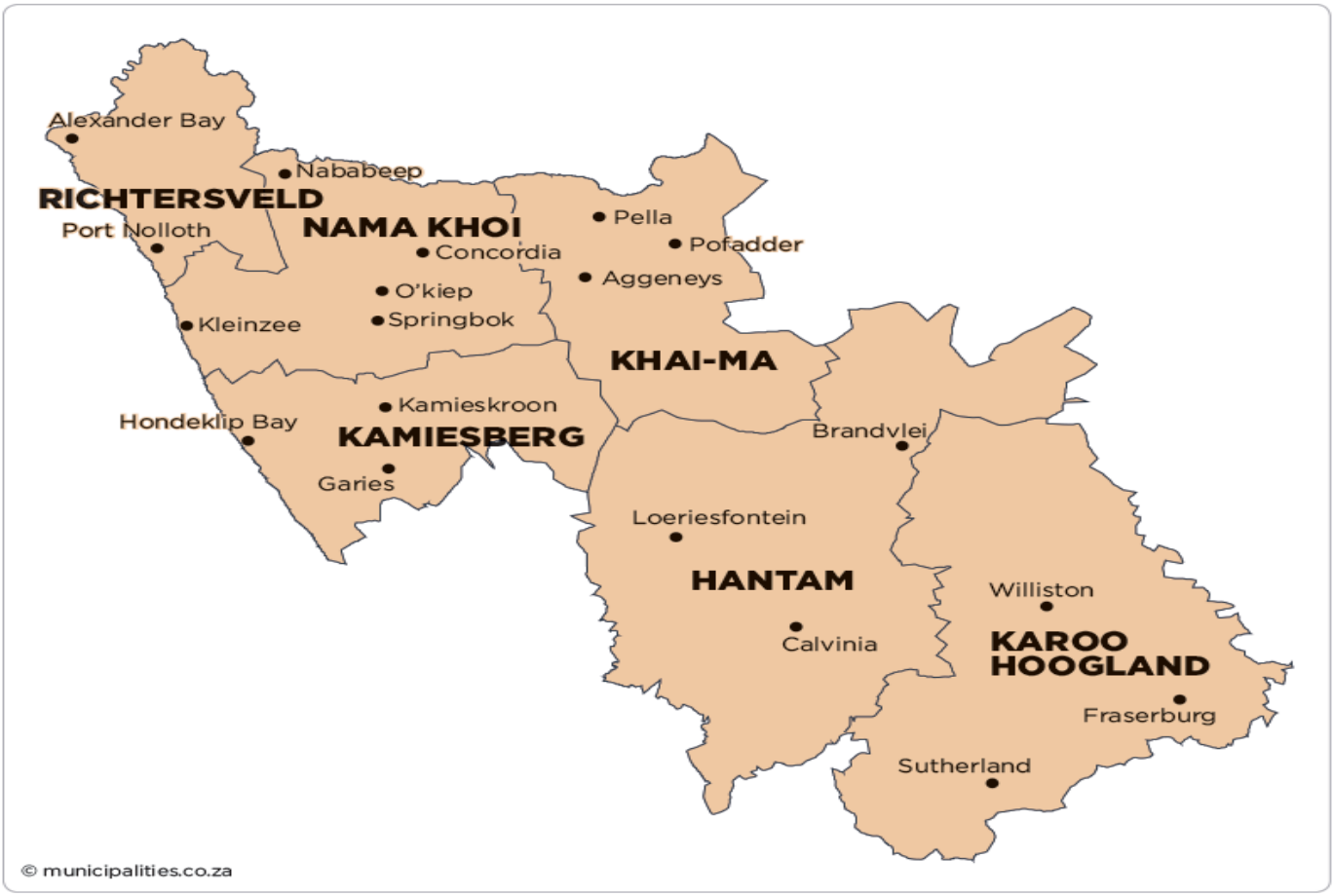


Figure 6.2: Map showing the local municipalities within the Namakwa District Municipality (Source: Local Government Handbook, 2016)

Nama Khoi Local Municipality

Nama Khoi Local Municipality (NKLM) is located in the Northern Cape Province's north-western corner. It is part of the Namakwa District Municipality, with Springbok serving as the administrative centre. The Gariep River provides access to water for agriculture, tourism and water sports. The municipality includes the communities of Springbok, Steinkopf, Okiep, Rooiwinkel, Concordia, Komaggas, Buffelsrivier, Nababeep, Bulletrap, Vioolsdrift, Goodhouse, Kleinzee and Carolusberg.

The NKLM includes parts of both the Greater Richtersveld and Central Namaqualand Coast biodiversity priority areas within its boundaries, making it an important region for conservation activities. Climate change threatens food security, poverty alleviation and sustainable socio-economic growth, and policy decisions taken in the next decade will determine the dimension of the impact of climate change. Ecosystems-based adaptation approaches, using nature and biodiversity to help people cope with and respond to the negative impacts of climate change.

6.3. Climatic Conditions

Kleinsee is characterised by a desert climate. The area receives virtually no rainfall throughout the year. The average annual temperature is 28°C, with an average annual rainfall of 93mm. The driest month is January, with an average temperature of 32°C. The coldest month is July with an average temperature of 7°C. **Figure 6.3** illustrates the climate in the area.

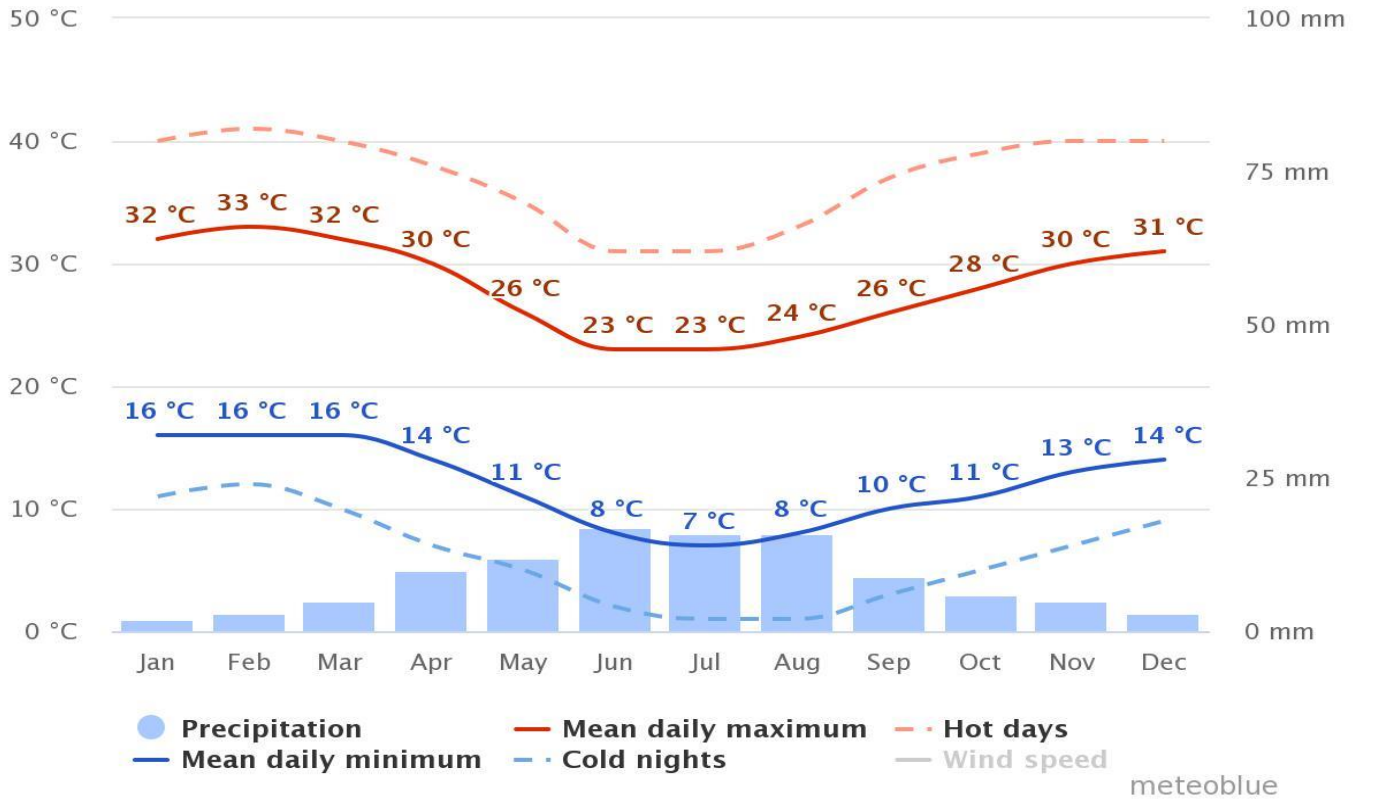


Figure 6.3: Climate graph for the Kleinzee area, Northern Cape Province within which the proposed project site is located (source: Meteoblue 2022)

6.4. Biophysical Characteristics of the Development Area

The following section provides an overview and description of the biophysical characteristics of the study area and has been informed by specialist studies (**Appendix D-I**) undertaken for this BA Report.

6.4.1. Topographical profile

The terrain surrounding the proposed site is generally flat, sloping gently westwards towards the coastline. The topography of the region is broadly described as slightly undulating plains. Low hills are present in the far east and south east of the study area. The area ranges in elevation from 165m above sea level (asl) to about 450m asl at the top of the local hills Graafwater se Kop and Byneskop. The lowest areas are associated with dry pans located to the west of the site. The terrain is generally soft underfoot due to the thick dune sands, except where hardpan outcrops of calcrete have formed firming up the ground. **Figure 6.4** provides a shaded relief/topography map of the study area.

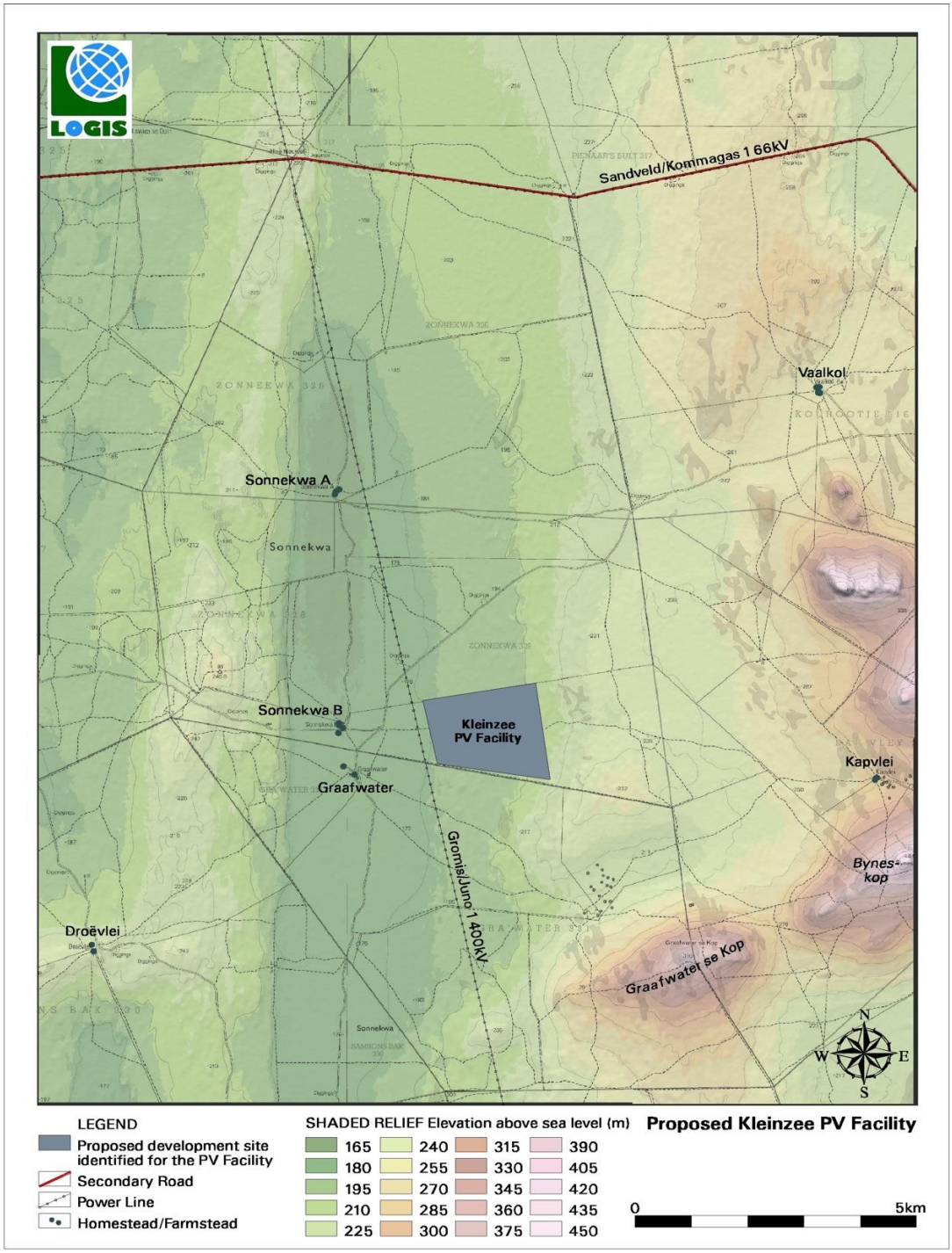


Figure 6.4: Topography for the development area, in the Northern Cape Province

6.4.2. Geology, Soils and Agricultural Potential

The soil profiles classified within the Kleinzee Solar PV Facility development area and grid connection consist of the Namib and Coega soil form. **Figure 6.5** indicates the distribution of the soil forms.

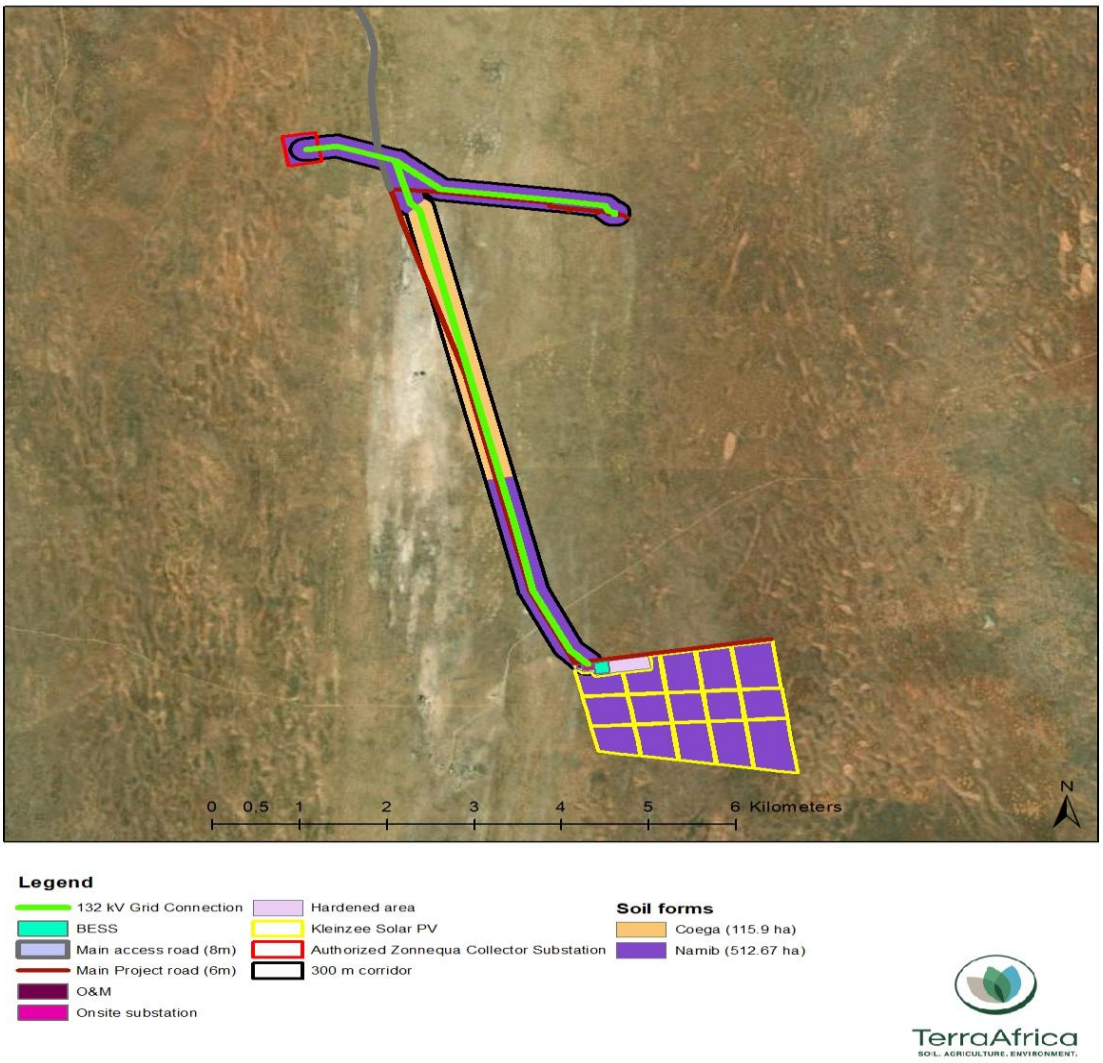


Figure 6.5: Soil classification map of the Kleinzee Solar PV Facility development area and Grid Connection corridor

Namib and Coega soils

The Namib was found in the Kleinzee solar PV area, authorized collector substation and in the northern parts of the grid connection. The Namib had a yellow brown regic sand and was also non calcareous. The Coega soil form was shallow with depths of 400 mm and was found within the grid connection corridor and main access road.

Figure 6.6: Photographic evidence of a Namib soil profile within the development area

Figure 6.7: Photographic evidence of a Coega soil profile within the development area

The largest part of the Kleinzee Solar PV Facility development area and grid connection corridor consists of land with Low (Class 05) land capability. This land capability class is present within the entire boundary of the development area while small areas in the centre section of the PV facility consisting of land with Low-Moderate (Class 06) land capability. The grid connection corridor, authorised Zonnequa collector

substation, and project access road fall in areas with a Low (Class 05) land capability. Only the far southern part of the grid connection corridor has areas where a Low-Moderate (Class 06) land capability is present. The position of the different land capability classes within the development area and grid connection are indicated in **Figure 6.8.**

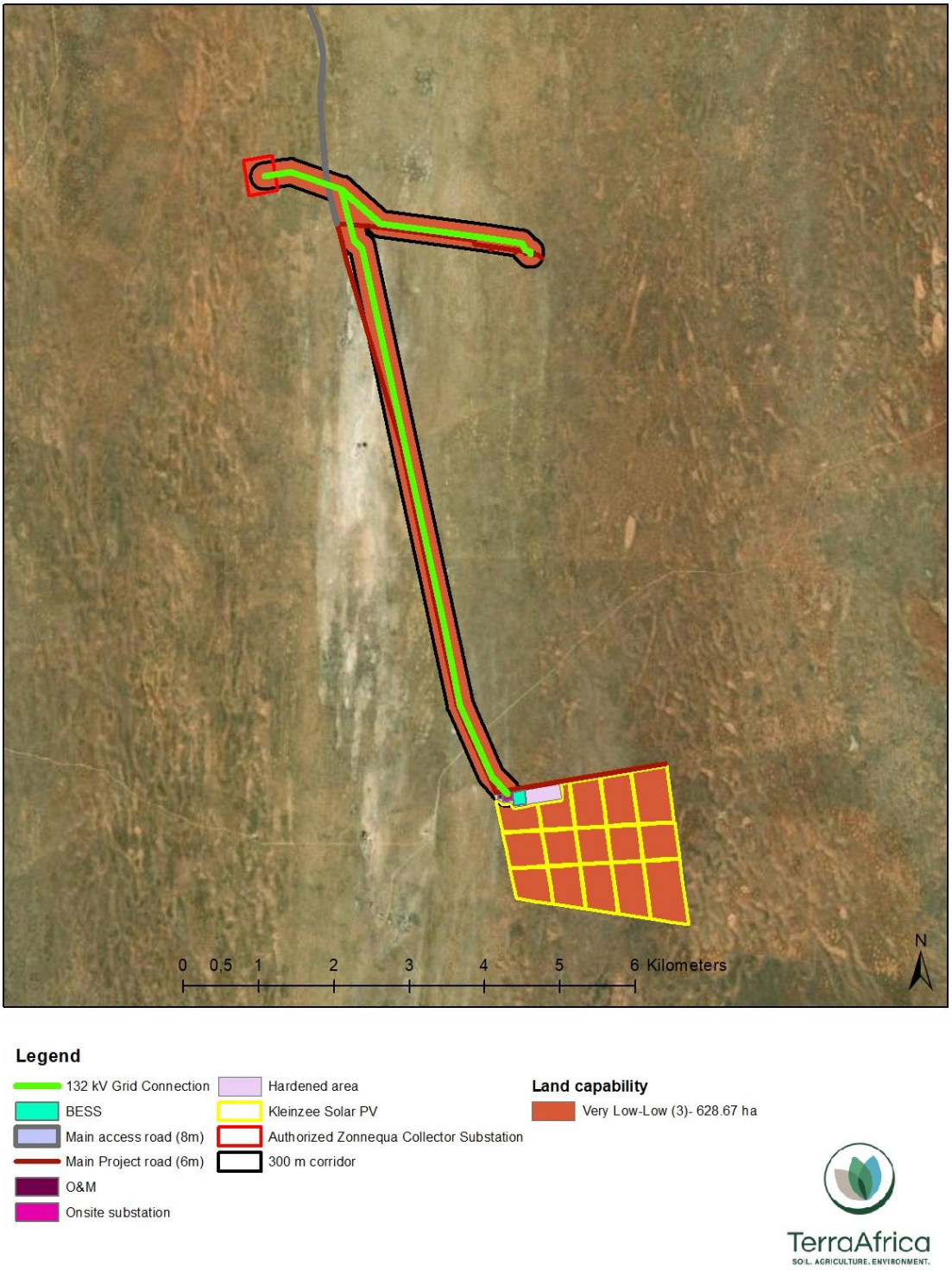


Figure 6.8: Land capability classification of the Kleinzee Solar PV Facility and Grid Connection corridor

Following the classification of the soil and the consideration of the soil properties and limiting factors to rainfed crop production, calculated land capability of the soil within the development area was determined. The total development area assessed, has Low land capability has been assigned to soils of the Namib and Coega soil form because of the regic sand and shallow depth that has a very low water holding capacity and structure. The low land capabilities of the soils within the development area is confirmed by the absence of crop field boundaries within the Kleinzee Solar PV Facility development area.

Following the metadata layer obtained from DALRRD, the long-term grazing capacity of the entire project area is 45 ha/LSU (refer to Error! Reference source not found.). The ideal grazing capacity is an indication of t he long-term production potential of the vegetation layer growing in an area. More specifically, it relates to its ability to maintain an animal with an average weight of 450 kg (defined as 1 Large Stock Unit (LSU)), with an average feed intake of 10 kg dry mass per day over the period of approximately a year. This definition includes the condition that this feed consumption should also prevent the degradation of the soil and the vegetation. The grazing capacity is therefore expressed in several hectares per LSU (ha/LSU) (DALRRD, 2018).

Using the long-term grazing capacity of 45 ha/LSU, the Kleinzee Solar PV Facility development area of 628.67ha can provide forage to 14 head of cattle. The grazing capacity is very low in comparison to the grazing capacity of the rest of the country. The grass cover shows no signs of regular grazing.

6.4.3. Land Use

The small town of Kleinsee lies about 28km north west of the proposed site. Large parts of the region are mine-owned, and as a result, significant diamond mining activities are evident, especially within a 7km band along the coast.

The region has a very low population density of 3 people per km². Roads include a number of internal farm roads and one lower order secondary road extending to the east and west from Komaggas to Kleinsee.

Individual homesteads/farmsteads are scattered throughout the region. Some of these in closer proximity to the PV facility and associated grid connection infrastructure include:

- Sonnekwa A
- Sonnekwa B
- Graafwater
- Vaalkol
- Droëvlei
- Kapvlei

Other than the mining activity located along the West Coast, the proposed development is also within the Northern Corridor of the Strategic Transmission Corridors. As a result, industrial infrastructure within the region includes a network of distribution power lines, a distribution substation in Kleinsee and the Gromis Transmission Substation. The study area is further traversed by the Gromis - Juno 400kV overhead power lines, as well as the Sandveld - Kommagas 66kV overhead power line running along the Kleinsee to Kommagas secondary road.

Land cover is primarily *low shrubland (Succulent Karoo)* with localised areas of *exposed rock and sand,* as well as *dry pans.* The vegetation type is *Strandveld of the West Coast (*refer to **Figure 6.10**). The greater

region is generally seen as having a high scenic value and high tourism value potential. It is well known for its scenic natural beauty (West Coast as a whole) and annual wildflower displays (Namaqualand)[22].

[22] Namaqualand stretches from the small town of Garies in the south to the Orange River to the north, its western border is the wild Atlantic coast, the remote town of Pofadder marks the eastern border (http://www.discoverthecape.com/namaqualand/flower-route.html)

Figure 6.9: Grazing capacity of the Kleinzee Solar PV Facility project area and grid connection corridor (data source: DALRRD, 2018)

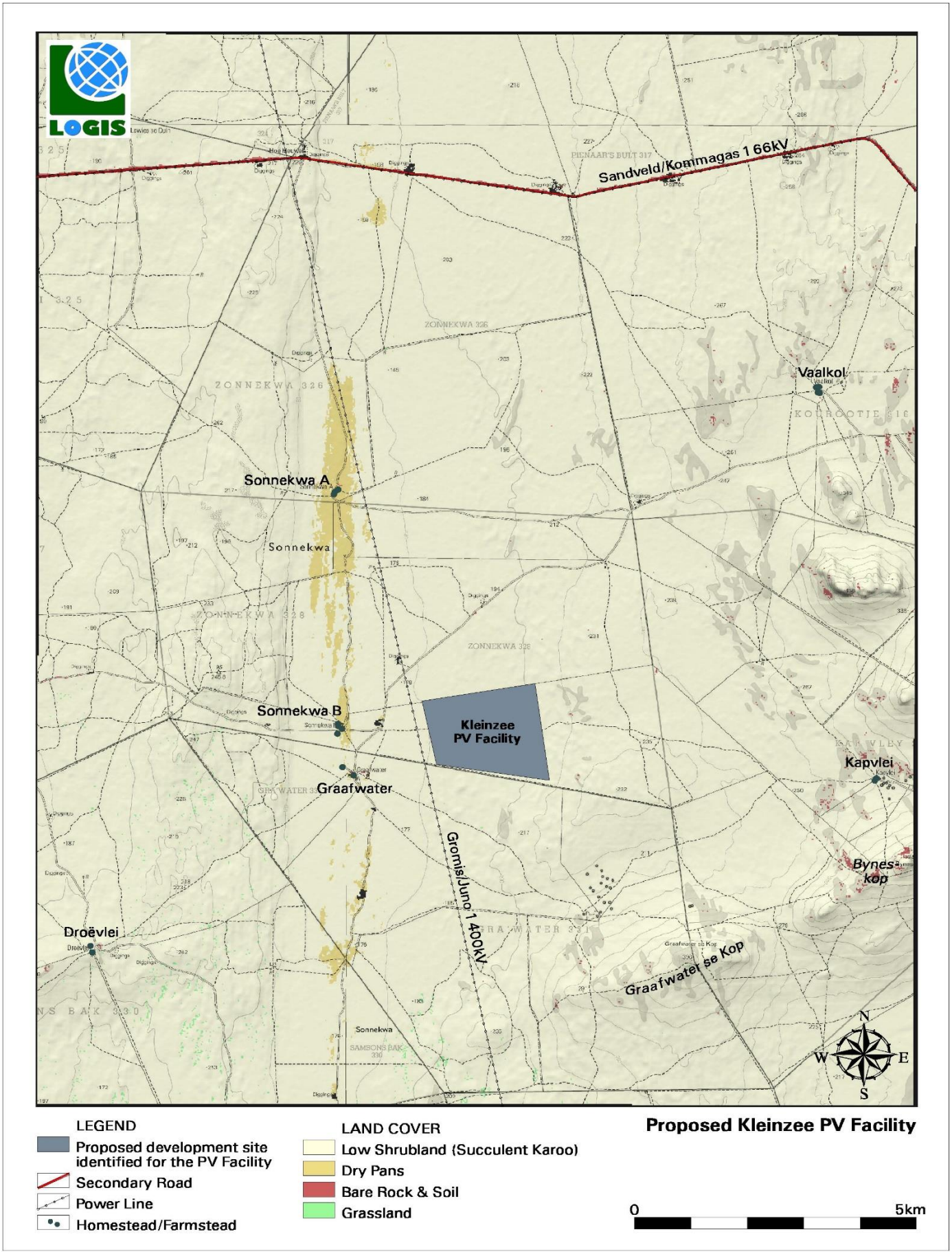


Figure 6.10: Illustration of land cover within the broader study area

6.4.4. Ecological Profile of the Study Area and the Development Area

i. Vegetation Type

The Kleinzee PV Facility project area falls entirely within the Namaqualand Strandveld vegetation type (**Figure 6.11**). Although there is some variation in the vegetation composition of the site relating to substrate conditions, these differences represent different communities rather than different vegetation types and there are no significant vegetation features within the site.

The Namqualand Strandveld vegetation type occurs in the Northern and Western Cape Provinces from the southern Richtersveld as far south as Donkins Bay. Especially in the north of this unit it penetrates up to 40km inland and approaches the coast only near the river mouths of the Buffels, Swartlintjies, Spoeg, Bitter and Groen Rivers. In the south of the unit it is variably narrow and approaches the coast more closely. It consists of flat to undulating coastal peneplains with vegetation being a low species richness shrubland dominated by a plethora of erect and creeping succulent shrubs as well as woody shrubs and in wet years annuals are also abundant. It is associated with deep red or yellowish-red Aeolian dunes and deep sand overlying marine sediments and granite gneisses. Mucina and Rutherford (2006 and 2018) list eight endemic species for this vegetation type. About 10% of this vegetation type has been lost mainly to coastal mining for heavy metals and it is not currently listed. Within the study area, the vegetation is relatively homogenous, although there is some variation depending on the nature of the underlying sand and landscape position. A single plant species of concern was confirmed present within the site, namely *Wahlenbergia asparagoides* (VU) which is occasional across most of the site[23].

Figure 6.11: Typical Strandveld vegetation within the Kleinzee PV Facility. The effects of the preceding drought are however still apparent as can be seen from the abundance of dead shrubs in the middle- and foreground.

[23] The impact of the development on this species is assessed in its' own associated plant species assessment.

ii. Critical Biodiversity, Ecological Support Areas and NPAES Focus Areas

The majority of the Kleinzee PV Facility site falls within a CBA2, with the remainder of the site falling within an ESA (**Figure 6.12**). While there are also some areas of CBA1 in the east, these are located outside of the project site and do not infringe on the project site area. In addition, the whole of the site falls within a NPAES Focus Area associated with the Namakwa National Park, which lies approximately 18 km south of the site. As areas of CBA2 are not considered to be irreplaceable, the development is not considered to have a very high impact on the affected CBA2, which is considerably larger than the site. The Northern Cape CBA map does not include any information on why a specific area has been included as a CBA, with the result that it is not possible to interrogate the map to establish the underlying reasons why the areas within the project site have been classified as CBA 2. Therefore, the ecologist has interrogated the environment based on the habitats and quality of the vegetation present in the field. The field assessment did not identify any significant biodiversity features within the site, with the result that the development would not have a high impact on biodiversity pattern features.

As the primary purpose of CBAs is to try and secure the broad-scale ecological functioning and resilience of landscapes, it is important to consider the impact that the proposed development may have on ecological processes. As the broader study area is relatively homogenous, it is not likely that there are any specific directional movement corridors that would be affected by the development. Furthermore, although the development would result in the loss of approximately 310ha of habitat, this is within a single contiguous area and there are extensive tracts of similar intact habitat around the site with the result that it is not likely that the development would result in significant disruption of ecological processes. The Kleinzee Solar PV project area represents typical Strandveld with a relatively low abundance of SCC and no specific features of high biodiversity or ecological value.

A potential issue associated with development within CBAs is the extent to which habitat loss would impact on ecological processes within the CBA and the potential irreplaceability of the affected area. The site is not considered irreplaceable, which is supported by the CBA2 status of the site as well as the field assessment, which found that the site has a relatively low abundance of SCC and no significant biodiversity features. Similar Strandveld habitat is widely available in the area and is also well-represented within the Namakwa National Park. The development is therefore considered highly unlikely to compromise the ecological functioning of the affected CBA, given that it has not been identified as being of particular significance for broad-scale ecological processes.

The site is located on the northern edge of the NPAES Focus Areas and potential expansion area of the Namakwa National Park (Namaqua National Park: Park Management Plan for the period 2013-2023) and is indicated in **Figure 6.13**. The priority area includes areas important to both biodiversity pattern and processes, and does not imply any loss of existing land use rights, but rather aims to ensure the Park's survival in a living landscape[24]. The area is currently privately owned, and has not been secured for inclusion in the Park. Other renewable energy projects have been authorised in this area, and the site is located within a REDZ, and renewable energy infrastructure is, therefore, considered to be part of the living landscape of this area south of Kleinsee.

[24] NNP MP 2013-2023, page 72

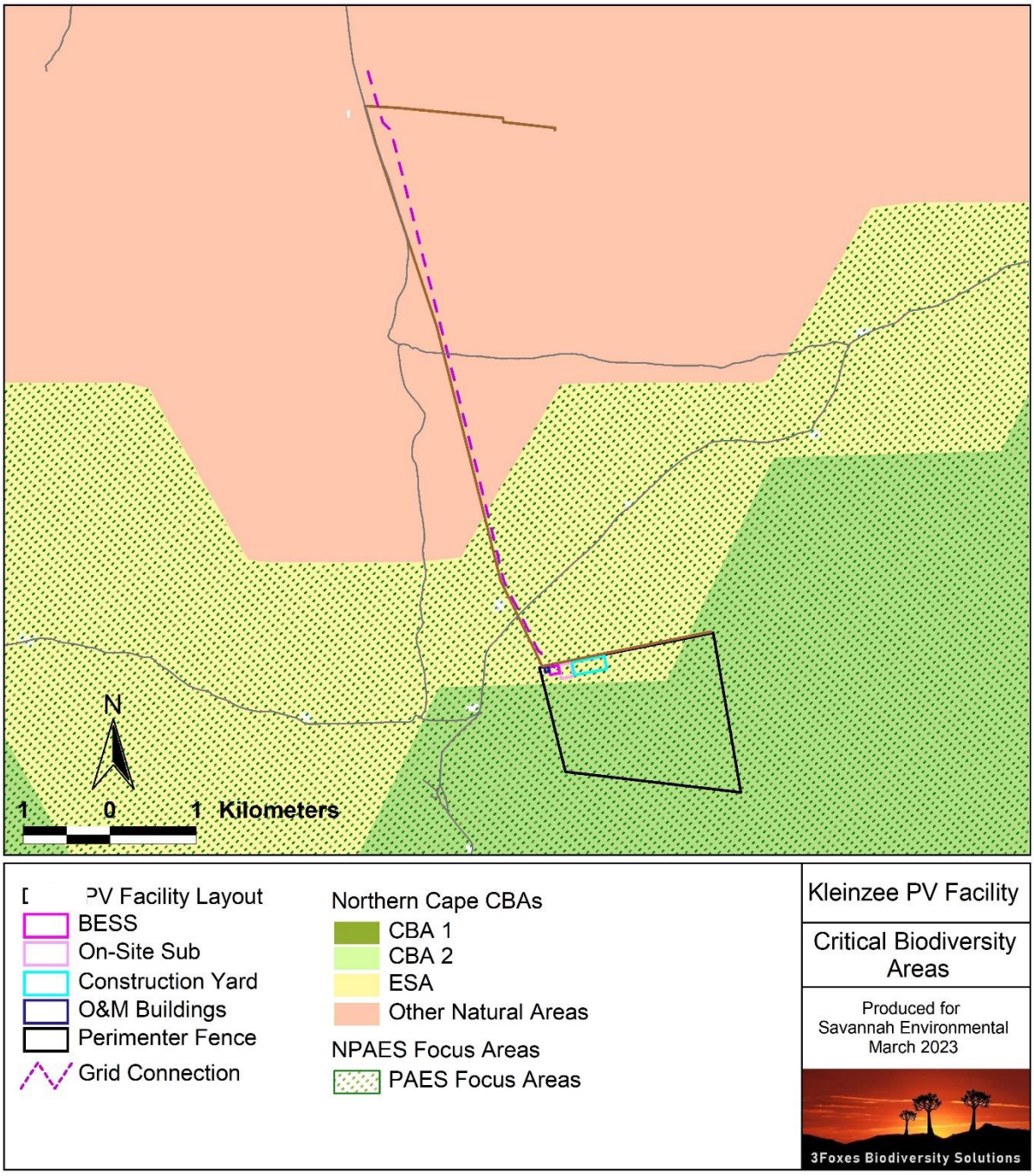


Figure 6.12: Northern Cape Critical Biodiversity Areas map overlain with the Kleinzee Solar PV development area. The majority of the project site is located within an area demarcated as CBA2, with some ESA present within the north of the site and traversed by the grid connection corridor. The NPAES includes the CBA1, CBA2 and ESA areas (as indicated by dot hatching)

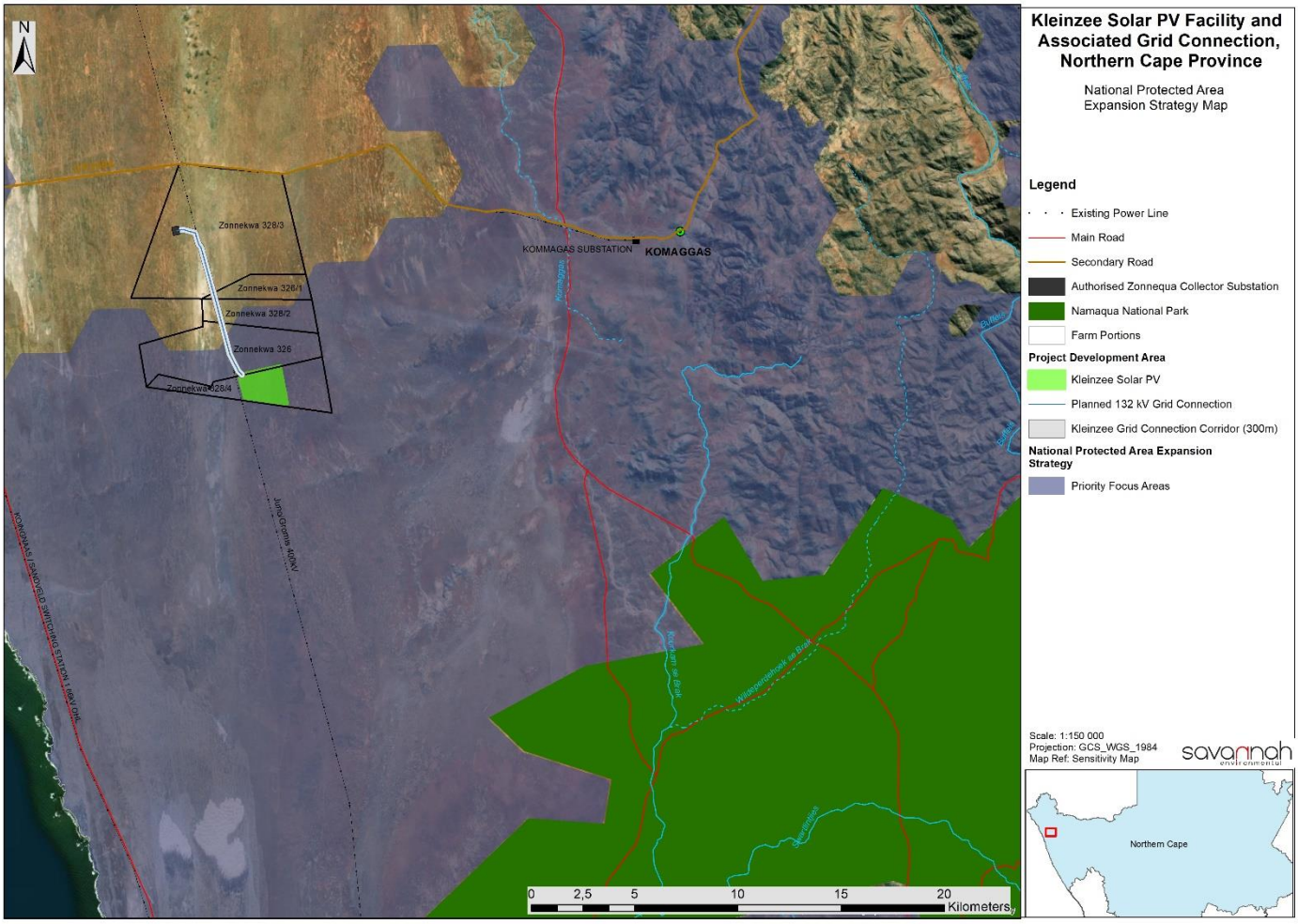


Figure 6.13: Namakwa National Park boundary, and the NPAES Focus Area in relation to the Kleinzee Solar PV Facility

iii. Terrestrial Fauna Communities in the Study Area

In terms of the fauna that are known from the wider area and potentially occur at the site, the potential diversity is considered to be moderate and numbers approximately 40 mammals, 45 reptiles and about seven frogs and toads.

Mammals observed directly or through camera trapping include Steenbok, Cape Hare, Cape Fox, Bat-eared fox, Striped Polecat, Suricate, Cape Porcupine, Common Duiker, Honey Badger, Small Spotted Genet, Grey Mongoose, Caracal, Yellow Mongoose and African Wild Cat. From camera trapping observations, more than half the observations are from Steenbok and Cape Hare, with Cape Fox, Bat-eared fox, Striped Polecat, Suricate and Cape Porcupine being moderately abundant and the remaining species uncommon. This represents a fairly typical mammalian community and is similar to that obtained at other sites along the West Coast.

Reptiles and amphibians observed on the site or in the immediate environment include Angulate Tortoise, Giant Desert Lizard, Common Giant Ground Gecko, Knox's Desert Lizard, Common Sand Lizard, Cape Skink, Coastal Dwarf Legless Skink, Namaqua Sand Lizard, Pink Blind Legless Skink, Dwarf Beaked Snake and Many-horned Adder and Namaqua Rain Frog. As many as 45 reptile species are known to occur in the wider area. No species of conservation concern have been recorded for the project site.

In terms of the two terrestrial fauna species identified by the Screening Tool:

- Sensitive Species 32 can be confirmed not present with a high degree of confidence as this reptile species has a strong association and preference for rocky terrain, which is not present within or near the site. As such, this species is considered absent from the site and its surrounds, and the site is considered low sensitivity for this species.
- In terms of the Sandveld Winter Katydid *Brinckiella mauerbergerorum*, the presence or absence of this species on the site is less definitive, but based on the amount of time spent on site and in the area which amounts to several weeks across different seasons and years and the failure to detect this species on the site, it is concluded that this species is absent from the site. As such, the site is considered low sensitivity for this species.

6.4.5. Avifauna profile for the area

Avian Microhabitats

Bird habitat in the region consists of uniform vegetation type of coastal shrubs and succulent plants. The vegetation includes succulent shrubs such as *Tertragonia, Cephalophyllum* and *Didelta* and non-succulents such as *Eriocephalus, Pteronia* and *Salvia*. There are a few alien trees on site (Eucalyptus), found around the farmsteads, and some farm dams and water points for sheep. Few grasses are found, making the lark species diversity rather slim within the site. One Eskom reticulation line with monopoles is found within the site, providing some perch sites for raptors but no nesting sites.

Avian species richness and Red Data species

A total of only 46 bird species were recorded around the Kleinzee PV site from four days of surveys on Kleinsee and an additional eight days on surrounding solar farms. Three of these were collision-prone species: one Red Data species Southern Black Korhaan *Afrotis afra* and two *Least Concern* Greater Kestrel and Pale Chanting Goshawk.

From the larger data from SABAP2 a total of 12 Priority species have been recorded from the same area (**Table 6.1**) of which six are Red Data species (two bustards, three raptors and one korhaan). A total of 92 species have been recorded on the same cards.

Table 6.1 All (12) Priority collision-prone bird species including those Red-listed (**in red**) likely to occur over the Kleinzee Solar PV site drawn from 33 cards by SABAP2 in the 12 pentads that surround the site. Those species grey-shaded were recorded on the Kleinzee Solar PV site in March and July 2022.

				Susceptibility to:	
Common Name	**Scientific Name**	**Red-list status**	**Reporting Rate ***	**Collision (Rank **)**	**Disturbance**
Verreaux's Eagle	*Aquila verreauxii*	**Vulnerable**	**17%**	**2**	**Medium**
Ludwig's Bustard	*Neotis ludwigii*	**Endangered**	**26%**	**10**	**Medium**
Kori Bustard	*Adeotis kori*	**Near Threatened**	**24%**	**37**	**Medium**
Secretarybird	*Sagittarius serpentarius*	**Vulnerable**	**13%**	**12**	**High**
Lanner Falcon	*Falco biarmicus*	**Vulnerable**	**20%**	**22**	**Medium**
Southern Black Korhaan	*Afrotis afra*	**Vulnerable**	**38%**	**35**	**Low**
Jackal Buzzard	*Buteo rufofuscus*	Least Concern	15%	42	Low
Booted Eagle	*Aquila pennatus*	Least Concern	38%	55	Medium

Common Name	Scientific Name	Red-list status	Reporting Rate *	Susceptibility to: Collision (Rank **)	Disturbance
Black-chested Snake Eagle	*Circaetus cinerescens*	Least Concern	28%	56	Medium
Pale Chanting Goshawk	*Melierax canorus*	Least Concern	70%	73	Low
Greater Kestrel	*Falco rupicolloides*	Least Concern	70%	97	low
Spotted Eagle Owl	*Bubo africanus*	Least Concern	14%	100	low

[a] Reporting rate is a measure of the likelihood of occurrence, as recorded in the atlas period (detections/number of cards)
[b] Collision rank derived from the BAWESG 2014 guidelines. Smaller numbers denote more collision prone.

In summary, three collision-prone Priority species were recorded on site, of which one was red-listed. Other species are likely as suggested by the SABAP2 atlas record of 12 Priority species (of which six are Red Data).

Density of birds in the project area

From the 1.0-km transects performed within the PV site , 11 species/kilometre were recorded in March 2022, and 12 species after the rains in July 2022, for a total of 20 species (**Table 6.2**). In comparison, walking transects performed outside the proposed solar arrays (Control) recorded 12.0 species/km in March 2022. The total number of species recorded in all transects and vantage point surveys was 46 species.

Table 6.2: Overall bird densities from 1.0-km transects of the Kleinzee Solar PV site in March and July 2022

Bird densities from 1-km transects	Species/km	Birds/km	Species/km	Birds/km
	March (dry)	March (dry)	July (wet)	July (wet)
Densities for the Kleinzee PV site	11	20	12	23
Outside PV sites (Control)	12	32	No data	No data

Passage rates of Priority birds in the Project area

Nine flights of three Priority species in 23 hours gives a medium-low Passage Rate of 0.39 flights per hour for the Priority birds over the proposed Kleinzee Solar PV site (**Table 6.3**). Most of these flights were recorded in the wet season (July) 2022.

Table 6.3: Records of the three Priority species recorded during Vantage Point observations in March and July 2022 at the proposed Kleinzee solar PV site.

KLEINZEE Solar Farm: Mar 2022

Date	Obs period	VP	Hrs	Time	No	Species	Age	Sex	Height	Seconds
2022/03/03	10h30-16h30	KZ1	6	-	-	No birds				
2022/03/06	7h30-12h30	KZ1	5	7:50	1	**Greater Kestrel**	Ad	U	5,5m	20
					1	**Pale Chanting Goshawk**	Ad	U	10;10;15;15;15;30;40;50;60	120
			11		**2**	**Birds** **2 Species**	**GK,PCG**			

KLEINZEE	**Passage Rates**	**=**	**0.18**	**Birds / h**
		Red Data	**0.00**	**Species/ h**

KLEINZEE Solar Farm: Jul 2022

Date	Obs period	VP	Hrs	Time	No	Species	Age	Sex	Height	Seconds

2022/07/03	9h00-15h00	KZ1	6	10:51	**2**	**Southern Black Korhaan**	Ad	M	5;5;5	30
				11:26	**2**	**Southern Black Korhaan**	Ad	M	5;5	20
				11:31	**1**	**Southern Black Korhaan**	Ad	M	5;5	15
				11:43	**2**	**Southern Black Korhaan**	Ad	M	5;5	15
2022/07/05	1:40-14:40	KZ1	6		-	No birds				
			12		**7**	**Birds**	**1 Species**	**SBK**		

KLEINZEE	**Passage Rates**		**=**	**0.58**	**Birds / h**
				0.58	**Red Data sp/ h**

KLEINZEE SEF	**COMBINED**	**Hr**	**Species**		
Mar & Jul		**23**	**9**	**0.39**	**Birds / h**
2022		**23**	**7**	**0.30**	**Red Data sp/ h**

The Passage Rate of threatened Red Data species was medium-low at 0.30 flights per hour over the course of March and July 2022. The only red data species was the Southern Black Korhaan were recorded on site and therefore the proposed site can be seen of relatively low significance for Red Data species, even following rains in July 2022. The overall Passage Rate for all Priority species was also Medium-low at 0.38 birds/hour.

Priority bird flights over the Kleinzee solar PV facility are indicated in **Figure 6.14**. One Red Data species was recorded (Southern Black Korhaan = mauve line), and two other species (Pale Chanting Goshawk and Greater Kestrel) also occurred. The red circles are our 1.4-km viewshed. The Passage Rate for the site was medium-low at 0.38 flights/hour, and similarly low for the Red Data species. Because of the low number of threatened species occurring over the PV facility, no high-risk areas are designated in this proposed solar farm.

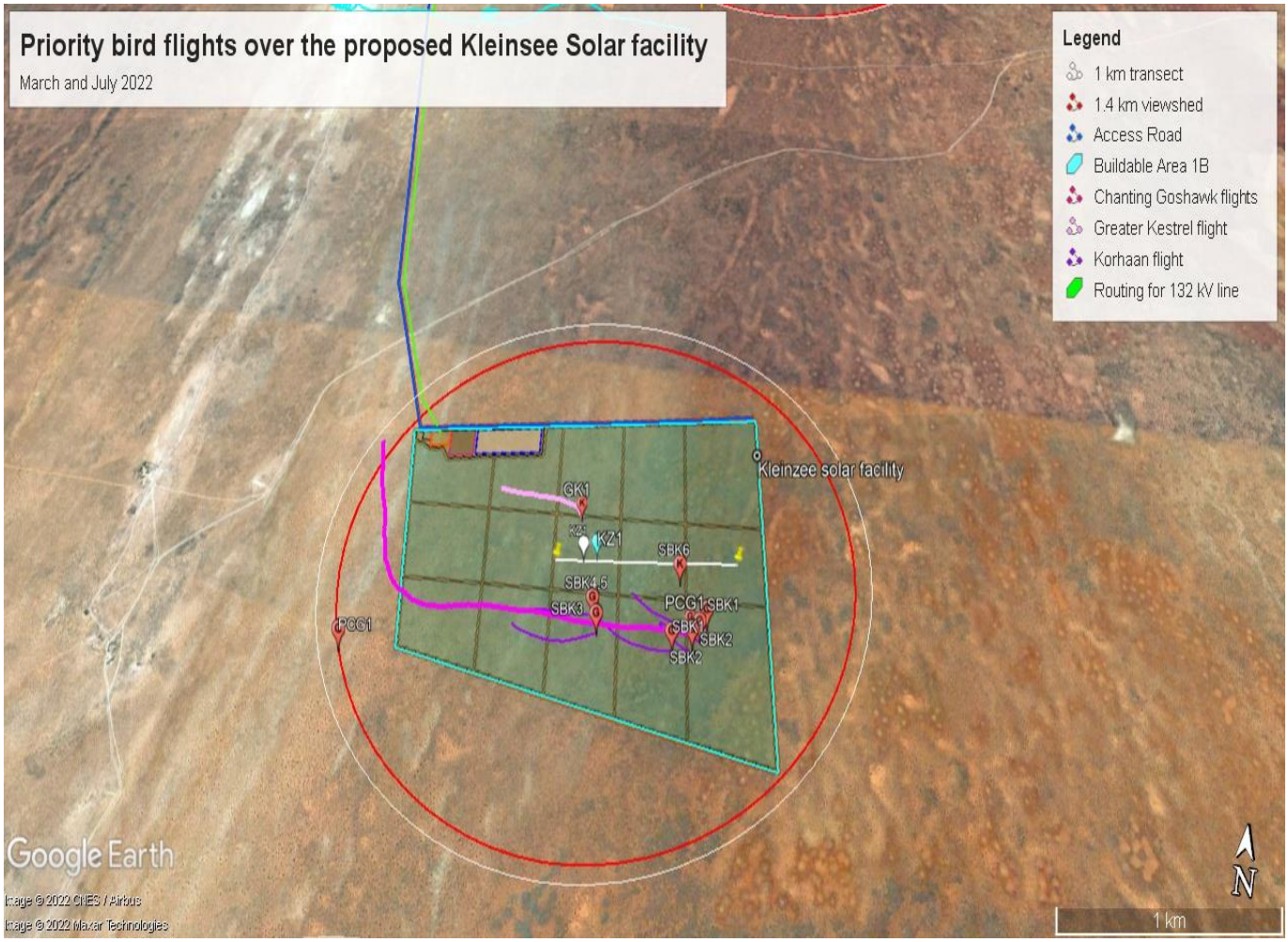


Figure 6.14: Priority bird flights over the Kleinzee solar PV facility

The planned 132 kV line is routed alongside the 400 kV Gromis-Juno 400 kV line. This allows the new mitigation of staggered pylons to be enacted to reduce impacts by all collision-prone species.

6.5. Integrated Heritage including Archaeology, Palaeontology and the Cultural Landscape

6.5.1. Cultural landscape

The Khoisan or Nama of the area extracted raw copper from the gneiss and granite hills of the Namaqualand Copper belt prior to 1652. Early settlers in the Cape Colony heard rumours of mountains in the north-west that were rich in copper. Governor Simon van der Stel believed these tales and led an expedition in 1685. Three shafts were sunk and revealed a rich lode of copper ore - the shafts exist today - but for almost 200 years nothing was done about the discovery.

James Alexander was the first to follow up on van der Stel's discovery in 1852. He examined the old shafts, discovered other copper outcrops and started mining operations. The first miners were Cornish and brought with them the expertise of centuries of tin-mining in Cornwall. The Namaqualand Railway started operating in 1876 and lasted for 68 years, carrying ore to Port Nolloth and returning with equipment and provisions. The carriages were initially pulled by mules and horses, but later replaced by steam locomotives. Road transport is now used to convey the ore to the railhead at Bitterfontein. The other principal mines of the area are at Carolusberg and Nababeep.

Kleinsee was established in 1927 as a small mining town. Legend has it that a teacher from the local farm school, De Villiers, kicked at a mound in the veld and dislodged a diamond, which was recorded as the first alluvial diamond found in the area. The resultant diamond rush opened up the Kleinzee 'crater', reminiscent of the 'Big Hole' at Kimberley, and the area became known as the Diamond Coast.

The Namaqualand Copper Mining Cultural Landscape has been put forward for World Heritage Site status, reflecting the beginnings of the mining industry in South Africa. It reflects the close links between the development of the Southern African mining industry and mining technology pioneered in Britain, particularly in the counties of Cornwall and Devon. The landscape is centred around Okiep, Concordia, Nababeep, Port Nolloth, Carolusberg and Springbok, and some infrastructure related to this landscape has been identified to the north of the development area. However, no evidence of resources associated with this landscape was identified within the area proposed for development.

In 2021, Orton (SAHRIS NID 573587) conducted a detailed HIA for a proposed Wind Energy Facility located immediately adjacent to the proposed development area. Orton (2021) describes the development context as dominated by undulating sandy plains, interspersed with deflation hollows. He identifies an elongated valley through this development area which he calls the Zonnekwa Valley (Orton, 2021).

Orton (2021) conducted an analysis of the cultural landscape of the broader context which is relevant to this proposed development. Elements of significance identified include the mining towns and missionary stations of Kleinzee, Komaggas and Grootmis, as well as the frontier nature of the landscape and the relationships between settlers and the indigenous Nama. In 1925, diamonds were discovered on the farm Oubeep and Kleyne Zee by Jack Carstens. Mining commenced at the latter in 1927 and the town of Kleinzee was soon established. Orton's field assessment confirmed that the area proposed for development is located in a very remote area with little infrastructure. The study area lacks any sign of development aside from the gravel road passing through its northern part, although some recent/historical materials do betray a historical presence on the land.

Orton (2021) identified four farm werfs in the broader study area located outside of the development footprint, none of which were determined to have any heritage value. However, Orton (2021) identified many small stock posts in the Komaggas Reserve, which are reminders of an important historical way of life practised by local Nama herders for at least the last two centuries since missionaries encouraged settlement. The cultural landscape conveys a sense of remoteness and inhospitality due to the frequent strong winds, low scrubby vegetation and seemingly endless sand flats and dunes. The tallest anthropogenic features are wind pumps and the Gromis-Juno 400kV power line.

Orton (2021) concluded that "The historical/recent cultural landscape is deemed to have low-medium cultural significance for its aesthetic value, but the archaeological cultural landscape is of medium significance for its scientific value and could be assigned a field rating of IIIB."

6.5.2. Archaeology and Built Environment Heritage

The archaeology of the region is dominated by Early, Middle and Later Stone Age artefact scatters. As a result of mining applications, much is known about the region's archaeology, which is dominated by Early, Middle and Later Stone Age artefact scatters. High quality data has been extracted from these sites, but little work has been done further inland.

Halkett et al (1997) conducted an impact assessment for proposed upgrades to the Kleinsee Golf Course.

They identified three Later Stone Age shell midden archaeological sites, none of which contained assemblages worthy of further study. De Beers mining staff noted a collection of Early Stone Age artefact sites just east of Kleinsee in 2001. The artefacts were determined to be deflating from the soil vestiges onto the more resistant hardpan deposits below and were therefore no longer in situ. These artefacts were collected and contributed to the record of archaeological resources from this area.

Orton (2016) and Webley (2012) conducted a Heritage Impact Assessment for a proposed Wind Energy Facility located within 15km of the proposed development area. The survey revealed a large number of archaeological sites including deflated ESA and MSA artefact scatters (one with bone), LSA shell scatters and in situ shell middens, formal graveyards, and old structures. Particularly significant archaeological finds were an ESA/MSA scatter with fossil bones preserved and a massive area of small shell scatters and middens in close proximity to the Buffels River near the point where fresh water was permanently available during historic (and presumably also pre-colonial) times. The ESA material included predominantly flakes, cores and hand-axes, but one cleaver was also found. MSA artefacts included flakes and cores and one bifacial point that may well be from the Still Bay period. LSA material included decorated pottery, retouched stone scrapers and in situ occurrences with generally higher research value.

Orton's assessment (2021) provides insight into the heritage resources likely to be impacted by the proposed development. He noted that the region is known for its high density of archaeological sites, but their number and significance often decreases away from the coast. The survey revealed many small Later Stone Age archaeological sites with occasional historical artefacts, none of which was of high cultural significance.

6.5.3. Palaeontology

The SAHRIS Palaeosensitivity Map suggests that the proposed development area is underlain by scree/talus/alluvium grading into piedmont gravel of low palaeontological sensitivity. Pether (2011) conducted a PIA for a proposed development located approximately 10km away from the proposed development area. He noted that terrestrial deposits blanket the area, consisting of loose, surficial coversands and underlying compact, clayey deposits. Fossil bones are sparsely distributed on the palaeosurfaces within these deposits but are locally abundant in contexts such as interdune deposits, carnivore bone accumulations in burrows and buried Stone Age sites. Trace fossils are ubiquitous and important palaeoenvironmental indicators. The significance rating is low for fossil potential due to the low probability of finding fossils in the terrestrial deposits.

Pether (2020) notes that the deposits in the surrounding area are altered by pedogenic processes involving decalcification and the precipitation of pedocrete. Fossil shells are not preserved and fossil bone is very sparse. The affected surficial formations include Holocene dunes of the Hardevlei Formation and earlier late Quaternary coversands of the Koekenaap Formation. Beneath these unconsolidated sands are compact, pedogenically-altered aeolianites termed the Dorbank Formation which are fossil dune plumes of later mid-Quaternary age. Orton (2021) elaborates that the aeolian formations (Hardevlei and Koekenaap) are assumed to contain the typical fossil content seen in similar deposits elsewhere. Pether (2021) considers fossil finds to be unlikely and no additional palaeontological study is recommended, but the attached Chance Fossil Finds Procedure must be implemented.

6.6 Visual Quality

The Kleinzee Solar PV site is located 20km west of Komaggas and 28km southeast of Kleinsee, within the Springbok Renewable Energy Development Zone (REDZ) in the Nama Khoi Local Municipality. Regionally,

the proposed PV facility site is 80km west of Springbok. The small town of Kleinsee lies about 28km north west of the proposed site.

Large parts of the region are mine-owned, and as a result, significant diamond mining activities are evident, especially within a 7km band along the coast. The region has a very low population density of 3 people per km². Roads include a number internal farm roads and one lower order secondary road extending to the east and west from Komaggas to Kleinsee. Access to the site will be from the existing gravel Kleinsee to Komaggas secondary road and a provincial gravel minor road that connects from the surfaced MR751 road located to the west of the project site.

Figure 6.15: Topography and vegetation of the region overlooking the hills on the site.

The study area for visual assessment occurs on land that ranges in elevation from 165m asl to about 450m asl at the top of the local hills Graafwater se Kop and Byneskop. The lowest areas are associated with dry pans located to the west of the site.

The terrain surrounding the proposed site is generally flat, sloping gently westwards towards the shore. It is described as slightly undulating plains, with low hills in the east and south east.

Individual homesteads/farmsteads are scattered throughout the region. Some of these in closer proximity to the PV site and associated grid connection infrastructure include:

- Sonnekwa A
- Sonnekwa B
- Graafwater
- Vaalkol
- Droëvlei
- Kapvlei

Figure 6.16: Example of farmsteads/homesteads in the region

Other than the mining activity located along the West Coast, the proposed development is also within the Northern Corridor of the Strategic Transmission Corridors. As a result, industrial infrastructure within the region includes a network of distribution power lines, a distribution substation in Kleinsee and the Gromis Transmission Substation. The study area is further traversed by the Gromis - Juno 400kV overhead power lines, as well as the Sandveld to Kommagas 66kV overhead power line running along the Kleinsee to Kommagas secondary road.

Figure 6.17: The Komaggas (east) to Kleinsee (west) road north of the proposed development site (to the left), as well as the 66kV overhead power line.

The desert climate of the study area is dry, receiving between 28mm and 123mm of rainfall per annum. Land cover is primarily *low shrubland (Succulent Karoo)* with localised areas of *exposed rock and sand,* as well as *dry pans.* The vegetation type is *Strandveld of the West Coast.*

Since the proposed site is located within the Springbok REDZ several approved renewable energy applications are already located within the study area. These include the Kleinzee Wind Energy Facility, Zonnequa Wind Energy Facility, Kap Vley Wind Energy Facility and Namas Wind Energy Facility. Of note is that the proposed site for the Kleinzee Solar PV Facility falls within the already approved development area of the Namas Wind Farm.

The Namaqua National Park lies approximately 25km to the southeast, just beyond the boundary of the Springbok REDZ and is therefore outside of the study area. The park is not expected to be visually influenced by the proposed PV Cluster and the solar PV project sites are both located well outside of the Namaqua National Park's viewshed protection zone (refer to **Figure 6.18**).

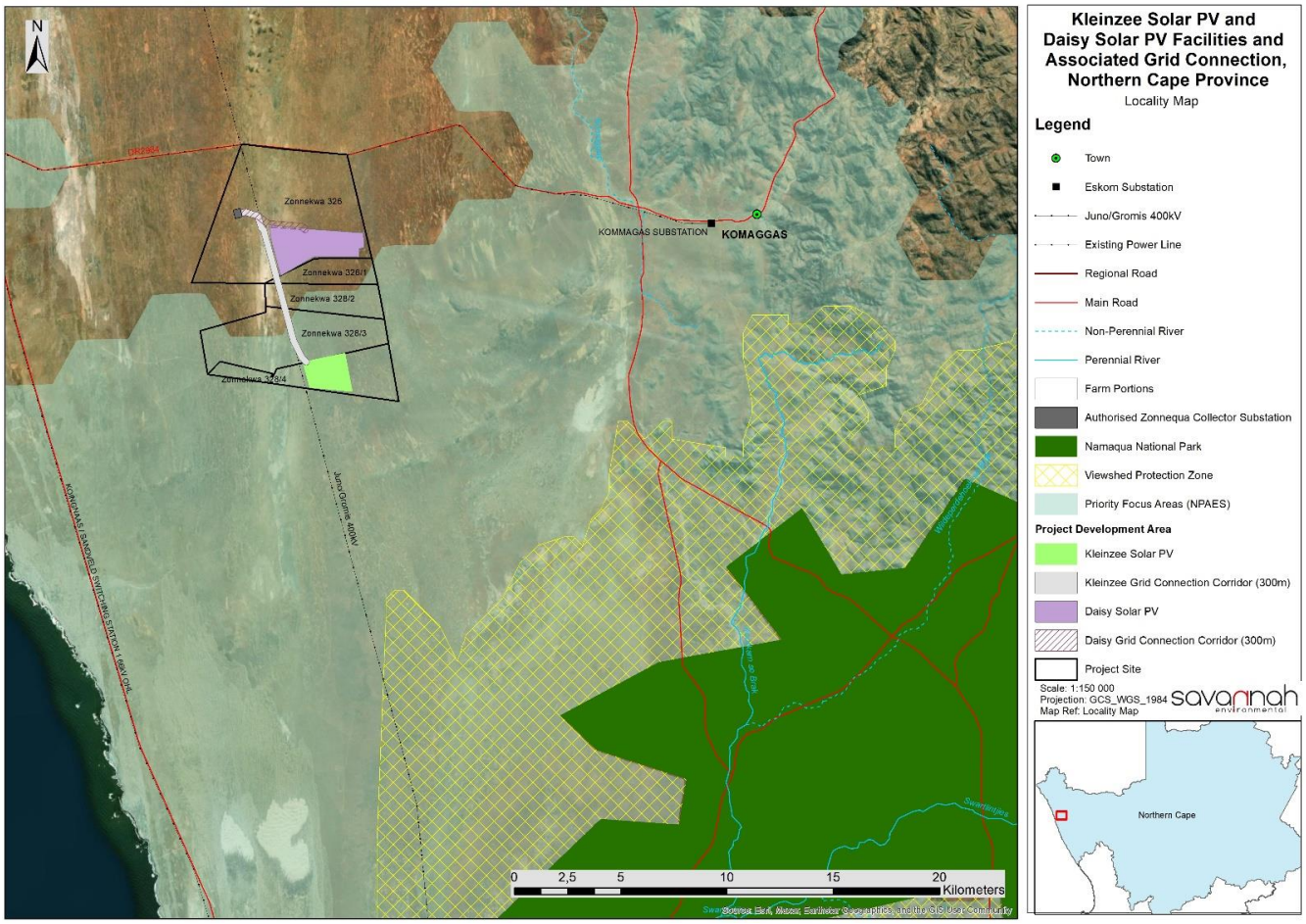


Figure 6.18: Kleinzee Solar PV Facility in relation to the Namaqua National Park viewshed protection zone.

The greater region is generally seen as having a high scenic value and high tourism value potential. It is well known for its scenic natural beauty (West Coast as a whole) and annual wildflower displays (Namaqualand)[25].

Within this scenic context, it is noteworthy that the mining areas along the coastline are significantly disturbed and visually apparent due to the scale and nature of the surface-based mining. In this respect the visual quality of the receiving environment is already impacted upon to some extent.

[25] Namaqualand stretches from the small town of Garies in the south to the Orange River to the north, its western border is the wild Atlantic coast, the remote town of Pofadder marks the eastern border (http://www.discoverthecape.com/namaqualand/flower-route.html)

Figure 6.19: Mine dumps and mining activity within the region along the coastline

6.7 Social Context

6.7.1 Profile of the Broader Area and Project Site

The site is located in a remote area between Kleinsee (approximately 28km to the north west) and Kommagas (17km north east) connected via an unnamed road. Kleinsee is a small village on the west coast of the Northern Cape province in South Africa at the mouth of the Buffels River. It was a diamond mining town until De Beers closed their operations and by the end of 2011 the 370 houses in Kleinzee were mostly empty and the town's population had dwindled from about 7000 to 1000. De Beers had Kleinzee declared a public town under the Nama Khoi municipality.

The development is located near Kommagas, a settlement 40 km south west of Springbok and 45 km north of Soebatsfontein, on the Komaggas River. The surrounding areas are largely undeveloped, with large stretches of vacant land with some parcels showing evidence for small stock grazing. The only infrastructure present is sparsely distributed farmhouses, farm tracks and fences and a number of stock posts. Roads in the immediate area are all gravel. The region has a very low population density of 3 people per km². Individual homesteads/farmsteads are scattered throughout the region. Some of these in closer proximity to the proposed Solar PV Facility and associated grid connection infrastructure include:

- Sonnekwa A
- Sonnekwa B
- Graafwater
- Vaalkol
- Droëvlei
- Kapvlei

Since the proposed site is located within the Springbok REDZ a number of approved renewable energy applications are already located within the study area.

Agricultural activity in the area is severely restricted by the arid nature of the local climate and livestock rearing is the dominant activity. There are no areas of cultivation present within the assessment zone and the natural vegetation has been retained across much of the study area. Other human influence is visible in the form of secondary roads which traverse the study area, which are gravel roads used by local farmers to access the nearby towns of Komaggas and Kleinsee.

The Namaqua National Park lies approximately 25km to the south east of the study area.

Population

The Nama Khoi Local Municipality housed 0.1% of South Africa's total population in 2021. Between 2011 and 2021, the population growth averaged 1.04% per annum, close to half the growth rate of South Africa as a whole (1.50%). Compared to Namakwa's average annual growth rate (1.12%), the growth rate in Nama Khoi's population at 1.04% was very similar than that of the district municipality. Compared to other regions, the Nama Khoi Local Municipality accounts for a total population of 56,600, or 40.4% of the total population in the Namakwa District Municipality.

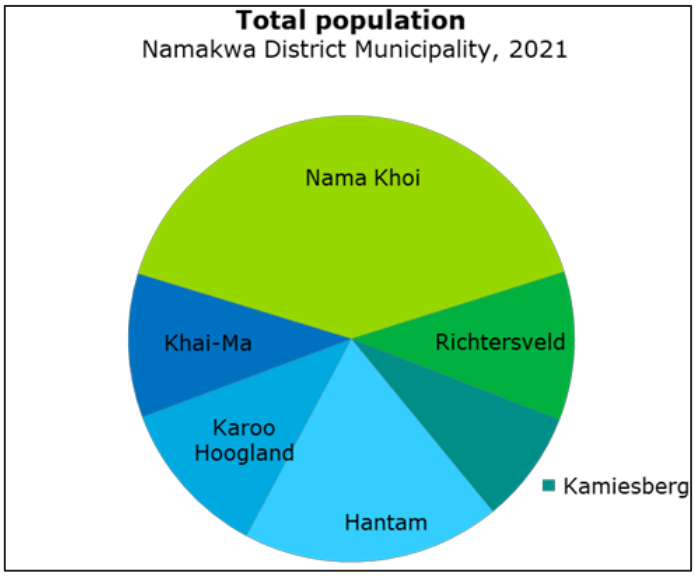


Figure 6.21: Namakwa District Municipality Total Population 2021

The population pyramid (**Figure 6.22**) reflects a projected change in the structure of the population from 2021 and 2026. In 2021, there is a significantly larger share of young working age people between 20 and 34 (22.1%), compared to what is estimated in 2026 (20.6%).

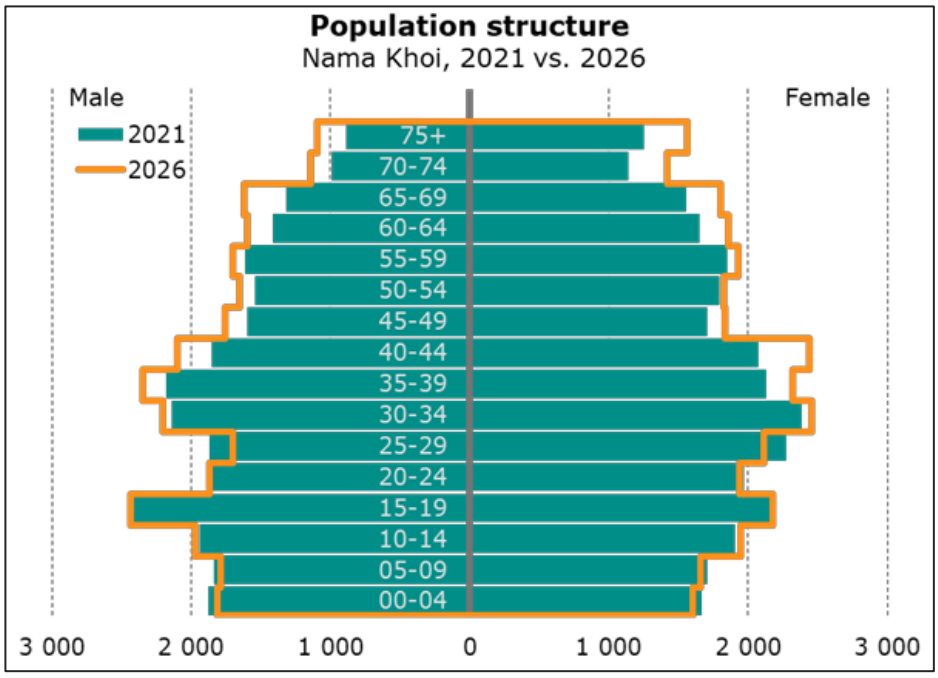


Figure 6.22: Projected Population Structure of Nama Khoi Local Municipality 2021 – 2026

Economy

The Nama Khoi Local Municipality had a GDP of R 5.39 billion in 2021, up from R 3.19 billion in 2011. It contributed 42.03% to the Namakwa District Municipality GDP of R 12.8 billion in 2021, increasing in the share of the Namakwa from 42.97% in 2011. It also contributed 4.28% to the GDP of Northern Cape Province and 0.09% to the GDP of South Africa, with a total GDP of R 6.21 trillion in 2021. The mining sector was the largest within the local municipality, accounting for R 3.26 billion or 64.6% of the total GVA. The community services sector was the second most contributor, with 10.9%, followed by the finance sector with 9.5%. The construction sector was the smallest contributor, with a contribution of R 53.9 million or 1.07% of the total GVA.

Table 6.4: Gross Value Added (GVA) by Broad Economic Sector - Nama Khoi Local Municipality, 2021

	Nama Khoi	Namakwa	Northern Cape	National Total	Nama Khoi as % of district municipality	Nama Khoi as % of province	Nama Khoi as % of national
Agriculture	0.1	1.3	8.5	150.9	*5.5%*	*0.83%*	*0.05%*
Mining	3.3	5.0	27.3	481.0	*65.7%*	*11.96%*	*0.68%*
Manufacturing	0.1	0.2	4.0	726.4	*28.1%*	*1.55%*	*0.01%*
Electricity	0.1	0.2	3.6	171.9	*51.6%*	*2.27%*	*0.05%*
Construction	0.1	0.2	2.0	139.0	*30.6%*	*2.71%*	*0.04%*
Trade	0.3	1.1	11.4	759.8	*26.0%*	*2.47%*	*0.04%*
Transport	0.2	0.7	9.5	392.3	*30.3%*	*2.18%*	*0.05%*
Finance	0.5	1.3	18.9	1,319.9	*37.6%*	*2.53%*	*0.04%*
Community services	0.5	2.0	29.6	1,422.3	*27.5%*	*1.86%*	*0.04%*
Total Industries	**5.0**	**11.8**	**114.8**	**5,563.5**	***42.7%***	***4.40%***	***0.09%***

Primary Sector

The primary sector consists of two broad economic sectors, namely the mining and the agricultural sector. The following chart represents the average growth rate in the GVA for both of these sectors in Nama Khoi Local Municipality from 2011 to 2021.

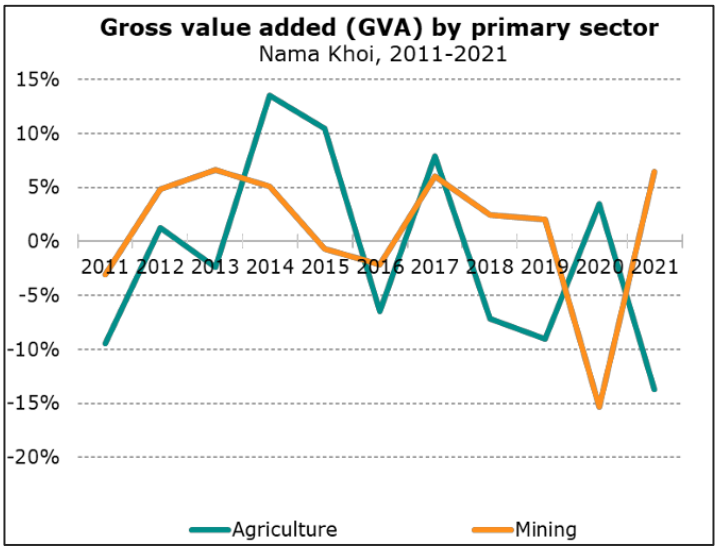


Figure 6.23: GVA by Primary Sector of Nama Khoi Local Municipality 2011 – 2021

Between 2011 and 2021, the agriculture sector experienced the highest positive growth in 2014 with an average growth rate of 13.5%. The mining sector reached its highest point of growth of 6.6% in 2013. The agricultural sector experienced the lowest growth for the period during 2021 at -13.7%, while the mining sector reaching its lowest point of growth in 2020 at -15.3%. Both the agriculture and mining sectors are generally characterised by volatility in growth over the period.

Employment

The working age population in Nama Khoi in 2021 was 38 500, increasing at an average annual rate of 1.00% since 2011. For the same period the working age population for Namakwa District Municipality increased at 1.18% annually, while that of Northern Cape Province increased at 1.58% annually. South Africa's working age population has increased annually by 1.51% from 33.9 million in 2011 to 39.4 million in 2021.

Figure 6.24 combines all the facets of the labour force in the Nama Khoi Local Municipality into one compact view. The chart is divided into "place of residence" on the left, which is measured from the population side, and "place of work" on the right, which is measured from the business side.

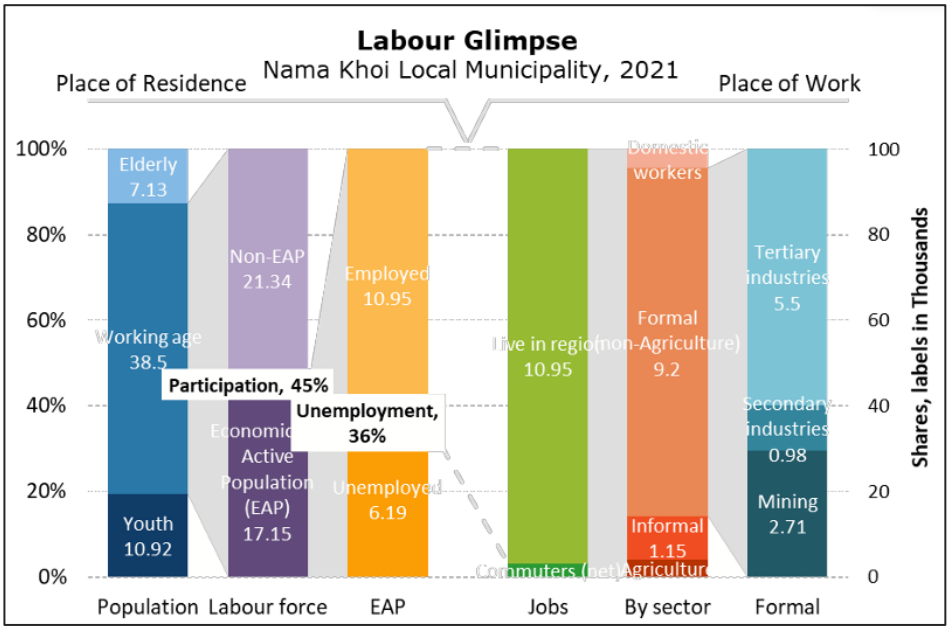


Figure 6.24: Labour Glimpse of Nama Khoi Local Municipality, 2021

The Nama Khoi Local Municipality (56 600) has a total population of 38 500 people of working age. 44.6% are participating in the labour force, with 17 200 residents of the local municipality being part of the economically active population (EAP). Comparing this to the non-economically active population (NEAP) of the local municipality, 21 400 people are part of the economically active population (NEAP). Out of the economically active population, 6 200 are unemployed, with an unemployment rate of 36.1%. All statistics are measured at the place of residence.

Education

The number of people without any schooling decreased from 2011 to 2021, while the number of people with 'matric only' increased from 6,840 to 10,700. The number of people with 'matric and a certificate/diploma'

increased with an average annual rate of 5.06%, while the number of people with a 'matric and a Bachelor's' degree decreased with an average annual rate of -0.55%.

The number of people without schooling in Nama Khoi Local Municipality is 12.37% of the district municipality, 0.89% of the province and 0.03% of the national. In 2021, the number of people with a matric only was 10,700, representing 41.25% of the district municipality's total number of people with a matric. The number of people with a matric and a Postgrad degree is 34.29% of the district municipality, 3.51% of the province and 0.04% of the national.

Table 6.5: Highest Level of Education Age 15+ in 2021

	Nama Khoi	Namakwa	Northern Cape	National Total	Nama Khoi as % of district municipality	Nama Khoi as % of province	Nama Khoi as % of national
No schooling	425	3,430	47,800	1,470,000	*12.4%*	*0.89%*	*0.03%*
Grade 0-2	237	850	8,840	439,000	*27.9%*	*2.68%*	*0.05%*
Grade 3-6	3,260	9,030	75,100	2,630,000	*36.2%*	*4.35%*	*0.12%*
Grade 7-9	12,200	28,600	171,000	5,840,000	*42.7%*	*7.13%*	*0.21%*
Grade 10-11	9,260	21,000	200,000	9,880,000	*44.1%*	*4.64%*	*0.09%*
Certificate / diploma without matric	248	485	3,440	177,000	*51.0%*	*7.21%*	*0.14%*
Matric only	10,700	25,900	256,000	12,800,000	*41.3%*	*4.18%*	*0.08%*
Matric certificate / diploma	3,260	6,770	47,200	2,680,000	*48.1%*	*6.89%*	*0.12%*
Matric Bachelors degree	622	1,810	17,700	1,650,000	*34.3%*	*3.51%*	*0.04%*
Matric Postgrad degree	311	809	9,120	853,000	*38.4%*	*3.41%*	*0.04%*

Income and poverty

In 2021, 4.57% of households in the Nama Khoi Local Municipality were living on R30,000 or less per annum, compared to 2011. The 192000-360000 income category had the highest number of households with 2 660, followed by the 132000-192000 income category with 2 120. Only 0.068 households fell within the 0-2400 income category.

Table 6.6: Households by Income Category 2021

	Nama Khoi	Namakwa	Northern Cape	National Total	Nama Khoi as % of district municipality	Nama Khoi as % of province	Nama Khoi as % of national
0-2400	0	0	22	1,260	*20.8%*	*0.31%*	*0.01%*
2400-6000	15	37	486	22,200	*41.7%*	*3.15%*	*0.07%*
6000-12000	48	128	3,370	197,000	*37.6%*	*1.43%*	*0.02%*
12000-18000	92	243	6,070	361,000	*37.9%*	*1.52%*	*0.03%*
18000-30000	607	1,480	24,000	1,350,000	*41.2%*	*2.53%*	*0.05%*
30000-42000	855	2,110	28,200	1,480,000	*40.6%*	*3.03%*	*0.06%*
42000-54000	937	2,340	28,500	1,440,000	*40.1%*	*3.29%*	*0.07%*
54000-72000	1,710	4,160	39,700	1,910,000	*41.1%*	*4.30%*	*0.09%*
72000-96000	1,960	4,820	38,300	1,730,000	*40.7%*	*5.13%*	*0.11%*
96000-132000	2,060	5,080	40,800	1,770,000	*40.5%*	*5.06%*	*0.12%*
132000-192000	2,120	5,230	37,600	1,520,000	*40.6%*	*5.64%*	*0.14%*
192000-360000	2,660	6,760	47,400	1,870,000	*39.4%*	*5.62%*	*0.14%*
360000-600000	1,650	4,410	31,600	1,310,000	*37.5%*	*5.24%*	*0.13%*
600000-1200000	1,290	3,650	25,800	1,100,000	*35.3%*	*5.00%*	*0.12%*
1200000-2400000	599	1,810	12,700	567,000	*33.1%*	*4.74%*	*0.11%*
2400000+	78	271	1,950	102,000	*28.8%*	*3.99%*	*0.08%*
Total	**16,700**	**42,500**	**366,000**	**16,700,000**	***39.3%***	***4.56%***	***0.10%***

In 2021, Nama Khoi Local Municipality had 24 700 people living in poverty, 43.63% higher than in 2011. The African population group had the highest percentage of people living in poverty, with 66.7%, while the White population group had decreased by -8.97 percentage points. This indicates an increase of -9.97 percentage points.

CHAPTER 7: ASSESSMENTS OF IMPACTS

This chapter serves to assess the significance of the positive and negative environmental impacts (direct, and indirect) expected to be associated with the development of the Kleinzee Solar PV Facility and its associated infrastructure. This assessment has considered the construction and operation of a PV facility with a contracted capacity of up to 200MW with a development footprint of approximately ~300ha (excluding environmentally constrained areas). The project will comprise the following key infrastructure and components:

- Solar PV array comprising PV modules and mounting structures
- Inverters and transformers
- Low voltage cabling between the PV modules to the inverters
- 33kV cabling between the project components and the facility substation
- 132kV onsite facility substation
- 132kV power line to connect to the grid at Zonnequa Collector Substation within a 300m wide and 8.5km long corridor
- Battery Energy Storage System (BESS)
- Site offices and maintenance buildings, including workshop areas for maintenance and storage
- Laydown areas
- Site access and internal roads.

The full extent of the project site was considered in this Basic Assessment Process by the independent specialists and the EAP. On-site sensitivities were identified through the review of existing information, desk-top evaluations and field surveys. A development footprint for the PV facility within the project site was proposed by the developer through consideration of the sensitive environmental features and areas identified through the screening process. **Figure 7.1** illustrates the Kleinzee Solar PV and Grid Connection development area.

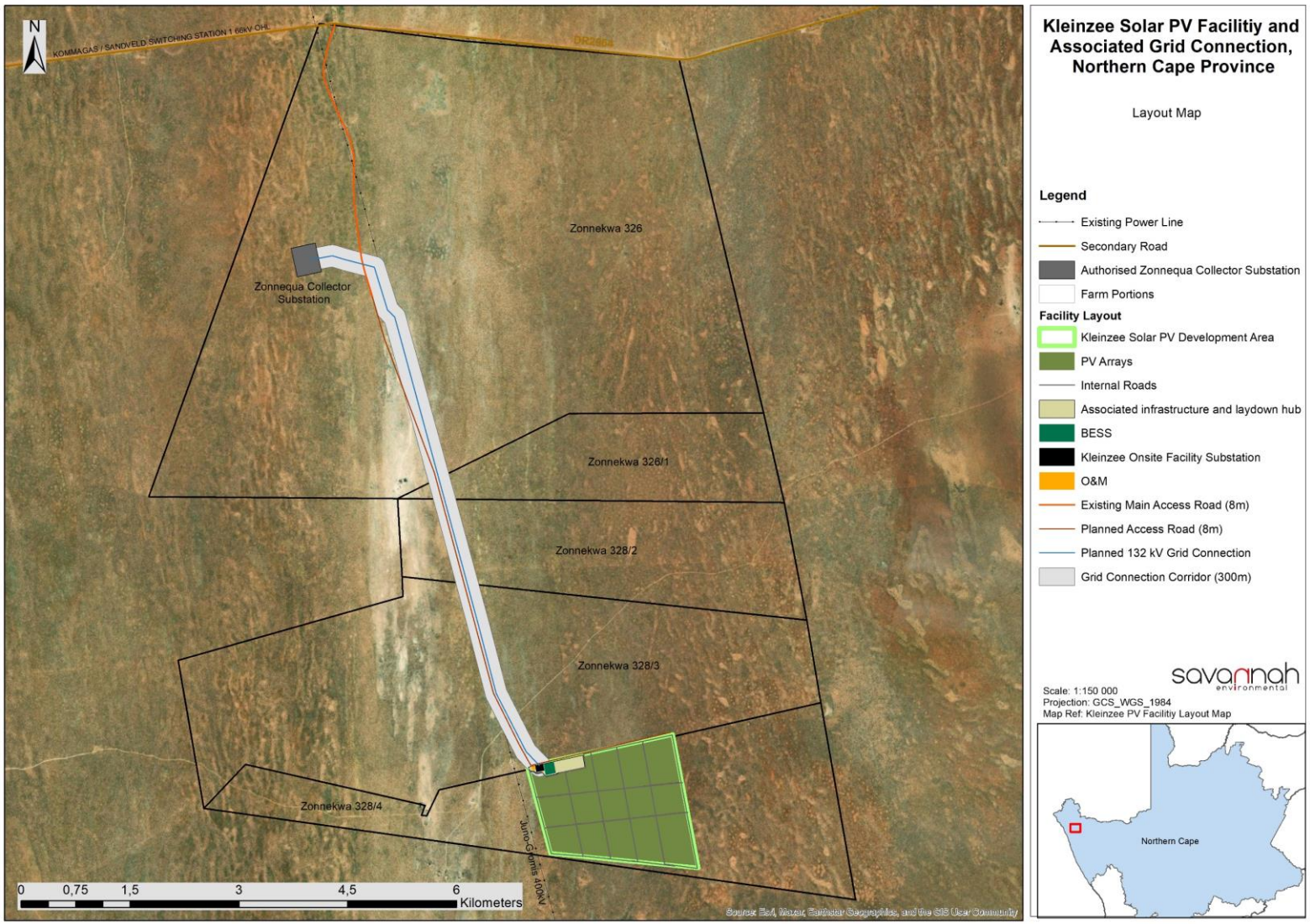


Figure 7.1: Map of the Kleinzee Solar PV Facility and Grid Connection development area, internal infrastructure and access road (refer to **Appendix M**).

The development of the Kleinzee Solar PV Facility will comprise the following phases:

- *Pre-Construction and Construction* – will include pre-construction surveys; site preparation; establishment of access roads, laydown areas, and facility infrastructure (including PV panels and substation); construction of foundations involving excavations; the transportation of components/construction equipment to site, manoeuvring and operating vehicles for unloading and installation of equipment; and commissioning of new equipment and site rehabilitation. The construction phase is estimated at 9 - 12 months.
- *Operation* – will include the operation of the PV facility and the generation of electricity, which will be fed into the national grid via the facility on-site substation and an overhead power line. The operation phase is expected to be 20-25 years (with maintenance).
- *Decommissioning* – depending on the economic viability of the PV facility, the length of the operation phase may be extended beyond a 20–25-year period. At the end of the project's life, decommissioning will include site preparation, disassembling of the components of the PV facility, clearance of the relevant infrastructure at the site and appropriate disposal thereof, and rehabilitation. Note that impacts associated with decommissioning are expected to be similar to those associated with construction activities. Therefore, these impacts are not considered separately within this chapter.

Environmental impacts associated with construction and decommissioning activities may include, among others, threats to biodiversity and ecological processes, including habitat alteration and impacts to fauna, avifauna and flora, impacts to sites of heritage value, soil contamination, erosion and loss of agricultural land and nuisance from the movement of vehicles transporting equipment and materials.

Environmental impacts associated with the operation phase includes soil contamination, erosion and potential invasion by alien and invasive plant species. Other impacts include visual impacts and social impacts.

7.1 Legal Requirements as per the EIA Regulations, 2014 (as amended) for the undertaking of an Impact Assessment Report

This chapter of the Basic Assessment Report includes the following information required in terms of Appendix 1: Content of Basic Assessment Reports:

Requirement	Relevant Section
3(1)(h)(v) the impacts and risks which have informed the identification of each alternative, including the nature, significance, consequence, extent, duration and probability of such identified 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.	The impacts and risks identified to be associated with the construction and operation phases of the Project have been included in **Section 7.3 – Section 7.8.** Impact tables have been included for each field of study which considers the nature, significance, consequence, extent, duration and probability of the impacts, as well the reversibility of the impacts, the loss of resources and avoidance, management or mitigation, as expected at this stage in the BA process.
3(1)(h)(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.	The positive and negative impacts associated with the Project have been included in **Section 7.3 – Section 7.8.**

Requirement	Relevant Section
3(1)(h)(viii) the possible mitigation measures that could be applied and level of residual risk	Possible mitigation (specifically relating to the avoidance of sensitive areas) has been included in **Section 7.3 – Section 7.8** where possible to provide such recommendations at this stage in the BA process.

7.2. Quantification of Areas of Disturbance on the Site

Site-specific impacts associated with the construction and operation of the Kleinzee Solar PV Facility and Grid Connection relate to the direct loss of vegetation, disturbance of animals (including avifauna) and loss of habitat and impacts to soils. In order to assess the impacts associated with the Kleinzee Solar PV Facility and Grid Connection, it is necessary to understand the extent of the affected area.

- The development area for the Kleinzee Solar PV Facility is approximately 300ha in extent. This area includes infrastructure including PV modules and mounting structures, inverters, transformers, and low voltage cabling, 132kV onsite facility substation, Battery Energy Storage System, temporary and permanent laydown area, site offices and maintenance buildings, including workshop areas for maintenance and storage, and site and internal access roads.
- The grid connection infrastructure is to be located within an assessment corridor of 300m wide and 8.5km long. The grid connection for the facility will consist of underground cabling within the facility, an on-site facility substation and switching substation to be connected to the authorised Zonnequa Substation (located on Farm Zonnekwa 326) via overhead power line (located ~8.5km north of the site). The registered servitude for the grid line would be approximately 32m in width.
- A main access road up to ~4km in length and up to 8m in width will provide access to the facility, and ultimately to both planned solar PV sites (that is, a shared access route). The access road is via the existing (unnamed) gravel road off the DR2964 between Komaggas and Kleinsee. This gravel road is well established, however it's likely portions of this road will require upgrading to accommodate the movement of heavy vehicles. This existing road traverses only Farm Zonnkewa 326. From this point, a planned access road up to ~7.5km in length and up to 8m in width located within the 300m grid connection corridor.

7.3. Potential Impacts on Terrestrial Ecology

The majority of the ecological impacts associated with the development would occur during the construction phase as a result of the disturbance associated with site clearance, excavations, the operation of heavy machinery at the site and the presence of construction personnel. The significance of the impacts on terrestrial ecology expected with the development of the project has been assessed as low, depending on the impact being considered, and with the implementation of mitigation measures. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix D** for more details).

7.3.1 Results of the Terrestrial Ecology Impact Assessment

The Kleinzee PV Facility footprint falls entirely within the Namaqualand Strandveld vegetation type. Although there is some variation in the vegetation composition of the site relating to substrate conditions, these differences represent different communities rather than different vegetation types and there are no significant vegetation features within the site.

The majority of the Kleinzee PV Facility site falls within a CBA2, with the remainder of the site falling within an ESA (refer to **Figure 7.2**) The site falls within a NPAES Focus Area, which is also associated with the Namakwa National Park (which lies > 20km south of the site) as an area of planned expansion in order to assist SANParks to achieve a planned biodiversity target for the Park.

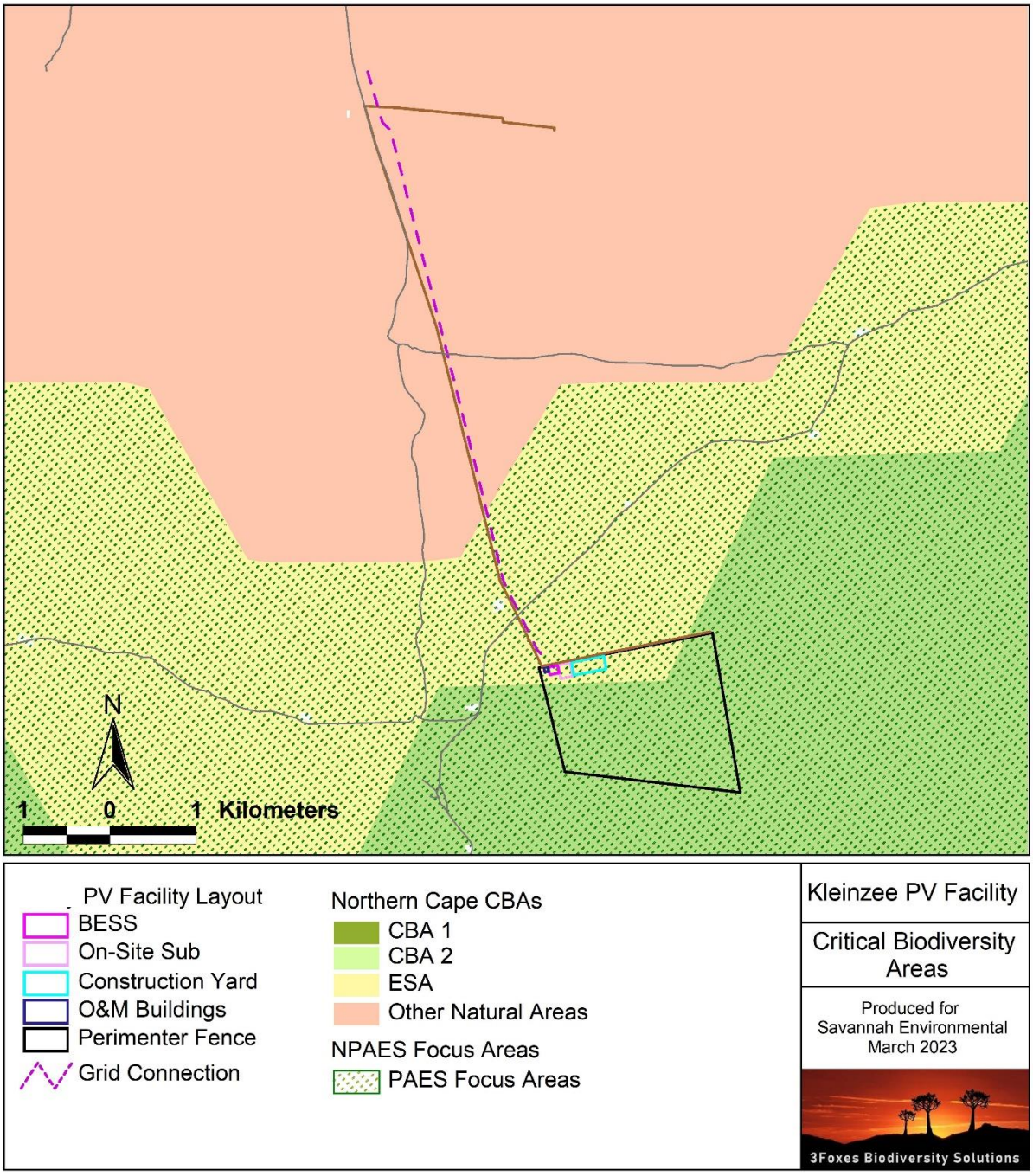


Figure 7.2: Extract of the Northern Cape CBA map for the Kleinzee PV Facility and surrounds.

CBA2: As areas of CBA2 are not considered to be irreplaceable, the development is not considered to have a very high impact on the affected CBA2, which is considerably larger than the site. The ecologist has

interrogated the environment based on the habitats and quality of the vegetation present in the field[26]. The field assessment did not identify any significant biodiversity features within the site, with the result that the development would not have a high impact on biodiversity pattern features. The overall impact of the development on CBAs and broader scale ecological processes is considered to be relatively low and no major impacts to dispersal ability or faunal movement patterns are likely to be generated by the development.

NPAES Focus Areas and potential expansion of the Namakwa National Park: The site falls within the Namakwa National Park Buffer Area and within a priority area for future park expansion. Development of the site would therefore place some limitations on the future expansion of traditional formalised conservation into the affected area. The total area of the affected Focus Area is 377 266 ha and the loss of 300 ha of this represents less than 0.01% of the Focus Area. As a result, this loss is, on its own is not considered to represent a significant loss. The impact of the Kleinzee Solar PV Facility on the potential future expansion of the Namakwa National Park or other protected area expansion is considered to be relatively low and is considered acceptable.

Impacts on CBA and ESA

The development would result in some impact on the affected CBA and ESA within the site through habitat loss and disturbance. The noise generated during construction would create disturbance for some fauna, which would decrease the value of the area for the affected fauna for that period. However, during the operational phase, disturbance would decrease significantly as compared to the construction phase and would not be very high. In addition, the development would result in some general habitat fragmentation and impact on broad-scale ecological processes in the area. These impacts cannot be entirely mitigated and there is likely to be some residual impact on broad-scale ecological processes due to the presence and operation of the solar PV facility.

Impact on NPAES Focus Areas

The Kleinzee PV Facility would be located within a NPAES Focus Area associated with the expansion of the Namakwa National Park, resulting in a direct footprint of approximately 300 ha within the NPAES Focus Area. This is not considered to represent a highly significant impact given the overall size of the NPAES Focus Area and the location of the development along the northern margin of the NPAES.

Impacts on Broad scale ecological processes

The development of the Kleinzee PV Facility would result in habitat loss and an increase in overall cumulative impacts on fauna and flora in the area. The contribution of the Kleinzee PV Facility to cumulative impact is not considered highly significant, given the lack of sensitive features within the development footprint and the concentrated nature of PV development. In addition, there are no observable corridors or gradients evident across the site that would be likely to be disrupted by the development.

[26] The Northern Cape CBA map does not include any information on why a specific area has been included as a CBA, with the result that it is not possible to interrogate the map to establish the underlying reasons why the areas within the project site have been classified as CBA2.

7.3.2 Impact tables summarising the significance of impacts on terrestrial ecology related to the PV facility, grid connection infrastructure and access road during construction and operation (with and without mitigation

Construction phase

Impact Nature: Habitat transformation and the presence of the facility will contribute to habitat loss within the affected CBA2 and ESA.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (3)	Minor (2)
Probability	Highly Likely (4)	Highly Likely (4)
Significance	**Medium (32)**	**Low (28)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes, negative impacts ca be reduced.	
Mitigation » Restrict the development footprint to remain within the development area and linear corridor. » Locate temporary-use areas such as construction camps and lay-down areas in low sensitivity or previously disturbed areas. » Appropriate design of roads and other infrastructure to minimise faunal impacts and allow fauna to pass over, through or underneath these features as appropriate. » The fencing around the facility infrastructure should not have any electrified strands within 30cm of the ground as this may result in tortoises being electrocuted. Alternatively, guard wires or mesh can be placed outside of the fence to prevent tortoises from accessing the electrified fence. » Monitoring of construction activities to ensure that the development footprint within sensitive areas is restricted to the authorised development footprint.		
Residual Risks Habitat loss within the CBA2 and ESA cannot be fully mitigated or avoided, with the result that there would some residual impact on these features, but this is considered to be low after mitigation.		

Impact Nature: Impact on a NPAES Focus Area associated with the Namakwa National Park, reducing the conservation value.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Minor (2)
Probability	Certain (5)	Highly Likely (4)
Significance	**Medium (40)**	**Low (28)**

Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	To some degree, but not entirely	

Mitigation

» Disturbance around the margins of the site should be kept to a minimum and any disturbance in these areas should be rehabilitated as quickly as possible.
» An erosion monitoring programme should be put in place for at least 3-5 years after construction. Any problems observed should be rectified as soon as possible using the appropriate revegetation and erosion control works.
» Ensure that the project design remains ecologically sensitive and minimises edge effects such as noise and light pollution.

Residual Risks

Habitat loss within the NPAES cannot be fully mitigated or avoided with the result that some residual disturbance and degradation will occur during operation of the facility.

Operation Phase

Impact Nature: The presence and operation of the facility will contribute to disturbance and fragmentation effects on the affected CBA2 and ESA.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (4)	Low (3)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	To some degree, but some residual disturbance associated with the project is likely unavoidable.	

Mitigation

» Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location.
» If any parts of the facility must be lit at night for security purposes, this should be done with inward- and downward-directed low-UV type lights (such as most LEDs and HPS bulbs), which attract fewer insects.
» All hazardous materials 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 should be cleaned up in the appropriate manner as related to the nature of the spill.
» All vehicles accessing the site should adhere to a low speed limit (30km/h max for heavy vehicles and 40km/h for light vehicles) to avoid collisions with susceptible species such as snakes and tortoises.
» If any parts of the facility are fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences because they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the security fence and not the outside.

Residual Risks
Habitat loss within the site and affected CBA and ESA cannot be fully mitigated or avoided with the result that some residual habitat and local disturbance, for affected fauna and flora will occur during operation of the facility.

Decommissioning phase

Impact Nature: The decommissioning of the facility will contribute to disturbance within the affected CBA2 and ESA.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Unlikely (2)
Significance	**Low (21)**	**Low (14)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Not fully, but the impact would be temporary in nature.	

Mitigation

- All vehicles should adhere to a low-speed limit on site. Heavy vehicles should be restricted to 30km/h and light vehicles to 40km/h.
- Any potentially dangerous fauna such as snakes or fauna threatened by the decommissioning activities should be removed to a safe location prior to the commencement of decommissioning activities.
- All hazardous materials 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 should be cleaned up in the appropriate manner as related to the nature of the spill.
- No excavated holes or trenches should be left open for extended periods as fauna may fall in become trapped.
- All above-ground infrastructures should be removed from the site.
- The footprint area should be rehabilitated with species from the local area and specific measures to reduce and limit wind erosion should be included.
- An erosion monitoring programme should be put in place for at least 3 years after decommissioning and should make provision for annual monitoring and rehabilitation.
- All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.
- There should be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous perennial shrubs, grasses and trees from the local area.
- Alien management at the site should be implemented post-decommissioning in accordance with an Alien Invasive Management Plan.
- Regular (annual) monitoring for alien plants during decommissioning to ensure that no alien invasive problems have developed as result of the disturbance, as per the Alien Management Plan for the project.
- Woody aliens should be controlled on at least an annual basis using the appropriate alien control techniques as determined by the species present.

Residual Risks
There may be some residual risks of degradation after decommissioning, but ultimately the functioning of the site should be restored through rehabilitation and revegetation of disturbed areas.

7.3.3 Conclusion

The Kleinzee PV Facility falls within the Namaqualand Stranded vegetation type, which has been impacted to a relatively limited extent by transformation to date and is classified as Least Threatened. There are several listed fauna which would potentially be present and be impacted by the development, but none of these species were observed at the site and it is considered low-sensitivity for these species due to a lack of suitable habitat. The field assessment found that the site has a relatively low abundance of plant SCC and only *Wahlenbergia asparagoides* (VU) was observed to be present. There are no significant biodiversity features within the site, and it is considered to be of low sensitivity.

Based on the field assessment, the site is not considered irreplaceable, and has a relatively low abundance of SCC and no significant biodiversity features. Similar Strandveld habitat is widely available in the area and is also well-represented within the Namakwa National Park, so the development is considered highly unlikely to compromise the ecological functioning of the affected CBA2. The overall impact of the development on CBAs and broader scale ecological processes is assessed as being relatively low.

The Kleinzee PV Facility development footprint falls within a NPAES Priority Focus Area and identified expansion area for the Namakwa National Park. The total area of the affected Focus Area is 377 266ha, and the loss of ~300ha of this represents less than 0.01% of the NPAES Priority Focus Area, and as the site is located along the northern margin of the PAES Focus Area, the impact on protected area expansion likely to be lower than if the site was deeper within the PAES Focus Area. Solar PV facilities do not have a large edge effect in terms of noise and disturbance, so their proximity to protected areas is not likely to represent a significant threat to biodiversity. Therefore, the impact of the Kleinzee Solar PV Facility on the potential future expansion of the Namakwa National Park or other protected area expansion is relatively low and is considered acceptable.

The Kleinzee PV Facility development is deemed acceptable from a terrestrial ecological impact perspective, with no impacts that cannot be mitigated. In terms of cumulative impacts, the contribution of the current PV development is considered acceptable. It is the specialist opinion that the development should be authorised subject to mitigation and avoidance measures.

7.4. Potential Impacts on Avifauna

The significance of the impacts on avifauna with the development of the Kleinzee Solar PV Facility has been assessed as low for the PV facility, and medium for the power line, after the implementation of mitigation measures. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix E** for more details).

7.4.1 Results of the Avifauna Impact Assessment

A total of only 46 bird species were recorded around the Kleinzee PV site during the four day survey. Three of these were collision-prone species: one Red Data species Southern Black Korhaan *Afrotis afra* and two *Least Concern* Greater Kestrel and Pale Chanting Goshawk. From the larger data from SABAP2 a total of 12 Priority species have been recorded from the same area of which six are Red Data species (two bustards, three raptors and one korhaan). A total of 92 species have been recorded on the same cards. In summary, three collision-prone Priority species were recorded on site, of which one was red-listed. Other species are likely as suggested by the SABAP2 atlas record of 12 Priority species (of which six are Red Data).

The presence of only two threatened (Red Data) Priority species, and their low Passage Rates, and their relatively low likelihood of occurring, indicates that this site does not require any specific mitigations as the risks to the birds, or the loss of habitat, are both insignificant for this development. Wetland birds that may perceive the solar panels as open water are generally confined to within 1-km of the coastal areas and, indeed, no cormorants or pelicans were recorded over the site in 24-hour observations over 2-months, despite their appearance in the SABAP records. Moreover, there are no small, threatened lark species that fall within this area that require protection due to possible habitat loss or displacement. That is, neither the Vulnerable Red Lark *Calendulauda burra*, nor the Near Threatened Barlow's Lark *Calendulauda barlowi,* occur in this area as it is too far north for the Red Lark and too far south for the Barlow's Lark. No areas or features of avifauna sensitivity are required to be avoided or buffered on the project site (and there is no sensitivity map for the site). The planned 132 kV line is routed alongside the 400 kV Gromis-Juno 400 kV line. This allows the new mitigation of staggered pylons to be enacted to reduce impacts by all collision-prone species.

As with any development, habitat will be permanently disturbed, displacing the resident and migrant species. The majority of the 300-ha area is planned in the operation of the PV facility, and this will reduce habitat availability for birds where construction takes place.

The main avian impacts according to a position paper on the subject by Birdlife SA are:

» Displacement of nationally important species from their habitats;
» Loss of habitats for such species;
» Disturbance during construction, and operation of the facility;
» Collision with the photovoltaic panels (mistaking them for water bodies);
» Collision with the 132kV power line.

The impact of the solar PV Facility area will generally be negative for birds given the certainty that:

» habitat will be transformed and potentially fragmented;
» birds may be killed directly if they collide with the132kV power line.
» Some displacement may also occur.

7.4.2 Impact tables summarising the significance of impacts on avifauna related to the PV facility, grid connection infrastructure and access road during construction and operation (with and without mitigation

Solar PV development site and access

Nature: Negative due to disturbance and loss of foraging habitat around the project site for the Red-listed bird groups identified

Impact Description:
The raptors (Martial, Snake-eagle and Chanting Goshawk) are the raptors species most likely to be impacted. The Pelicans recorded off site are at less at risk.

	Without mitigation	With mitigation
Extent	Low (1)	Low (1)
Duration	Low (4)	Low (4)
Magnitude	Low (3)	Low (3)
Probability	Low (3)	Low (3)

Significance	**Low (24)**	**Low (24)**
Status	Negative	Negative
Reversibility	No, habitat will be permanently altered	No, habitat will be permanently altered
Irreplaceable loss of species?	No	No
Can impacts be mitigated?	No	No
Mitigation: » Position panels away from bird-sensitive habitats (**there were none identified at the Kleinzee Solar PV site**)		
Residual impacts: Direct mortality through collision, or area avoidance, may occur if wetland birds are attracted by the shiny solar panels This possibility can be gauged from a systematic monitoring programme.		

132 kV power line infrastructure

Nature: Negative due to potential for collision and electrocution for the Red-listed Bustards (collisions) and raptors (electrocution)

Impact Description:
Ludwig's Bustards that occur in the surrounding areas are most at risk, while the raptors (Greater Kestrel, Chanting Goshawk) are the species most likely to be electrocuted if conductors are exposed above the support structures.

	Without mitigation	**With mitigation**
Extent	Low (1)	Low (1)
Duration	Low (4)	Low (4)
Magnitude	High (8)	Medium (7)
Probability	Low (4)	Low (3)
Significance	**Medium-High (52)**	**Medium (36)**
Status	Negative	Negative
Reversibility	Yes, with appropriate contemporary mitigations	Yes, with appropriate contemporary mitigations
Irreplaceable loss of species?	No	No
Can impacts be mitigated?	Yes	Yes

Mitigation:
The top mitigation for birds around new power lines are as follows:

- » Stagger the pylons such that the new line parallels the existing line and the pylons of one align with the midspan of the existing line. This is expected to reduce fatalities of all species by 67% (Pallett et al. 2022)
- » Affix bird diverters (spirals) to the earth wire as the line goes up. This is known to reduce fatalities of large birds by 60% and 90% (Shaw et al. 2021)
- » All configuration for the conductors must be bird-friendly and be **slung below** the support structures to avoid any danger of electrocution (See Appendix 3 of the Avifauna Impact Assessment (Appendix E) for safe and unsafe designs)

Residual Impacts:
Direct mortality through collision, or area avoidance, may occur if wetland birds are attracted by the shiny solar panels This possibility can be gauged from a systematic monitoring programme.

7.4.3 Conclusion

The desktop and two-season site visit of birds on the proposed Kleinzee Solar PV Facility site indicated a medium level of activity in terms of Passage Rates of Priority species (0.38 birds/hour), and medium activity of Red Data species (0.30 birds/hour). Low overall species richness (46 species) and medium-low reporting rates for the four species of Priority birds. National Bird Atlas data (SABAP2) suggests that six Red Data species

can occur in the area, but only one was seen on this small site. The DFFE Screening Tool Assessment indicated a low risk for the Avian theme. No small, threatened larks (Vulnerable Red Lark, or Near Threatened Barlow's Lark) were recorded on site. This suggests that the avian impact will be low for the proposed PV solar farm site at Kleinsee. The power lines exporting power to the grid pose a medium risk to the birds after mitigation, given their short length and the ability for the proposed line to be aligned and staggered with the existing Gromis-Juno 400kV power line.

Due to the low avian diversity, low Passage Rates, and paucity of highly threatened species on this small site, no mitigation measures are required for the solar farm. For the power line, the best form of mitigation is the staggered pylon concept (Pallett et al. 2022). No fatal flaws were identified during the assessment. The avian specialists consider the site and facility suitable for development from an avian perspective.

7.4. Assessment of Impacts on Land Use, Soil and Agricultural Potential

The impact of the Kleinzee Solar PV Facility on the soils, land use, land capability and agricultural potential has been assessed as low to medium (after mitigation), depending on the impact being considered. Potential impacts on soil, land use and agricultural potential and the relative significance of the impacts are summarised below (refer to **Appendix F** Soils Impact Assessment).

7.4.1 Results of the Land Use, Soil and Agricultural Potential Study

The largest part of the Kleinzee Solar PV Facility development area, access road and grid connection consist of land with Low (Class 05) land capability. This land capability class is present within the entire boundary of the development area, while small areas in the center section of the PV facility consist of land with Low-Moderate (Class 06) land capability. The grid connection corridor, authorised collector substation and main access road falls in areas with a Low (Class 05) land capability. Only the far southern part of the grid connection corridor has areas where a Low-Moderate (Class 06) land capability is present.

The land capability was calculated by using 30% terrain and soil, and 40% climate capability of the area. The calculations showed that Low land capability has been assigned to soils of the Namib and Coega soil form because of the regic sand and shallow depth that has a very low water holding capacity and structure. The low land capabilities of the soils within the development area are confirmed by the absence of crop field boundaries within the Kleinzee Solar PV Facility development area. It is therefore confirmed that the current layout and development area for the Kleinzee Solar PV Facility does not exceed the allowable development limits.

Sensitivity analysis

Following the consideration of all the desktop and gathered baseline data, the findings of the report are not the same as the Environmental Screening Tool. The soil forms present within the project area are of the Namib and Coega soil forms, which has a deep regic sand up to 1400mm and shallow depths because of the hard carbonate. The area has historically not been used for crop production recently, as confirmed by the field crop boundary data of DALRRD (2019). No irrigation infrastructure, such as centre pivots or drip irrigation, are present within the project area and irrigated agricultural is currently not practiced in the area.

Considering the soil properties, land capability and calculated land capability of the development area, most of the area has Low Agricultural Sensitivity (refer to **Figure 7.3**). Soil in the project area will have Low

sensitivity, depending on the successful implementation of mitigation measures to prevent soil erosion, compaction, and pollution.

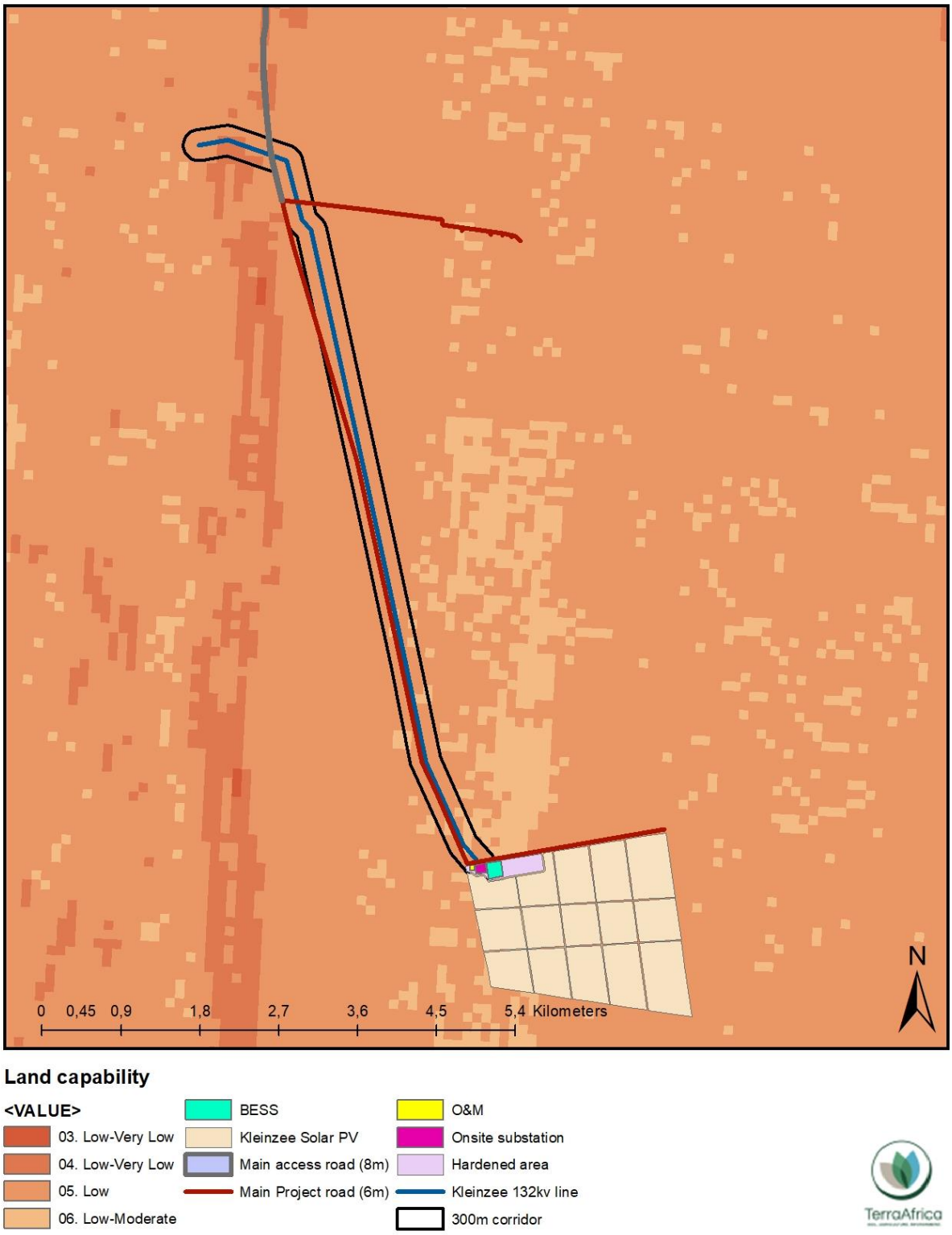


Figure 7.3: Land capability classification of the Kleinzee Solar PV Facility development area (data source: DALRRD, 2016)

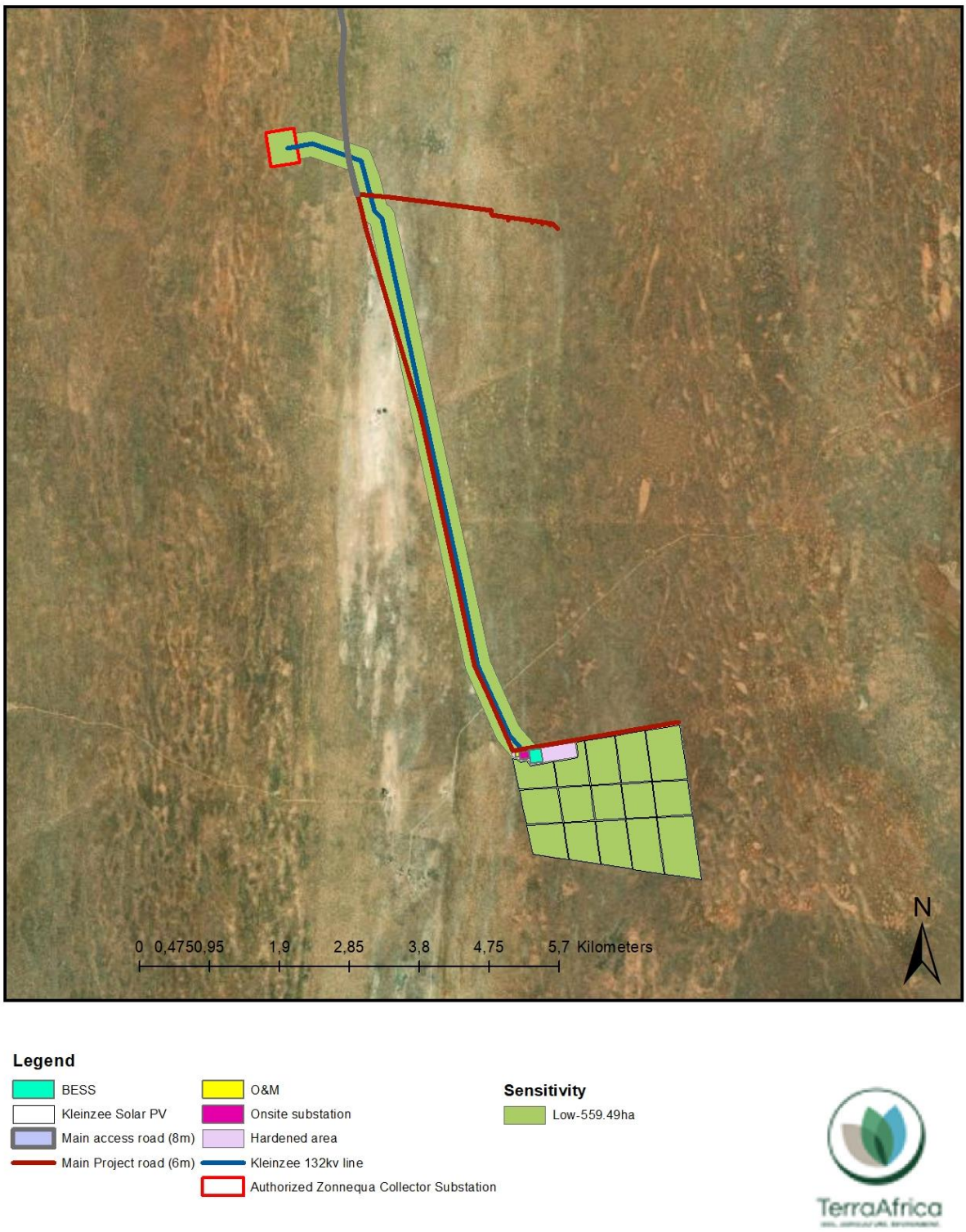


Figure 7.4: Agricultural sensitivity rating of the Kleinzee Solar PV Facility development area and grid connection

The most significant impacts of the proposed project on soil and agricultural productivity will occur during the construction phase when the vegetation is removed, and the soil surface is prepared for the delivery of materials and assembly of the infrastructure. During the operational phase, the risk remains that soil will be

polluted by the waste generated or in the case of a spill incident. During the decommissioning phase, soil will be prone to erosion when the infrastructure is removed from the soil surface.

Potential Impacts during the construction Phase:

- Change in land use from livestock farming to energy generation.
- Soil erosion
- Soil compaction
- Soil pollution

Potential Impacts during the operational Phase:

- Soil erosion
- Soil pollution

7.4.2 Impact tables summarising the significance of impacts on Land Use, Soil and Agricultural Potential related to the PV facility, grid connection infrastructure and access road during construction and operation (with and without mitigation)

Construction phase

Impact: Change in land use from livestock farming to energy generation.

Nature: Prior to construction of the project infrastructure, the PV development area will be fenced off and livestock farming will be excluded from the development area. The access road and grid line will be stripped of vegetation during construction and will no longer be suitable for livestock grazing.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Medium duration (3)	Medium duration (3)
Magnitude	Moderate (6)	Low (4)
Probability	Definite (4)	Definite (4)
Significance	**Medium (40)**	**Medium (32)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	No	N/A

Mitigation:

» Vegetation clearance must be restricted to areas where infrastructure is constructed.
» No materials removed from development area must be allowed to be dumped in nearby livestock farming areas.
» Prior arrangements must be made with the landowners to ensure that livestock and game animals are moved to areas where they cannot be injured by vehicles traversing the area.
» No boundary fence must be opened without the landowners' permission.
» All left-over construction material must be removed from site once construction on a land portion is completed.
» No open fires made by the construction teams are allowable during the construction phase.

Residual Impacts:

The residual impact from the construction of the Kleinzee Solar PV Facility and Associated Infrastructure is considered medium.

Impact: *Soil erosion.*

Nature: All areas where vegetation is removed from the soil surface in preparation for the infrastructure construction will result in exposed soil surfaces that will be prone to erosion. Both wind and water erosion are a risk, as the area falls within a region that experiences strong winds.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (30)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	N/A

Mitigation:

» Land clearance must only be undertaken immediately prior to construction activities and only within the development footprint;
» Unnecessary land clearance must be avoided;
» Level any remaining soil removed from excavation pits (where the PV modules will be mounted) that remained on the surface, instead of allowing small stockpiles of soil to remain on the surface;
» Where possible, conduct the construction activities outside of the rainy season; and
» Stormwater channels must be designed to minimise soil erosion risk resulting from surface water runoff.

Residual Impacts:

The residual impact from the construction and operation of the project on the susceptibility to erosion is considered low.

Impact: Soil compaction.

Nature: The clearing and levelling of land for construction of the infrastructure will result in soil compaction. In the area where the access roads, substation and grid connection will be constructed, topsoil will be removed, and the remaining soil material will be deliberately compacted to ensure a stable surface prior to construction.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (30)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	N/A

Mitigation:

» Vehicles and equipment must travel within demarcated areas and not outside of the construction footprint;
» Unnecessary land clearance must be avoided;
» Materials must be off-loaded and stored in designated laydown areas;
» Where possible, conduct the construction activities outside of the rainy season; and
» Vehicles and equipment must park in designated parking areas.

Residual Impacts:

The residual impact from the construction and operation of the project on soil compaction is considered low.

Impact: *Soil Pollution*

During the construction phase, construction workers will access the land for the preparation of the terrain and the construction of the thermal plant and access road. Potential spills and leaks from construction vehicles and equipment and waste generation on site can result in soil pollution.

Nature:
The following construction activities can result in the chemical pollution of the soil:
» Petroleum hydrocarbon (present in oil and diesel) spills by machinery and vehicles during earthworks and the removal of vegetation as part of site preparation;
» Spills from vehicles transporting workers, equipment, and construction material to and from the construction site;
» The accidental spills from temporary chemical toilets used by construction workers;
» The generation of domestic waste by construction workers;
» Spills from fuel storage tanks during construction;
» Pollution from concrete mixing;
» Pollution from road-building materials; and
» Any construction material remaining within the construction area once construction is completed.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Low (4)	Improbable (2)
Significance	**Medium (36)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	N/A

Mitigation:
» Maintenance must be undertaken regularly on all vehicles and construction/maintenance machinery to prevent hydrocarbon spills;
» Any waste generated during construction must be stored into designated containers and removed from the site by the construction teams;
» Any left-over construction materials must be removed from site;
» The construction site must be monitored by the Environmental Control Officer (ECO) to detect any early signs of fuel and oil spills and waste dumping;
» Ensure battery transport and installation by accredited staff / contractors; and
» Compile (and adhere to) a procedure for the safe handling of battery cells during transport and installation.

Residual Impacts:
The residual impact from the construction and operation of the proposed project will be low to negligible.

Operations phase

Impact: *Soil Erosion*
During the operations phase, staff and maintenance personnel will access the project area daily.

Nature: The areas where vegetation was cleared will remain at risk of soil erosion, especially during a rainfall event when runoff from the cleared surfaces will increase the risk of soil erosion in the areas directly surrounding the project area.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)

Probability	Probable (3)	Improbable (2)
Significance	**Medium (30)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	N/A
Mitigation:		
» The area around the project, including the internal access roads, must regularly be monitored to detect early signs of soil erosion on-set; and » If soil erosion is detected, the area must be stabilised using geo-textiles and facilitated re-vegetation.		
Residual Impacts: The residual impact from the operation of the project on the susceptibility to erosion is considered low.		

Impact*: Soil Pollution*

Nature: During the operational phase, potential spills and leaks from maintenance vehicles and equipment and waste generation on site can result in soil pollution. Also, any spillages around the workshop area or damaged infrastructure, such as inverters and transformers, can be a source of soil pollution.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Low (4)	Improbable (2)
Significance	**Medium (36)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	N/A
Mitigation:		
» Maintenance must be undertaken regularly on all vehicles and maintenance machinery to prevent hydrocarbon spills; » No domestic and other waste must be left at the site and must be transported with the maintenance vehicles to an authorised waste dumping area; and » Regularly monitor areas alongside the roads, parking area and workshop for any signs of oil, grease and fuel spillage or the presence of waste.		
Residual Impacts: The residual impact from the operation of the proposed project will be low to negligible.		

Decommissioning phase

The decommissioning phase will have the same impacts as the construction phase i.e., soil erosion, soil compaction and soil pollution. It is anticipated that the risk of soil erosion will especially remain until the vegetation growth has re-established in the area where the project infrastructure was decommissioned.

7.4.3 Conclusion

Following the data analysis and impact assessment, the proposed Kleinzee Solar PV Facility and associated infrastructure is considered an acceptable development within the area that was assessed for the purpose of compiling the Soils Impact Assessment Report.

With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of impacts of Kleinzee Solar PV is expected to have a **Medium and Low impact** on soils and agricultural potential, depending on which impact is being considered. These impacts can be reduced by keeping the footprints minimised where possible and strictly following soil management measures pertaining to erosion control and management and monitoring of any possible soil pollution sources such as vehicles traversing over the sites. From the outcomes of the studies undertaken, it is concluded that the PV facility can be developed and impacts on soils managed by taking the following into consideration:

- Limit vegetation clearance to only the areas where the surface infrastructure will be constructed
- Avoid parking of vehicles and equipment outside of designated parking areas.
- Plan vegetation clearance activities for dry seasons (late autumn, winter and early spring).
- Design and implement a Stormwater Management System where run-off from surfaced areas is expected.
- Re-establish vegetation along the access road to reduce the impact of run-off from the road surface.
- Maintenance must be undertaken regularly on all vehicles and construction/maintenance machinery to prevent hydrocarbon spills.
- Any waste generated during construction must be stored in designated containers and removed from the site by the construction teams.
- Any left-over construction materials must be removed from site.

It is the specialist's opinion that this application be considered favourably, and that the mitigation measures are implemented to prevent soil erosion and soil pollution, and to minimise impacts on the veld quality of the farm portions that will be affected. The project infrastructure should also remain within the assessed development areas.

7.5. Assessment of Impacts on Heritage Resources

Negative impacts on heritage resources will be due to loss of archaeological and palaeontological resources during construction activities of the Kleinzee Solar PV Facility. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix G**).

7.5.1 Results of the Heritage Impact Assessment (including archaeology and palaeontology)

All of the historic and present mining activities in Namaqualand form part of the Namaqualand Copper Mining Cultural Landscape that has been previously put forward for World Heritage Site status. No infrastructure related to this landscape is present within the development area. The proposed PV facility is located within an exceptionally flat landscape located well away from the nearest formal road. Due to the distance of the development area from the heart of the Namaqualand Copper Mining Cultural Landscape it is not anticipated that the proposed development will negatively impact on this significant cultural landscape.

Archaeology

The overall archaeological sensitivity of the Namaqualand with regard to the preservation of Early, Middle and Later Stone Age archaeology as well as Khoe and San heritage, early colonial settlement and the Namaqualand Copper Mining landscape is regarded as very high. Despite this, the field assessment conducted for this project has demonstrated that the specific area proposed for development has low sensitivity for impacts to significant heritage resources.

None of the heritage resources identified fall within the area PV layout and as such, no direct impact to any heritage resources is anticipated. One heritage resource of significance was identified - that of the Sonnekwa farmhouse complex and kraals, graded IIIB. Based on the footprints provided, it is unlikely that this resource will be directly negatively impacted by the proposed development of the PV facilities in the area, although the sense of place associated with the farmhouse may be impacted.

Palaeontology

Trace fossils are ubiquitous and important palaeoenvironmental indicators. The significance rating is low for fossil potential as a consequence of the low probability of finding fossils in the terrestrial deposits. Further observations in the surrounding area (John Pether) indicate that the deposits are altered by pedogenic processes involving decalcification and the precipitation of pedocrete., Furthermore, fossil shells are not preserved, and fossil bone is very sparse. Given the low palaeontological potential, it is improbable that fossil bones will be encountered, and no impact is anticipated.

Table 7.1 below shows the identified heritage resources identified in the field assessment. **Figure 7.5** illustrates where these resources have been identified.

Table 7.1: Heritage resources identified within the Kleinzee Solar PV development area

Site No.	Description	Type	Period	Density	Co-ordinates		Grading	Mitigation
022	Silcrete point with barb along one side	Artefacts	MSA	0 to 5	-29.86137	17.28439	NCW	NA
023	Quartz core	Artefacts	LSA	0 to 5	-29.8585	17.28558	NCW	NA
024	Rough silcrete core flake and quartz elongated flake	Artefacts	MSA	5 to 10	-29.85249	17.2846	NCW	NA
025	Quartz core, flakes	Artefacts	LSA	0 to 5	-29.85752	17.28164	NCW	NA
026	Quartz core, flakes	Artefacts	MSA	0 to 5	-29.85232	17.27936	NCW	NA
027	Quartz core, flakes	Artefacts	MSA	0 to 5	-29.84925	17.28196	NCW	NA
028	Quartz flake, core	Artefacts	LSA	0 to 5	-29.85524	17.28062	NCW	NA
029	CCS flake point	Artefacts	LSA	0 to 5	-29.85145	17.28435	NCW	NA
030	Quartz flakes	Artefacts	MSA	5 to 10	-29.86016	17.2856	NCW	NA
031	Silcrete unworked flake and quartz core	Artefacts	MSA	0 to 5	-29.85151	17.25772	NCW	NA

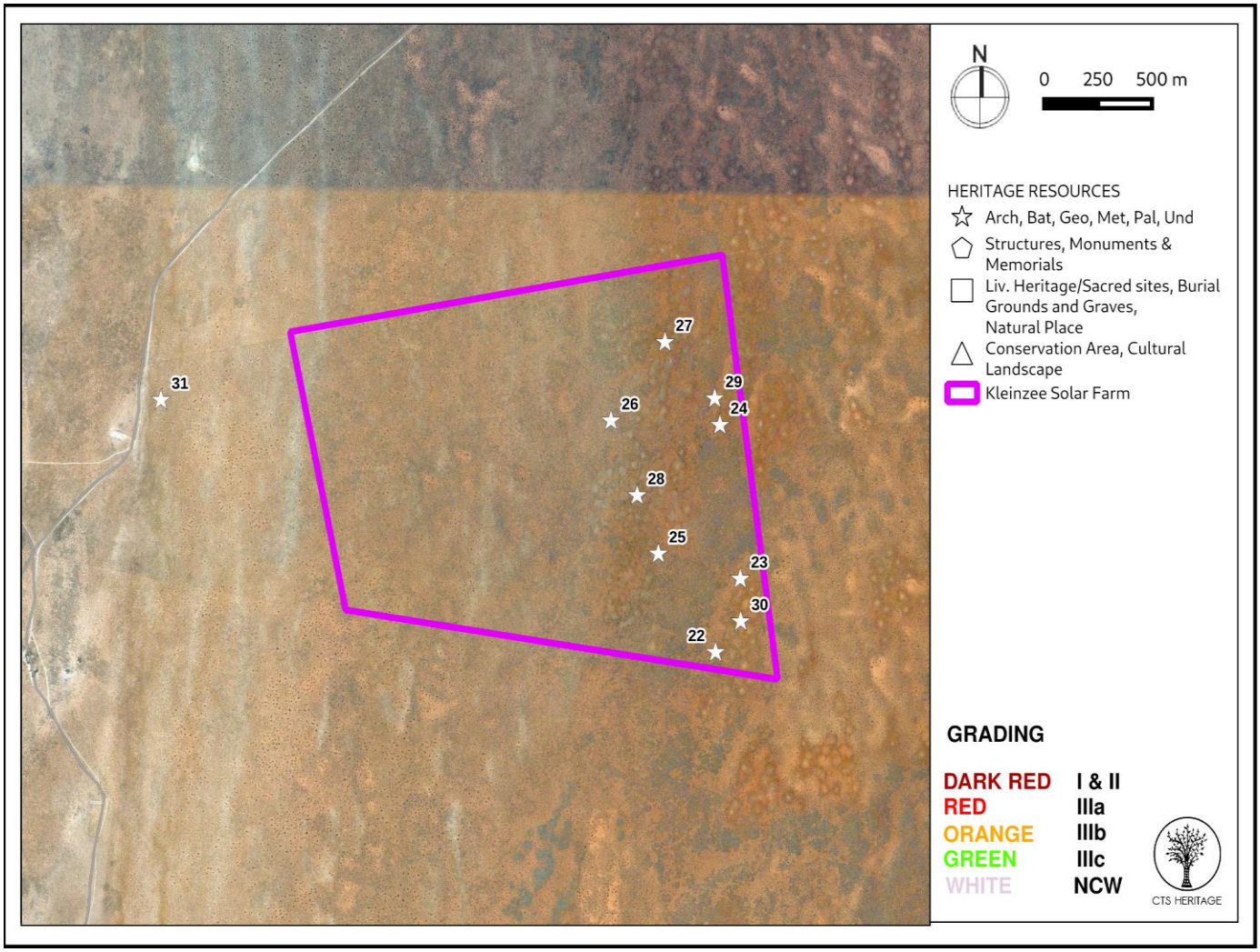


Figure 7.5: Heritage resources identified in the proposed development area

7.5.2 Impact tables summarising the significance of impacts on heritage related to the PV facility, grid connection infrastructure and access road during construction and operation (with and without mitigation)

Nature: The construction phase of the project will require excavation, which may impact on archaeological heritage resources if present.		
	Without Mitigation	**With Mitigation**
Magnitude	Medium (6)	Medium (6)
Duration	High (5)	High (5)
Extent	Low (1)	Low (1)
Probability	Moderate (3)	Low (1)
Significance	**Medium (36)**	**Low (12)**
Status (positive or negative)	Negative	Neutral
Reversibility	Any impacts to heritage resources that do occur are irreversible	Any impacts to heritage resources that do occur are irreversible

Irreplaceable loss of resources?	Possible	Not Likely
Can impacts be mitigated	Yes	
Mitigation: Should any buried archaeological resources or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward.		
Residual Risk: None		

Nature: The construction phase of the project will require excavation, which may impact on palaeontological heritage resources if present		
	Without Mitigation	**With Mitigation**
Magnitude	Low (4)	Low (2)
Duration	High (5)	High (5)
Extent	Local (1)	Local (1)
Probability	Low (1)	Low (1)
Significance	**Low (10)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	Any impacts to heritage resources that do occur are irreversible	Any impacts to heritage resources that do occur are irreversible
Irreplaceable loss of resources?	Possible	Not Likely
Can impacts be mitigated	Yes	
Mitigation: The Chance Fossil Finds procedure included in the HIA in **Appendix G** must be implemented during the course of construction activities		
Residual Risk: None		

7.5.3 Conclusion

There is no objection to the Kleinzee Solar PV Facility considering the potential for impacts to heritage resources where:

- The recommendations in the VIA (Appendix H) are implemented
- The Chance Fossil Finds Procedure (Appendix J of the Facility EMPr and Appendix G) is implemented during the course of construction activities.
- Any buried archaeological resources or burials be uncovered during the course of development activities, that work ceases in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) is to be be contacted immediately in order to determine an appropriate way forward.

With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of impacts of the Kleinzee Solar PV Facility will be low. From the outcomes of the studies undertaken, it is concluded that the solar PV facility can be developed. Although no archaeological or

heritage resources identified fall within the development footprint; however, some archaeological material, including artefacts and graves can be buried underground and as such, may not have been identified during the initial survey and site visits. In the case where the proposed development activities bring these materials to the surface, work must cease and SAHRA must be contacted immediately to determine a way forward.

7.6. Assessment of Visual Impacts

Negative impacts on visual receptors will occur during the undertaking of construction activities and the operation of the Kleinzee Solar PV Facility. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix H**).

7.6.1 Results of the Visual Impact Assessment

The construction and operation of the proposed Kleinzee Solar PV Facility and its associated grid connection infrastructure may have a visual impact on the study area. The visual impact will differ amongst places, depending on the distance from the facility.

Kleinzee Solar PV Facility:

- During construction, there may be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users and landowners in the area. Construction activities may potentially result in a low, temporary visual impact, both before and after mitigation. No sensitive receptors are located in close proximity to the proposed PV facility. This essentially negates the probability of this impact occurring.

- The PV facility is expected to have a low visual impact pre-mitigation and post mitigation on sensitive receptors within a 1km radius of the proposed PV facility. No sensitive receptors are located in close proximity to the proposed PV facility. This essentially negates the probability of this impact occurring.

- The operational PV facility could have a moderate visual impact on residents of Sonnekwa B and Graafwater within a 1 – 3km radius of the PV facility structures. This impact may be mitigated to low.

- The anticipated impact of lighting at the PV facility is likely to be of moderate significance and may be mitigated to low.

- The potential visual impact related to solar glint and glare as a road travel hazard is expected to be of low significance, as there are no roads within a 1km radius of the proposed PV facility.

- There are no affected residences within a 1km radius of the proposed PV facility. The potential visual impact related to solar glint and glare on static ground-based receptors (residents of homesteads) is therefore expected to be of low significance, both before and after mitigation.

- The anticipated visual impact resulting from the construction of on-site ancillary infrastructure is likely to be of low significance both before and after mitigation.

- The anticipated visual impact of the proposed PV facility on the regional visual quality (i.e. beyond 6km of the proposed infrastructure), and by implication, on the sense of place, is difficult to quantify,

but is generally expected to be of low significance. The Namaqua National Park lies approximately 25km to the south east. The park is not expected to be visually influenced by the PV facility and the development area is located outside of the viewshed protection zone of the Namaqua National Park.

» The cumulative visual impact is expected to be of moderate significance due to their remote locations and the general absence of potential sensitive visual receptors.

The combined results of the visual exposure, viewer incidence/perception and visual distance of the PV facility are illustrated in **Figure 7.6**.

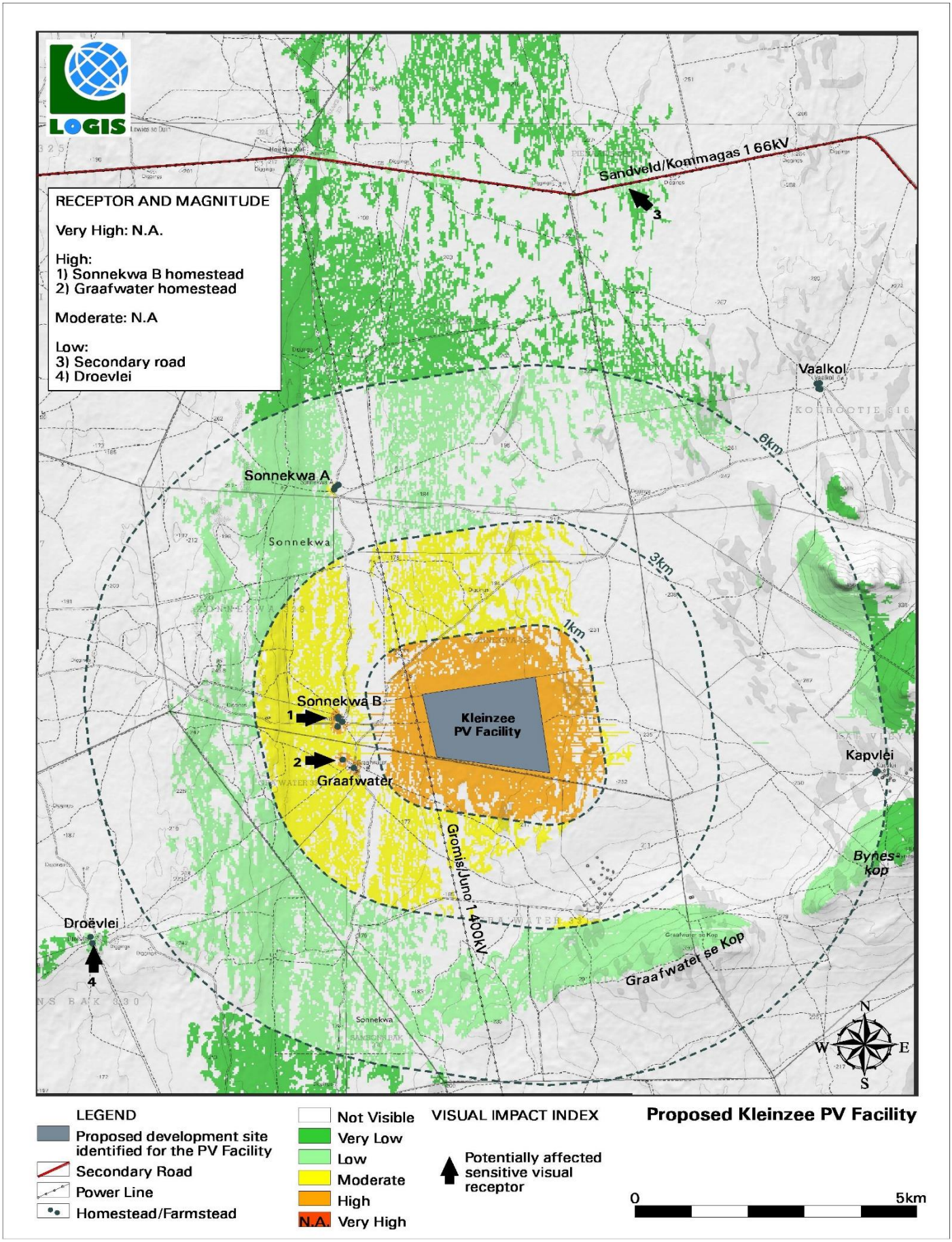


Figure 7.6: Visual impact index and potentially affected sensitive visual receptors.

Grid Connection Infrastructure:

- During the construction phase, there may be an increase in heavy vehicles utilising the roads to the power line that may cause, at the very least, a visual nuisance to other road users and landowners in the area. Construction activities may potentially result in a moderate temporary visual impact that may be mitigated to low.

- The grid connection infrastructure is expected to have a moderate visual impact on observers within a 0.5km radius (and potentially up to a 1.5km radius) of the grid connection infrastructure.

- The grid connection infrastructure is expected to have a low negative visual impact on observers traveling along the roads and residents of homesteads within a 1.5 - 3km radius of the structures.

- The potential visual impact of associated infrastructure is expected to have a low visual impact on observers within a 0.5km radius (and potentially up to a 1.5km radius) of the grid connection infrastructure pre mitigation and a low visual impact post mitigation.

- The anticipated visual impact of the proposed grid connection infrastructure on the regional visual quality (i.e. beyond 3km of the proposed infrastructure), and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of low significance.

- The anticipated cumulative visual impact of the proposed grid connection infrastructure is expected to be of moderate negative significance, which is considered to be acceptable from a visual perspective.

The anticipated visual impacts listed above (i.e. post mitigation impacts) range from moderate to low significance. Anticipated visual impacts on sensitive visual receptors (if and where present) in close proximity to the proposed facility are not considered to be fatal flaws for the proposed Kleinzee Solar PV facility or its associated grid connection infrastructure.

Considering all factors, it is recommended that the development of the facility as proposed be supported, subject to the implementation of the recommended mitigation measures and management programmes.

The visual impact index and potentially affected sensitive visual receptors for the Kleinzee Solar PV Facility grid connection are indicated in **Figure 7.7**

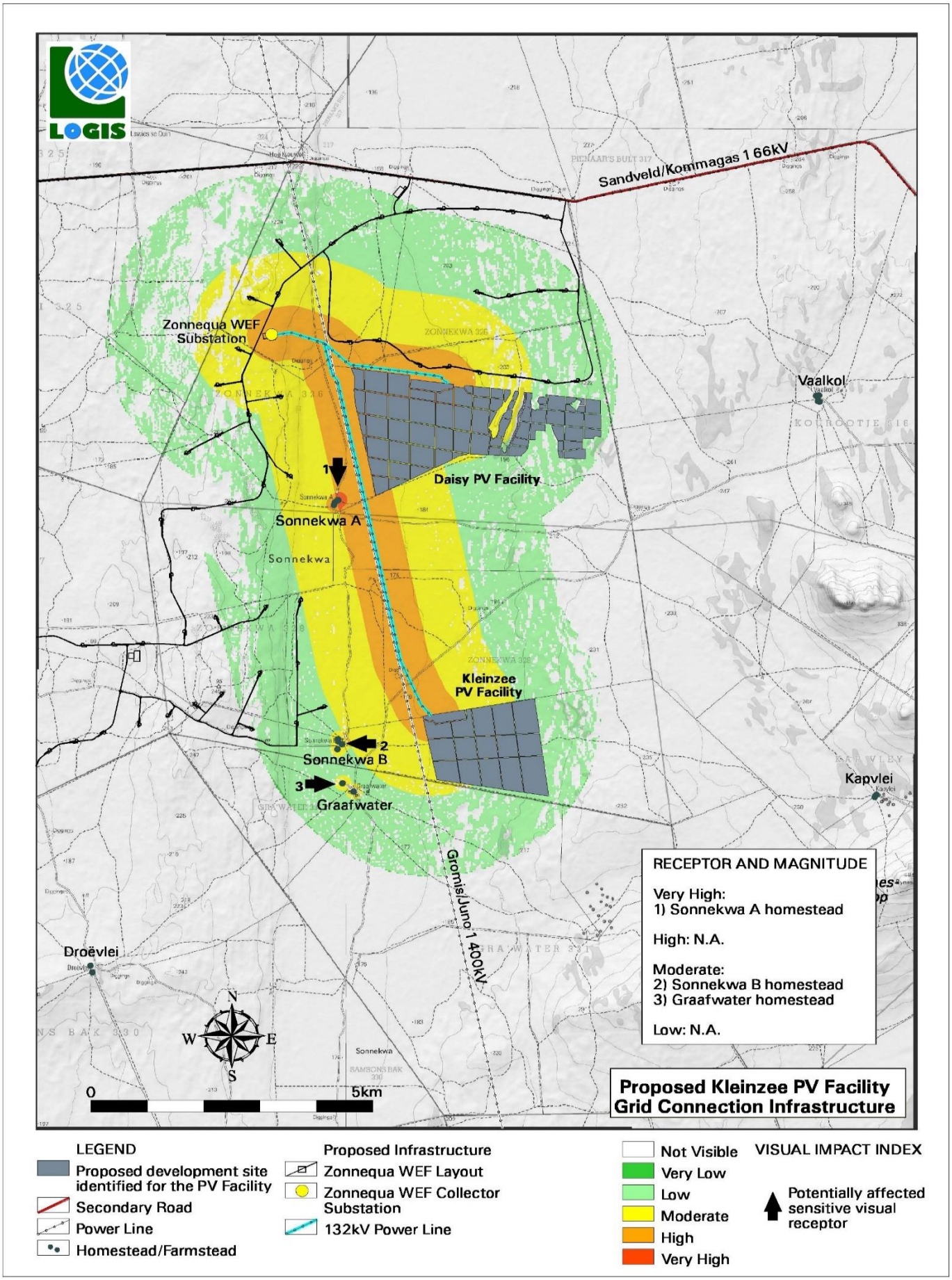

LOGIS
Sandveld/Kommagas 166kV
Zonnequa WEF Substation
Vaalkol
Daisy PV Facility
1
Sonnekwa A
Sonnekwa
Kleinzee PV Facility
2
Sonnekwa B
3
Graafwater
Kapvlei
Gromis/Juno 1400kV
Droëvlei
N
W
E
S
0
5km
RECEPTOR AND MAGNITUDE
Very High:
1) Sonnekwa A homestead
High: N.A.
Moderate:
2) Sonnekwa B homestead
3) Graafwater homestead
Low: N.A.
Proposed Kleinzee PV Facility
Grid Connection Infrastructure
LEGEND
Proposed development site identified for the PV Facility
Secondary Road
Power Line
Homestead/Farmstead
Proposed Infrastructure
Zonnequa WEF Layout
Zonnequa WEF Collector Substation
132kV Power Line
Not Visible
Very Low
Low
Moderate
High
Very High
VISUAL IMPACT INDEX
Potentially affected sensitive visual receptor

Figure 7.7: Visual impact index and potentially affected sensitive visual receptors (grid connection)

7.6.2 Impact table summarising the significance of visual impacts related to the PV facility, grid connection infrastructure and access road during construction and operation (with and without mitigation)

During the construction phase, there may be a noticeable increase in heavy vehicles utilising the roads to the project site that may cause, at the very least, a visual nuisance to other road users and landowners in the area. Construction activities may potentially result in a moderate, temporary visual impact, that may be mitigated to low.

During the operation phase there will be a moderate visual impact on observers (residents and road users) located between a 1-3km radius of the PV facility structures. Mitigation of this impact is possible and both specific measures as well as general "best practice" measures are recommended in order to reduce/mitigate the potential visual impact.

Visual impacts during the operation phase will also include lighting impacts relating to glint and glare. It is possible that the Kleinzee Solar PV Facility may contribute to the effect of glint and glare within the environment which is currently undeveloped.

The tables below are applicable for the Kleinzee Solar PV Facility.

Kleinzee Solar PV Facility
Construction Phase Impacts

Nature of Impact: Visual impact of construction activities on sensitive receptors in close proximity to the proposed PV facility.		
	Without mitigation	**With mitigation**
Extent	Very short distance (4)	Very short distance (4)
Duration	Short term (2)	Short term (2)
Magnitude	Very High (10)	Moderate (6)
Probability	Very Improbable (1)	Very Improbable (1)
Significance	**Low (16)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Planning: » Retain and maintain natural vegetation (if present) immediately adjacent to the development footprint. Construction: » Ensure that vegetation cover adjacent to the development footprint (if present) is not unnecessarily removed during the construction phase, where possible. » Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible. » Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. » Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.		

» Reduce and control construction dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent). » Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts. » Rehabilitate all disturbed areas (if present/if required) immediately after the completion of construction works.
Residual impacts: None, provided rehabilitation works are carried out as specified.

Operation Impacts

Nature of Impact: Visual impact on sensitive receptors within a 1km radius of the PV facility structures		
	Without mitigation	**With mitigation**
Extent	Very short distance (4)	Very short distance (4)
Duration	Long term (4)	Long term (4)
Magnitude	Very high (10)	Moderate (6)
Probability	Very Improbable (1)	Very Improbable (1)
Significance	**Low (18)**	**Low (14)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation / Management: <u>Planning:</u> » Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the development footprint, where possible. » Consult adjacent landowners (if present) in order to inform them of the development and to identify any (valid) visual impact concerns. » Investigate the potential to screen affected receptor sites (if applicable and located within 1km of the facility) with planted vegetation cover. <u>Operations:</u> » Maintain the general appearance of the facility as a whole. <u>Decommissioning:</u> » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.		
Residual impacts: The visual impact will be removed after decommissioning, provided the PV facility infrastructure is removed. Failing this, the visual impact will remain.		

Nature of Impact: Visual impact on residents of homesteads within a 1 – 3km radius of the PV facility structures		
	Without mitigation	**With mitigation**
Extent	Short distance (3)	Short distance (3)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	**Moderate (45)**	**Low (26)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation / Management:

Planning:

» Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the development footprint.

Operations:

» Maintain the general appearance of the facility as a whole.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use.

» Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.

Residual impacts:

The visual impact will be removed after decommissioning, provided the PV facility infrastructure is removed. Failing this, the visual impact will remain.

Nature of Impact:

Visual impact of lighting at night on sensitive visual receptors in close proximity to the proposed PV facility.

	Without mitigation	**With mitigation**
Extent	Very short distance (4)	Very short distance (4)
Duration	Long term (4)	Long term (4)
Magnitude	Very High (10)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	**Moderate (54)**	**Low (28)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

Planning & operation:

» Shield the sources of light by physical barriers (walls, vegetation, or the structure itself).

» Limit mounting heights of lighting fixtures, or alternatively use foot-lights or bollard level lights.

» Make use of minimum lumen or wattage in fixtures.

» Make use of down-lighters, or shielded 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.

Residual impacts:

The visual impact will be removed after decommissioning, provided the PV facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Nature of Impact:

The visual impact of solar glint and glare as a visual distraction and possible road travel hazard

	Without mitigation	**With mitigation**
Extent	Very short distance (4)	N.A.
Duration	Long term (4)	N.A.
Magnitude	Low (4)	N.A.
Probability	Improbable (2)	N.A.
Significance	**Low (24)**	N.A.
Status (positive or negative)	Negative	N.A.
Reversibility	Reversible (1)	N.A.

Irreplaceable loss of resources?	No	N.A.
Can impacts be mitigated?	N.A.	
Mitigation: N.A.		
Residual impacts: N.A.		

Nature of Impact: The visual impact of solar glint and glare on residents of homesteads in closer proximity to the PV facility		
	Without mitigation	**With mitigation**
Extent	Very short distance (4)	Very short distance (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (24)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: <u>Planning & operation</u>: » Use anti-reflective panels and dull polishing on structures, where possible and industry standard. » Adjust tilt angles of the panels if glint and glare issues become evident, where possible. » If specific sensitive visual receptors are identified during operation, investigate screening at the receptor site, where possible.		
Residual impacts: The visual impact will be removed after decommissioning, provided the PV facility infrastructure is removed. Failing this, the visual impact will remain.		

Nature of Impact: Visual impact of the ancillary infrastructure during the operation phase on observers in close proximity to the structures.		
	Without mitigation	**With mitigation**
Extent	Very short distance (4)	Very short distance (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (24)**	**Low (24)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	

Generic best practise mitigation/management measures: Planning: » Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the development footprint/power line servitude where possible. Operations: » Maintain the general appearance of the infrastructure. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.
Residual impacts: The visual impact will be removed after decommissioning, provided the ancillary infrastructure is removed. Failing this, the visual impact will remain.

Nature of Impact: The potential impact on the sense of place of the region.		
	Without mitigation	**With mitigation**
Extent	Medium to longer distance (2)	Medium to longer distance (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (20)**	**Low (20)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Generic best practise mitigation/management measures: Planning: » Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the development footprint/servitude, where possible. Operations: » Maintain the general appearance of the facility as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.		
Residual impacts: The visual impact will be removed after decommissioning, provided the PV facility infrastructure is removed. Failing this, the visual impact will remain.		

Nature of Impact: The potential cumulative visual impact of the PV facility on the visual quality of the landscape.		
	Overall impact of the proposed project considered in isolation (with mitigation)	**Cumulative impact of the project and other projects within the area (with mitigation)**
Extent	Very short distance (4)	Medium to longer distance (2)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)

Probability	Probable (3)	Probable (3)
Significance	**Moderate (42)**	**Moderate (36)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Generic best practise mitigation/management measures: Planning: » Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the development footprint where possible. Operations: » Maintain the general appearance of the facility as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.		
Residual impacts: The visual impact will be removed after decommissioning, provided the PV facility infrastructure is removed. Failing this, the visual impact will remain.		

The tables below are applicable for the Kleinzee Solar PV Facility's Grid Connection.

Kleinzee Solar PV Facility Grid Connection
Construction Phase Impacts

Nature of Impact: Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed grid connection infrastructure.		
	Without mitigation	**With mitigation**
Extent	Very short distance (4)	Very short distance (4)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Moderate (36)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

Planning:

» Retain and maintain natural vegetation immediately adjacent to the development footprint/servitude.

Construction:

» Ensure that vegetation is not unnecessarily removed during the construction phase.
» Plan the placement of lay-down areas (if required) and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.
» Restrict the activities and movement of construction workers and vehicles to the immediate construction area and existing access roads.
» Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed of regularly at licensed waste facilities.
» Reduce and control construction dust using appropriate and effective dust suppression techniques as and when required (i.e. whenever dust becomes apparent).
» Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts.
» Rehabilitate all disturbed areas immediately after the completion of construction works.

Residual impacts:

None, provided rehabilitation works are carried out as specified.

Nature of Impact:

Visual impact on residents at homesteads in close proximity to the power line structures.

	Without mitigation	**With mitigation**
Extent	Very short distance (4)	Very short distance (4)
Duration	Long term (4)	Long term (4)
Magnitude	Very High (10)	Very High (10)
Probability	Improbable (2)	Improbable (2)
Significance	**Moderate (36)**	**Moderate (36)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	

Best Practise Mitigation/Management:

Planning:

» Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude.

Operations:

» Maintain the general appearance of the infrastructure.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use.
» Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.

Residual impacts:

The visual impact will be removed after decommissioning, provided the power line infrastructure is removed. Failing this, the visual impact will remain.

Nature of Impact:

Visual impact on observers travelling along the roads and residents at homesteads within a 1.5 – 3km radius of the grid connection infrastructure.

	Without mitigation	**With mitigation**
Extent	Short distance (3)	Short distance (3)
Duration	Long term (4)	Long term (4)

Magnitude	High (8)	High (8)
Probability	Very Improbable (1)	Very Improbable (1)
Significance	**Low (15)**	**Low (15)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	

Best Practise Mitigation/Management:

Planning:

» Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude.

Operations:

» Maintain the general appearance of the servitude as a whole.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use.
» Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.

Residual impacts:

The visual impact will be removed after decommissioning, provided that the grid connection infrastructure is removed. Failing this, the visual impact will remain.

Nature of Impact:

Visual impact on observers travelling along the roads and residents at homesteads within a 1.5 – 3km radius of the grid connection infrastructure.

	Without mitigation	**With mitigation**
Extent	Short distance (3)	Short distance (3)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	High (8)
Probability	Improbable (2)	Very Improbable (1)
Significance	**Low (30)**	**Low (15)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	

Best Practise Mitigation/Management:

Planning:

» Retain and maintain natural vegetation immediately adjacent to the development footprint/servitude.

Construction:

» Ensure that vegetation is not unnecessarily removed during the construction phase.
» Plan the placement of lay-down areas (if required) and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.
» Restrict the activities and movement of construction workers and vehicles to the immediate construction area and existing access roads.
» Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed of regularly at licensed waste facilities.
» Reduce and control construction dust using appropriate and effective dust suppression techniques as and when required (i.e. whenever dust becomes apparent).
» Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts.
» Rehabilitate all disturbed areas immediately after the completion of construction works.

Residual impacts: The visual impact will be removed after decommissioning, provided that the grid connection infrastructure is removed. Failing this, the visual impact will remain.

Nature of Impact: The potential impact of the development of the proposed grid connection infrastructure on the sense of place of the region.		
	Without mitigation	**With mitigation**
Extent	Medium to longer distance (2)	Medium to longer distance (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (20)**	**Low (20)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Generic best practise mitigation/management measures: Planning: » Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude. Operations: » Maintain the general appearance of the servitude as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.		
Residual impacts: The visual impact will be removed after decommissioning, provided the grid connection infrastructure is removed. Failing this, the visual impact will remain.		

7.6.3 Conclusion

The visual impact of the Kleinzee PV facility and associated grid connection infrastructure that form part of Cluster is expected to increase the area of potential visual impact within the region. The intensity of visual impact (number of PV arrays visible) to exposed receptors, especially those located within a 3km radius, is expected to be greater than it would be for a single solar energy facility. The proposed power line infrastructure is located in the vicinity to an existing power line and various authorised renewable energy facilities with their associated grid connections still to be constructed. The visual amenity along this power line corridor has already been or is already proposed to be compromised to a large degree. Admittedly, the frequency of visual exposure to power line infrastructure is expected to increase, but it is still preferable to consolidate the linear infrastructure as much as possible.

Overall, the significance of the visual impacts for both the Kleinzee Solar PV Facility and its associated grid connection infrastructure is expected to range from moderate to low as a result of the generally undeveloped character of the landscape and the remote location of the project infrastructure. There are a very limited number of potential sensitive visual receptors within a 3km radius of the proposed structures, although the possibility does exist for visitors to the region to venture into closer proximity to the PV facility

structures. These observers may consider visual exposure to this type of infrastructure to be intrusive. The Namaqua National Park lies approximately 25km to the south east of the Kleinzee Solar PV Facility and associated grid connection corridor. The park is not expected to be visually influenced by the PV facility and the development area is also located outside of the viewshed protection zone of the Namaqua National Park

A number of mitigation measures have been proposed. Regardless of whether or not mitigation measures will reduce the significance of the anticipated visual impacts, they are considered to be good practice and should all be implemented and maintained throughout the construction, operation and decommissioning phases of the proposed facility.

If mitigation is undertaken as recommended, it is concluded that the significance of most of the anticipated visual impacts will remain at or be managed to acceptable levels. As such, the Solar PV facility and associated grid connection infrastructure would be considered to be acceptable from a visual impact perspective and can therefore be authorised.

7.7. Assessment of Social Impacts

Potential social impacts and the relative significance of the impacts associated with the development of the Kleinzee Solar PV Facility are summarised below (refer to **Appendix I**).

7.7.1 Results of the Social Impact Assessment

The majority of the social impacts associated with the project are expected to occur during the development's construction phase and are typical of the types of social impacts typically associated with construction activities. These effects will be temporary and short-term (12 – 18 months), but they may have long-term consequences on the surrounding social environment if not properly planned and managed. As a result, the detailed design phase must be carried out in such a way that it does not result in long-term social impacts due to improper placement of project components or associated infrastructure, or mismanagement of construction phase activities.

The positive and negative social impacts identified and assessed for the **construction phase** includes:

Potential positive impacts
- Creation of employment and business opportunities
- Contributions to the local economy
- Skills Development
- Growth of the local communities

Potential negative impacts
- Impacts associated with the presence of construction workers on site
- Threat to safety and security surrounding developments or land users
- Fire Risks
- Pressure on local services
- Impact of heavy vehicles, including damage to roads, safety, noise and dust

The **operations phase** is associated with the following key potential positive and negative social issues.

Potential positive impacts

» Creation of employment and business opportunities
» Contributions to the local economy
» Skills Development
» Development of Renewable energy projects

Potential negative impacts

» In-migration of people (non-local workforce and jobseekers).
» Pressure on local services
» Health and Safety of workers and communities

The social impact of decommissioning the Kleinzee PV project is likely to be significant. While the relatively small number of people employed during the operational phase, the associated funding available for community projects and benefits are significant and expected to end with decommissioning of the plant. With mitigation however, the impacts are assessed to be low.

The Developer should inform and discuss the stakeholder and wider community involved and affected in the governance, management, and implementation of community funds about the decommissioning of the energy project. This communication needs to be timed well in advance of the decommissioning, allowing all relevant parties to prepare. Further consideration is required to develop strategies for rehabilitation of the land.

7.7.2 Impact tables summarising the significance of social impacts related to the PV facility, grid connection infrastructure and access road during construction and operation (with and without mitigation measures)

Construction Phase Impacts

Nature:
Employment opportunities and skills development

Impact description:
The area is sparsely populated, primarily dominated by agricultural development and vacant land within the surrounding communities.

The directly affected communities are unskilled farm workers or individuals working and residing in the surrounding settlements and small towns. Areas such as Kleinzee and Komaggas may attract more semi-skilled workers, a need for employment and direct skill-based work is required aimed at providing either long term employment or generating new skills within the existing work force.

It is vital that all employment be sourced locally where possible, and where not possible (highly skilled provisions) the opportunity for skills transfer is made available.

Several indirect employment opportunities will also be created. Indirect employment opportunities will predominantly be created in the service industry, through the opportunity for the provision of secondary services to the construction team. Services may include, but are not limited to, accommodation, catering, and laundry services.

	Without enhancement	**With enhancement**
Extent	Local – Regional (5)	Regional (4)

Duration	Short-term (1)	Short-term (1)
Magnitude	Low (4)	Moderate (6)
Probability	Probable (3)	Definite (5)
Significance	**Low Positive (30)**	**Medium Positive (55)**
Status (positive or negative)	Positive	Positive
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Enhancement:

» The developers be committed to involving and benefiting the communities surrounding the development, contributing to their development and growth
» It is recommended to conduct structured and proactive engagement sessions within the municipal district, to expose local small, micro and medium enterprises which will benefit from the proposed development
» Training and skills development programmes should be initiated prior to the commencement of the construction phase
» The communities which are most in need of employment on a local level should be considered for employment before outsourcing.

Residual Impacts:

» Initiatives to eliminate unfair discrimination in employment
» Recruit and select suitably qualified individuals from the designated groups
» Employees from designated groups who have been identified in the talent pool should be advanced and accelerated through targeted training and development programs
» Assist individuals in obtaining an initial vocational education and pre-qualification, as well as additional education and training that refreshes knowledge, skills, work and life competencies that are critical for overall development
» Provide portable skills training to employees who express an interest in obtaining such training, with a special emphasis on employees who have been incapacitated or retrenched, in order for them to remain economically active, employable, or self-sustaining in their communities
» Growth of talent is facilitated, thereby providing opportunities for all employees to contribute to their full potential.

Nature:
Contributions to the local economy

Impact description:
The developer should be committed to the long-term socioeconomic development and well-being of the communities in which they operate by contributing to community development that will last long after the PV development has been decommissioned.

It is therefore important that the developer use and source from local suppliers as much as possible to stimulate the local economy, this includes but is not limited to things such as the purchasing of construction materials, provision of services, transportation, and acquisition of other goods.

	Without enhancement	**With enhancement**
Extent	Local – Regional (4)	Local – Regional (4)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Definite (5)
Significance	**Medium Positive (36)**	**Medium Positive (60)**
Status (positive or negative)	Positive	Positive
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Enhancement:		

- » Preference is given to suppliers that are local to the operation where the service will be consumed
- » Establishing liaison and communication structures with the district and local government structures
- » Liaises with the local governmental structures and municipal authorities in the labour- sending communities to ensure that group development initiatives are integrated into the economic and development plans of those areas
- » The continuous review of the economic development of the project during the implementation process will ensure that the project does not become static but is revised in terms of changing needs and also to ensure sustainability
- » It is recommended that a local procurement policy be adopted by the developer to maximise the benefit to the local economy, where feasible
- » Create job opportunities, boost local economies by supporting business activities, and contribute to government tax revenues through the development of the Solar Facility
- » Prior to the start of the construction contractor procurement, the Developer of the Solar Facility should create a database of local companies, specifically Historically Disadvantaged (HD) companies, that qualify as potential service providers (e.g., construction companies, catering companies, waste collection companies, security companies, etc.). These businesses should be informed about the tender process and invited to bid on project-related work, if applicable
- » Engage with local authorities and business organisations to investigate the feasibility of obtaining construction materials, goods, and products from local suppliers, where possible

Residual Impacts:

- » Improved local service sector, growth in local business
- » Community development and stimulation of the local economy
- » Growth in the local markets

Nature:
Safety and security

Impact description:
Temporary increase in safety and security concerns associated with the influx of people during the construction phase.

The commencement of construction activities can be associated with an increase in crime within an area. The perceived loss of security during the construction phase of a project due to an influx of workers and / or outsiders to the area may have indirect effects such as increased safety and security concerns for neighbouring properties, damage to property, increased risk of veld fire, stock theft, poaching, crime and so forth.

It is advised that no personal camp be established onsite, and the labour force will therefore not permanently reside within the area or have any reason to be onsite after hours significantly reducing the probability of such safety and security impacts occurring.

The project proponent should strive to develop and maintain good relationships and ongoing and open communication with neighbouring landowners. Suitable grievance control mechanisms must be developed and implemented, and the local community informed of the grievance mechanism to be followed additionally a security company must be appointed and security measures implemented prior to the commencement of construction activities onsite.

	Without mitigation	**With mitigation**
Extent	Local – Regional (3)	Local (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Moderate Negative (33)**	**Low Negative (16)**

Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Stopping significant unwanted events by focusing on critical control management
» Safety awareness and training as well as positive behaviour reinforcement
» Improving system monitoring and analysis to improve risk management
» Employment of a local security company
» Making the surrounding land owners aware of the dangers associated with the influx of workers during the construction period
» Identifying abandoned buildings and utilizing them or ensuring they can not be used for malicious activities
» Ensuring that access can not be gained to surrounding properties
» Encourage employees to stop working when a workplace is considered unsafe and/or to prevent unsafe actions
» Education, Training and Development Services must be implemented
» Access in and out of the construction area should be strictly controlled by a security company
» The contractor must provide adequate firefighting equipment on site and provide firefighting training to selected construction staff
» Have clear rules and regulations for access to the proposed site to control loitering
» A comprehensive employee induction programme would cover land access protocols, fire management and road safety must be prepared
» A Community Liaison Officer should be appointed
» A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process

Residual Impacts:

» Theft of livestock, equipment and stock
» Trespassing onto private property

Nature:
Increased pressure on local services/resources

Impact description:
Added pressure on economic and social infrastructure during construction as a result of in-migration of people.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Moderate Negative (30)**	**Low Negative (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» It is necessary to appoint a Community Liaison Officer. A method of communication should be implemented, with procedures for filing complaints outlined, so that the local community can express any complaints or grievances about the construction process
» Current procurement channels set up by the mine should be utilized to reduce any complications which may arise from the development

Residual Impacts:

» Possibility of outside workers remaining in the area after construction is completed and subsequent pressures on local infrastructure

Nature:
Increased probability of fire risk

Impact description:
Risk from accidental or intentional fire being set to the surrounding area which then spreads to the adjacent properties

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Moderate Negative (30)**	**Low Negative (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:
» Ensure training is given to employees on the risks of fires
» Ensure that firefighting equipment is present and working
» No fires are to be made on site for any reason
» No hunting or cooking of any animals or plants in or around the development footprint

Residual Impacts:
» None identified

Nature:
Nuisance impacts (noise& dust)

Impact description:
Construction activities will result in the generation of noise and dust, the area is situated in a relatively agricultural area which is not frequently subjected to dust and noise disturbances therefore all possible measures must be made to mitigate these impacts

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	High (8)	Moderate (6)
Probability	Highly Probable (4)	Improbable (2)
Significance	**Medium Negative (44)**	**Low Negative (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:
» During construction, care should be taken to ensure that noise from construction vehicles and plant equipment does not intrude on the residential areas nearby. Plant equipment such as generators, compressors, concrete mixers, and vehicles should be kept in good working order and, where possible, equipped with effective exhaust mufflers
» The movement of construction vehicles on the site should be confined to agreed access road/s

» Heavy vehicle movement during the construction phase should be timed (where possible) to avoid times of the week, such as weekends, when the volume of traffic on the access roads may be higher » Dust suppression measures should be implemented, such as wetting on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers
Residual Impacts: » Noise and Dust generation will remain an issue irrespective of the Solar PV development

Operation Phase Impacts

Nature:
Employment opportunities and skills development

Impact description:
The area is sparsely populated, primarily dominated by agricultural development and vacant land within the surrounding communities.

The directly affected communities are unskilled farm workers or individuals working and residing in the surrounding settlements and small towns. Areas such as Kleinsee and Komaggas may attract more semi-skilled workers, a need for employment and direct skill-based work is required aimed at providing either long term employment or generating new skills within the existing work force.

A PV Facility of this size will create employment opportunities comprising a mixture of skilled, semi-skilled and unskilled positions during the operational phase.

It is vital that all employment be sourced locally where possible, and where not possible (highly skilled provisions) the opportunity for skills transfer is made available.

	Without enhancement	**With enhancement**
Extent	Local – Regional (5)	Regional (4)
Duration	Short-term (1)	Short-term (1)
Magnitude	Low (4)	Moderate (6)
Probability	Probable (3)	Definite (5)
Significance	**Low Positive (30)**	**Medium Positive (55)**
Status (positive or negative)	Positive	Positive
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Enhancement:
» The developers be committed to involving and benefiting the communities surrounding the development, contributing to their development and growth
» It is recommended to conduct structured and proactive engagement sessions within the municipal district, to expose local small, micro and medium enterprises which will benefit from the proposed development
» Training and skills development programmes should be initiated prior to the commencement of the construction phase
» The communities which are most in need of employment on a local level should be considered for employment before outsourcing.

Residual Impacts:
» Initiatives to eliminate unfair discrimination in employment
» Recruit and select suitably qualified individuals from the designated groups
» Employees from designated groups who have been identified in the talent pool should be advanced and accelerated through targeted training and development programs

- » Assist individuals in obtaining an initial vocational education and pre-qualification, as well as additional education and training that refreshes knowledge, skills, work and life competencies that are critical for overall development
- » Provide portable skills training to employees who express an interest in obtaining such training, with a special emphasis on employees who have been incapacitated or retrenched, in order for them to remain economically active, employable, or self-sustaining in their communities
- » Growth of talent is facilitated, thereby providing opportunities for all employees to contribute to their full potential

Nature:
Contributions to the local economy

Impact description:
The developer should be committed to the long-term socioeconomic development and well-being of the communities in which they operate by contributing to community development that will last long after the PV development has been decommissioned.

It is therefore important that the developer use and source from local suppliers as much as possible to stimulate the local economy, this includes but is not limited to things such as the purchasing of construction materials, provision of services, transportation, and acquisition of other goods

	Without enhancement	**With enhancement**
Extent	Local – Regional (4)	Local – Regional (4)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Definite (5)
Significance	**Medium Positive (36)**	**Medium Positive (60)**
Status (positive or negative)	Positive	Positive
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Enhancement:

- » Preference is given to suppliers that are local to the operation where the service will be consumed
- » Establishing liaison and communication structures with the district and local government structures
- » Liaises with the local governmental structures and municipal authorities in the labour- sending communities to ensure that group development initiatives are integrated into the economic and development plans of those areas
- » The continuous review of the economic development of the project during the implementation process will ensure that the project does not become static but is revised in terms of changing needs and also to ensure sustainability
- » It is recommended that a local procurement policy be adopted by the developer to maximise the benefit to the local economy, where feasible
- » Create job opportunities, boost local economies by supporting business activities, and contribute to government tax revenues through the development of the Solar Facility
- » Prior to the start of the construction contractor procurement, the Developer of the Solar Facility should create a database of local companies, specifically Historically Disadvantaged (HD) companies, that qualify as potential service providers (e.g., construction companies, catering companies, waste collection companies, security companies, etc.). These businesses should be informed about the tender process and invited to bid on project-related work, if applicable
- » Engage with local authorities and business organisations to investigate the feasibility of obtaining construction materials, goods, and products from local suppliers, where possible

Residual Impacts:

- » Improved local service sector, growth in local business

» Community development and stimulation of the local economy
» Growth in the local markets

Nature:
Development of renewable energy

Impact description:
South Africa is in the midst of a power crisis. Eskom's ageing infrastructure, reduced reliability and inferior quality of coal, and the significant gap in power generation capacity and demand has left the country susceptible to rolling blackouts. These have also contributed to an increased frequency of load shedding needed to reduce the burden on its power generation facilities.

The rising energy demand has started to overwhelm the existing power generating plants in South Africa. Also, the conventional electricity generating plants are largely responsible for the high greenhouse gas emissions recorded in the country. In an attempt to mitigate CO2 emissions and provide reliable electricity for its people, South Africa is gradually developing its renewable energy sector.

South Africa has some of the best solar and wind resources in the world and currently the running costs are very low as there are effectively no fuel purchases. Prices of solar and wind technology have dropped very sharply in the past 10 years. The cost – including building and other expenses – of solar and wind electricity is now well below the corresponding expenses for electricity from gas, nuclear and even coal. Their extremely low carbon emissions mitigate global warming and makes solar and wind energy attractive for investors.

	Without enhancement	**With enhancement**
Extent	Local – Regional (5)	Local – Regional (5)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium Positive (52)**	**Medium Positive (52)**
Status (positive or negative)	Positive	Positive
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Enhancement:
» None recommended

Residual Impacts:
» Contributing to carbon reduction goals
» Contribution to the allegation of the national energy crisis

Nature:
In migration of individuals for job opportunities

Impact description:
The energy sector currently employs the least number of people in the Nama Khoi LM. The operation of the Kleinzee Solar PV Facility will improve this situation as about 10 jobs may be created for a long-term period (i.e. 20-25 years). Further, employment opportunities will be created within the local municipality and across South Africa as a result of the project's multipliers and the additional electricity supply to the national grid.

The demand for supporting services and other goods and services to be created as a result of multiplier effects will also lead to the creation of additional indirect jobs, increasing the positive effect on employment in the region.

	Without enhancement	With enhancement
Extent	Local – Regional (3)	Local – Regional (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Moderate (39)**	**Moderate (39)**
Status (positive or negative)	Positive	Positive
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Enhancement:

» Employ local where at all possible
» Promote fair and honest employment practises

Residual Impacts:

» Shift in employment from agricultural workers to working at the solar plant.

Nature:
Health and Safety Risks associated with facilities such as a BESS and Substations

Impact description:
Impact description: The project will include a substation, a control and maintenance building, civil works, and electrical infrastructure required to connect to the existing electricity network as well as a Battery energy storage system. The BESS will improve the efficiency and reliability of the electrical grid by collecting energy from the electricity grid, storing it and discharging that energy to provide electricity when needed, in addition to providing critical grid support services.

Unplanned battery fires or explosions may result in the loss of human lives and/or injuries. Assessing the impacts of an unforeseen event is difficult as the nature and severity of the accident cannot be predicted. This is also the case for the operation and maintenance of areas such as substations which must be regulated to ensure that the correct protocols are followed

	Without enhancement	With enhancement
Extent	Long term (4)	Local (1)
Duration	Local (1)	Long-term (4)
Magnitude	High (8)	Moderate (6)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (26)**	**Low (22)**
Status (positive or negative)	Positive	Positive
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Enhancement:

» Compile an Emergency Response Plan and ensure that this is located on within the offices at all times and that all personal are familiar with the procedures.
» Ensure that emergency procedures (in relation to fire, spills, contamination of the ground, accidents to employees, use of hazardous substances, etc.) are established prior to commencing operation.
» Make all emergency procedures available, including responsible personnel, contact details of emergency services, etc. to all the relevant personnel.
» Clearly demarcate emergency procedures at the relevant locations around the property
» Ensure a health and safety representative is on site at all times during operational hours
» Ensure that no fires are permitted on or adjacent to operations except in areas designated for this purpose.

» Liaise with the local fire-firefighting department in regard to correct procedures to combat battery fires. » Properly train staff and crew who operate in these areas on the correct procedures and safety guidelines to follow. » Ensure a spill procedure which informs the community on a way forward in the event of any toxic spillages is available
Residual Impacts: » Health and safety risks to the community

7.7.3 Conclusion

From a social perspective it is concluded that the project is supported, but that mitigation measures should be implemented and adhered to. Positive and negative social impacts have been identified. The assessment of the key issues indicated that there are no negative impacts that can be classified as fatal flaws, and which are of such significance that it cannot be successfully mitigated. Positive impacts could be enhanced by implementing appropriate enhancement measures and through careful planning. Therefore, implementation of mitigation measures will ensure that the proposed development of the 200MW Solar PV facility and associated infrastructure will have social benefits that outweigh the negative impacts. Based on the social assessment, the following general conclusions and findings can be made:

» With a decline in the mining industry and the looming threat of Climate Change, diversifying the economy and capitalizing on the Northern Cape's comparative advantages needs to be considered in order to strengthen the economy and reduce poverty.
» Overall, the reviewed planning documentation supports the development of the proposed development and associated infrastructure as it will provide the necessary infrastructure to support future IPP developments and is situated within a Renewable Energy Development Zone. In addition, the development will benefit the area's economy through job creation and the increased supply of electricity.
» In general, the farmers consulted support the development as they welcomed the extra income that compensation which it could provide.

It is anticipated that during the construction and the operational phase of the proposed project, various employment opportunities, with different levels of skills will be created. In addition, this will also create local business opportunities benefitting the socio-economic development of the local community. Therefore, from a social perspective the development of the Kleinzee Solar PV facility and grid connection is acceptable.

7.8. Assessment of the 'Do Nothing' Alternative

The 'do-nothing' alternative (i.e. no-go alternative) is the option of not constructing the Kleinzee Solar PV Facility. Should this alternative be selected, there would be no environmental impacts on the site due to the construction and operation activities of a PV facility.

a) Land use and biodiversity

The area is currently used for extensive livestock which is considered to be largely compatible with long-term biodiversity maintenance. Many fauna species are to some degree negatively affected by farming including many predators which are targeted due to their negative impact on livestock, while some species may also be vulnerable to habitat loss or degradation and may experience depressed populations within the farming landscape.

In terms of vegetation and plant species, extensive grazing may result in changes in composition towards less palatable species and a reduction in plant cover. This is likely to result in change of species composition and diversity, which is considered a negative impact on terrestrial biodiversity.

The development area falls within an NPAES Priority Focus area and the Namakwa National Park's identified expansion area. If the project is not constructed, it will not present a restriction on the planned expansion of traditional formalised conservation into the affected area. However, there are already other authorised renewable energy projects directly adjacent to the site, and these authorised developments in the affected area will continue to impose restrictions on the future expansion of traditional formalised conservation, given that the affected area is part of the Springbok Renewable Energy Development Zone and the Northern Corridor of the Strategic Transmission Corridors. Nodal development is inevitable, considering the REDZ status of the area.

Overall, the no-go alternative is anticipated to result in a low negative impact on terrestrial biodiversity.

b) Land use and agriculture

The 'do nothing' alternative would result in a lost opportunity for the landowners (in terms of implementing a compatible land use option, while still retaining the current land use and livestock grazing) and the country (in terms of renewable energy). Using the long-term grazing capacity of 45 ha/LSU[27], an area of ~300ha can provide forage to 7 head of cattle. The grazing capacity is very low in comparison to the grazing capacity of the rest of the country. From this perspective the no-go alternative is not preferred when considering land use and agricultural potential of the project site, as grazing is not a sustainable land use.

c) Socio-economic impact

The implementation of the proposed project is expected to result in several positive and negative social impacts. Most negative impacts identified for the project are associated with the construction phase of the project, while the positive impacts are associated with both the construction and operation phases of the project.

The impacts of pursuing the "no-go" alternative can therefore be summarised as follows:

- The benefits would be that there is no disruption from nuisance impacts (noise and dust during construction), visual impacts and safety and security impacts. The impact is therefore neutral.
- There would also be an opportunity loss in terms of limited job creation, skills development, community upliftment and associated economic business opportunities for the local economy. This impact is considered to be negative.
- The opportunity to strengthen the grid connection within the municipal area would be lost which will have a negative impact on economic growth and development and therefore result in negative social impacts.

[27] Following the metadata layer obtained from DALRRD, the long-term grazing capacity of the entire project area is 45 ha/LSU. The ideal grazing capacity is an indication of the long-term production potential of the vegetation layer growing in an area. More specifically, it relates to its ability to maintain an animal with an average weight of 450 kg (defined as 1 Large Stock Unit (LSU)), with an average feed intake of 10 kg dry mass per day over the period of approximately a year. This definition includes the condition that this feed consumption should also prevent the degradation of the soil and the vegetation. The grazing capacity is therefore expressed in several hectares per LSU (ha/LSU) (DALRRD, 2018).

The No-Development option would mean that the electricity generated through renewable sources, in this case solar energy, is not generated and fed into the national electricity grid. In the given and described policy context, this would represent a negative social and environmental cost.

In addition, the employment opportunities associated with the construction and operational phase, as well as the benefits associated with the additional funding for socio-economic and enterprise development measures and the established local ownership entity representing beneficiary communities would be forgone.

d) Conclusion

As the project site experiences ample solar resource and optimal grid connection opportunities are available, not developing the Kleinzee Solar PV Facility and Grid Connection would see such an opportunity being lost. As current land use activities can continue on the project site once the project is operational, the loss of the land to this project during the operation phase is not considered significant. Therefore, from a regional perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of benefits for the regional area.

From the specialist studies undertaken, no environmental fatal flaws were identified to be associated with the Kleinzee Solar PV Facility and Grid Connection. All impacts associated with the project can be mitigated to acceptable levels. If the PV facility is not developed the following positive impacts will not be realised:

- Job creation from the construction and operation phases.
- Economic benefit to participating landowners due to the revenue that will be gained from leasing the land to the developer.
- Meeting of energy generation mix in a most economic and rapid manner.
- Provision of clean, renewable energy in an area where it is optimally available.

As detailed above, the 'do-nothing' alternative will result in a number of lost opportunities. The 'do nothing' alternative is therefore not preferred and not proposed to be implemented for the development of the Kleinzee Solar PV Facility.

CHAPTER 8: ASSESSMENT OF POTENTIAL CUMULATIVE IMPACTS

As identified and assessed in Chapter 7, a PV facility and the associated infrastructure may have effects (positive and negative) on the natural and social environments and on the people living in a project area. The preceding impact assessment chapter has reported on the assessment of the impacts associated with the Kleinzee Solar PV Facility and Grid Connection largely in isolation (from other similar developments).

The DMRE, under the REIPPP Programme, released in 2011 a request for proposals (RFP) to contribute towards Government's renewable energy target and to stimulate the industry in South Africa. The REIPPP Programme has been rolled out in bid windows (rounds) over the past 11 years, in which developers submit planned renewable energy projects for evaluation and selection. The bid selection process considers a number of qualification and evaluation criteria. The proposed tariff and socio-economic development contributions by the project bidder are the main basis for selection after the qualification criteria have been met.

As a result of the REIPPP Programme, there has been a substantial increase in interest in PV facility developments in South Africa (largely in the Northern Cape and North West Provinces), with a number of PV facilities selected as Preferred Bidder projects. It is, therefore, important to follow a precautionary approach in accordance with NEMA to ensure that the potential for cumulative impacts[28] are considered and avoided where possible.

This chapter assesses the potential for the impacts associated with the project to become more significant when considered in combination with the other known or proposed PV facility projects within the area.

8.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of basic assessment reports:

Requirement	Relevant Section
3(j)(i) an assessment of each identified potentially significant impact and risk, including cumulative impacts.	The cumulative impacts associated with the development of the Kleinzee Solar PV Facility are included and assessed within this chapter.

8.2 Approach taken to Assess Cumulative Impacts

The cumulative impacts that have the potential to be compounded through the development of the Kleinzee Solar PV Facility and its associated infrastructure in proximity to other similar developments include impacts such as those listed below. The role of the cumulative assessment is to test if such impacts are relevant to the Kleinzee Solar PV Facility within the project site being considered for the development:

[28] Cumulative impacts in relation to an activity are defined in the Environmental Impact Assessment Regulations (Government Notice R326) as 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 existing and reasonably foreseeable impacts eventuating from similar or diverse activities.

- Unacceptable loss of threatened or protected vegetation types, habitat or species through clearing, resulting in an impact on the conservation status of such flora, fauna or ecological functioning
- Unacceptable risk to avifauna through habitat loss, displacement, collision and interaction with power infrastructure
- Unacceptable loss of agricultural potential and increased soil erosion
- Unacceptable loss of heritage resources
- Complete or whole-scale change in sense of place and character of an area and unacceptable visual intrusion
- Unacceptable impact to socio-economic factors and components

It is important to explore the potential for cumulative impacts as this will lead to a better understanding of these impacts and the potential for mitigation that may be required. The scale at which the cumulative impacts are assessed is important. For example, the significance of the cumulative impact on the regional or national economy will be influenced by PV facility developments throughout South Africa, while the significance of the cumulative impact on visual amenity may only be influenced by PV facility developments that are in closer proximity to each other. For practical purposes a sub-regional scale of 30km has been selected for this cumulative impact evaluation.

Figure 8.1 indicates the location of the Kleinzee Solar PV Facility and grid connection corridor in relation to all other known and viable PV facilities (i.e., projects with a valid Environmental Authorisation) located within a radius of 30km from the project site. These projects were identified using the Department of Forestry, Fisheries and the Environment Renewable Energy Database, and current knowledge of projects being proposed in the area. In the case of the Kleinzee Solar PV Facility, there are four (4) authorised wind farm facilities located within a 30km radius of the project site (refer to **Figure 8.1** and **Table 8.1**). The only solar PV facility is the Daisy PV facility, which is proposed as part of the Kleinsee Cluster (and the BAR is currently in process). The potential for cumulative impacts is summarised in the sections that follow and has been considered within the specialist studies (refer to **Appendices D – I**).

The entire extent of the site falls within the Springbok Renewable Energy Development Zone and within the Northern Corridor of Strategic Transmission Corridors. The REDZ areas have been selected by Government as core nodes for development of wind and solar PV projects, and are supported by Strategic Transmission Corridors to provide grid connection support to these energy projects. The potential for several projects to cluster within these nodes is noted in all REDZ areas, and the cumulative impacts are considered accordingly.

Table 8.1: Renewable energy facilities located within the broader area (within a 30km radius) of the Kleinzee Solar PV Facility

Project Name	DFFE Reference Number(s)	Approximate distance from the Kleinsee Solar PV Facility	Project Status
Eskom Kleinzee Wind Farm	12/12/20/2212	~ 13 km north west	Environmental Authorisation issued
Namas Wind Farm	14/12/16/3/3/1/1971	Directly adjacent and north of the site. Adjacent farm portion of the Kleinsee Solar PV development area	Environmental Authorisation issued
Zonnequa Wind Farm	14/12/16/3/3/1/1970	~ 7 km north	Environmental Authorisation issued

Kap Vley Wind Farm	14/12/16/3/2/1046	~ 4 km south east	Environmental Authorisation issued
Daisy Solar PV Facility	TBC	~ 6 km north	Proposed as part of the Kleinsee Cluster (and the BAR is currently in process)

It should be noted that not all the PV and Wind Energy facilities presently under consideration by various solar and wind energy developers will be built for operation. Not all proposed developments will be granted the relevant permits by the relevant authorities (DFFE, DMRE, NERSA and Eskom) due to the following reasons:

- There may be limitations to the capacity of the existing or future Eskom grid;
- Not all applications will receive a positive environmental authorisation;
- There are stringent requirements to be met by applicants in terms of the REIPPP Programme and a highly competitive process that only selects the most competitive projects;
- Not all proposed PV facilities will be able to reduce the associated negative impacts to acceptable levels or be able to mitigate the impacts to acceptable levels (fatally flawed);
- Not all proposed facilities will eventually be granted a generation license by NERSA and sign a Power Purchase Agreement with Eskom; and
- Not all developers will be successful in securing financial support to advance their projects further.

As there is therefore a level of uncertainty as to whether all the above-mentioned Wind Energy facilities will be implemented, this results in it being difficult to quantitatively assess the potential cumulative impacts. The cumulative impacts of other known PV facilities in the broader area and the Kleinzee Solar PV Facility and Grid Connection are therefore qualitatively assessed in this Chapter. The following potential impacts are considered:

- Cumulative Impacts on Terrestrial Ecology
- Cumulative Impacts on Avifauna
- Cumulative Impacts on Land use, soil and agricultural potential
- Cumulative Impacts on Heritage Resources
- Cumulative Visual Impacts
- Cumulative Social Impacts

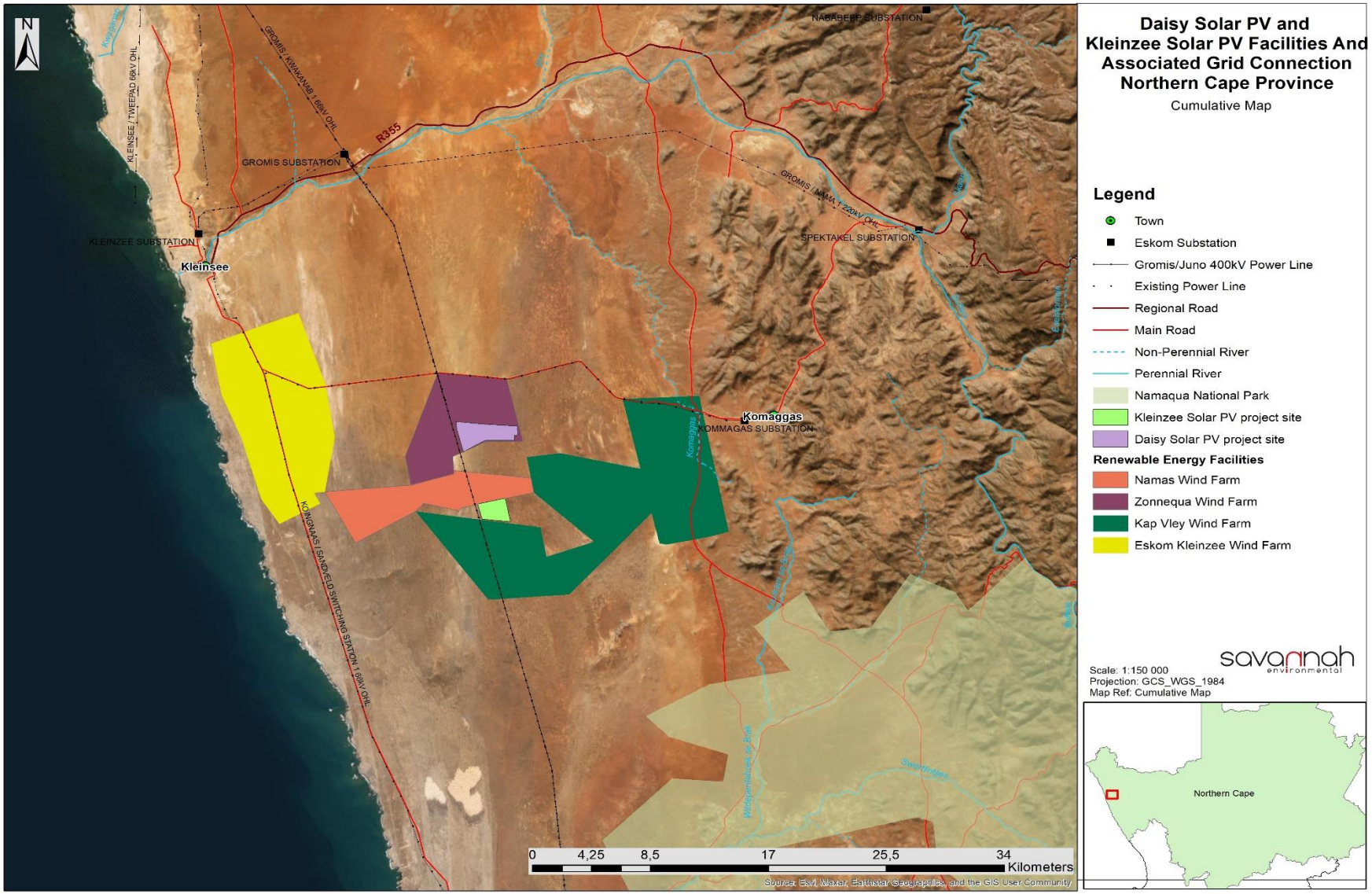


Figure 9.1: Identified Wind Energy facility projects located within a 30km radius of the Kleinzee Solar PV Facility and Grid Connection that are considered as part of the cumulative impact assessment for the Kleinzee Solar PV Facility and Grid Connection project

8.3 Cumulative Impacts on Terrestrial Ecology

Cumulative impacts associated with the Kleinzee Solar PV Facility and grid connection corridor have been identified by the ecological specialist (refer to **Appendix D**) and are assessed in context of the extent of the proposed project area; other developments in the area; and general habitat loss and transformation resulting from other activities in the area.

The majority of the Kleinzee PV Facility site falls within a CBA2, with the remainder of the site falling within an ESA. The whole of the site falls within a NPAES Focus Area associated with the Namakwa National Park, which lies approximately 20km south of the site.

CBA2: As areas of CBA2 are not considered to be irreplaceable, the development is not considered to have a very high impact on the affected CBA2, which is considerably larger than the site. The ecologist has interrogated the environment based on the habitats and quality of the vegetation present in the field[29]. The field assessment did not identify any significant biodiversity features within the site, with the result that the development would not have a high impact on biodiversity pattern features. The overall impact of the development on CBAs and broader scale ecological processes is considered to be relatively low and no major impacts to dispersal ability or faunal movement patterns are likely to be generated by the development.

NPAES Focus Areas and potential expansion of the Namakwa National Park: The site falls within the Namakwa National Park Buffer Area and within a priority area for future park expansion. Development of the site would therefore place some limitations on the future expansion of traditional formalised conservation into the affected area. The total area of the affected Focus Area is 377 266ha and the loss of 300 ha of this represents less than 0.01% of the Focus Area. As a result, this loss is, on its own is not considered to represent a significant loss. The impact of the Kleinzee Solar PV Facility on the potential future expansion of the Namakwa National Park or other protected area expansion is considered to be relatively low and is considered acceptable.

There do not appear to be any major concerns for specific fauna species but should all the developments in the area go ahead, this would likely generate significant fragmentation of the landscape for some species and habitat degradation for others. This would however be related largely to the wind energy facilities present and the contribution of the Kleinzee Solar PV Facility to such cumulative impact is considered likely to be low. The increasing development footprint would also have an impact on the local populations of some flora SCC such as *Wahlenbergia asparagoides* (VU), *Helichrysum tricostatum* (NT) and *Leucoptera nodosa* (NT). However, these species are quite dispersed and the overall footprint in area affected by the above facilities amounts to less than 5% of the landscape, with the result that these species are unlikely to be significantly affected overall.

The development of the Kleinzee PV Facility would result in habitat loss and an increase in overall cumulative impacts on fauna and flora in the area. The contribution of the Kleinzee PV Facility to cumulative impact 300 ha is not considered highly significant, given the lack of sensitive features within the development area

[29] The Northern Cape CBA map does not include any information on why a specific area has been included as a CBA, with the result that it is not possible to interrogate the map to establish the underlying reasons why the areas within the project site have been classified as CBA2.

and the contiguous, concentrated nature of PV development. In addition, there are no observable corridors or gradients evident across the site that would be likely to be disrupted by the development.

Nature:
Development of the Kleinzee PV Facility may impact on broad-scale ecological processes such as the ability of fauna to disperse. The development would potentially contribute to habitat degradation and the loss of landscape connectivity and ecosystem function within the area, but this is likely to be relatively low as most species are likely to be able to avoid or move around the facility.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Low (4)
Probability	Improbable (2)	Probable (3)
Significance	**Low (16)**	**Low (27)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	Low	Low
Can impacts be mitigated?	Only partly as a significant proportion of the impact results from the presence and operation of the facility which cannot be well mitigated.	

Mitigation

- Ensure that the mitigation hierarchy is applied with a particular emphasis on reducing the development footprint, rehabilitating disturbed areas and minimising degradation around the site.
- An open space management plan should be developed for the site, which should include management of biodiversity within the affected areas, as well as that in the adjacent veld.

Residual Risks
The presence and operation of the facility would potentially represent an obstacle for some fauna which would experience some fragmentation as a result of the facility.

8.4 Cumulative Impacts on Avifauna

Cumulative impacts from an avifauna perspective include exacerbated displacement and loss of habitat. In addition, the grid connection (via power lines) of these facilities could potentially contribute towards bird strikes with powerlines and PV structures in the region.

The cumulative avifauna impacts, considering the development of the Kleinzee Solar PV Facility and the wind farms within the surrounding area will be of medium significance.

Nature:
The impact of the Kleinsee solar energy facility proposed in the Kleinsee area is expected to be negative and arise from disturbance, displacement, and possibly collision for birds around the solar panels.
The direct potential impact of the four wind farms and two solar farms was gauged using a review of data in 2020 Birdlife South Africa for fatalities at 20 wind farms in South Africa (Perold et al. 2018).
About 4.6 birds per turbine per year, or 2.0 ± 1.3 birds per MW per year are killed annually at wind farms and 4.5 ± 3.5 birds per MW are killed at (one) solar farm (Visser et al. 2018).

If a total of 681.2 MW (wind) and 380 MW (solar) is generated per year from facilities within 50km, it is estimated that about 3072 birds could be killed annually, of which 36% (1106 birds) are likely to be raptors. Since about 17% of these raptors are threatened Red Data species (Simmons and Martins 2018), about 188 threatened raptors are forecast to be killed. Therefore, the likely impact is forecast to high without mitigation – but careful mitigation can reduce this to medium levels.

The contribution of the Kleinzee solar PV project is low in comparison to the wind farm projects authorised in this area.

	Contribution of Proposed Kleinsee solar farm project*	**Cumulative Impact Of all renewable projects within 50 km**
Extent	Local (1)	Regional (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	High (9)
Probability	Medium Probability (3)	Probable (4)
Significance (E+D+M]P	**Low (24)**	**Medium-high (64)**
Status (positive/negative)	Negative	Negative
Reversibility	Medium	Medium
Loss of resources/species?	Unlikely	Likely
Can impacts be mitigated?	Probably, Yes	Yes

Confidence in findings:
Medium: the avian fatality data released by Birdlife South Africa and Visser et al. (2018) allows for the estimation of the probable avian mortality, but they may over-estimate avian mortality rates in the arid conditions typical in the north-western part of South Africa. Passage Rates and occurrence of Collision-prone species are typically low when annual rainfall is low, and mortality is thus expected to fluctuate with weather conditions and increase at times of high rainfall. The mitigation measures suggested to avoid major raptor fatalities is unknown for each of the wind farms in the Cumulative Assessment. Without mitigation measures (i.e., the avoidance of high-use and high-risk areas) the chances of mortality will increase greatly.
**With mitigation*

Given the general assumption that power line length and bird impacts are linearly related, a starting point in determining cumulative impacts due to other power lines is to determine:

» the number of birds killed by collision with the existing power lines surrounding the site; and
» the length and size of the existing power lines within a 50km radius.

The number of power lines, and their length are indicated in **Table 8.1**. The bustards were used as a proxy for other species, as they are among the most collision-prone species.

Table 8.1: Power lines within 50km of the Kleinsee Solar PV Farm and associated (adjusted) bustard fatalities from similar size power lines (Shaw 2015)

	Power line	**Voltage**	**Length within the 50-km radius**	**Rate of bustard deaths from same-size power lines**	**Estimated number of bustard deaths/y**
1	Gromis-Juno	400 kV	99 km	1.05 b/km/y	104
2	Gromis-Kleinsee-Koingnaas	66 kV	78 km	0.37 b/km/y	29
3	Kommagaas-Sandveld	66 kV	36 km	0.37 b/km/y	13
Totals: 3 OHPL (400kV + two 66kV) totalling 213-km are estimated to kill 146 bustards per year					

Given the following fatality rates associated with different sized power lines:
- transmission lines of > 220kV kill ~1.05 bustards/km/yr (Shaw 2013); and
- distribution lines of 66kV kill ~0.37 bustards/km/yr (Shaw 2013)

A cumulative total of 146 Red Data bustards per year are expected to be killed by these 400kV and 66kV power lines per year. This is a high number and is therefore classified of medium-high significance. Staggered pylons as a mitigation measure are recommended for all power lines in such areas. In addition, bird flight diverters should be installed as and when necessary.

8.5 Cumulative Impacts on Land Use, Soil and Agricultural Potential

Cumulative impacts have been identified from an agricultural perspective. These include a cumulative impact on areas susceptible to soil erosion, areas with compacted soils and an increased risk of soil pollution. The overall impact of the proposed project when considered in isolation was assessed as low. The cumulative impact of the project and other projects in the area were assessed to be medium.

Nature: Decrease in areas with suitable land capability for livestock grazing.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Regional (2)
Duration	Short duration - 2-5 years (2)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Highly likely (4)	Highly likely (4)
Significance	**Low (28)**	**Medium (40)**
Status (positive/negative)	Negative	Negative
Reversibility	High	Low
Loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	No

Confidence in findings:
High.
Mitigation:
The only mitigation measure for this impact is to keep the footprints of all renewable energy facilities as small as possible and to manage the soil quality by avoiding far-reaching soil degradation such as erosion.

Nature: Increase in areas susceptible to soil erosion		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Regional (2)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Medium (30)**	**Medium (33)**
Status (positive/negative)	Negative	Negative
Reversibility	Low	Low
Loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	No
Confidence in findings: High.		
Mitigation: » Each of the projects should adhere to the highest standards for soil erosion prevention and management. » The area around the project, including the internal access roads, must regularly be monitored to detect early signs of soil erosion on-set; and » If soil erosion is detected, the area must be stabilised using geo-textiles and facilitated re-vegetation.		

Nature: Increase in areas susceptible to soil compaction		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Regional (2)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Probable (3)
Significance	**Low (16)**	**Low (27)**
Status (positive/negative)	Negative	Negative
Reversibility	Low	Low
Loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Confidence in findings: High.		
Mitigation: » Each of the projects should adhere to the highest standards for soil erosion prevention and management. » Vehicles and equipment must travel within demarcated areas and not outside of the construction footprint; » Unnecessary land clearance must be avoided; » Materials must be off-loaded and stored in designated laydown areas; » Where possible, conduct the construction activities outside of the rainy season; and » Vehicles and equipment must park in designated parking areas.		

Nature: Increase in areas susceptible to soil pollution		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Regional (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Medium (30)**
Status (positive/negative)	Negative	Negative
Reversibility	Low	Low
Loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	No
Confidence in findings: High.		
Mitigation: » Each of the projects should adhere to the highest standards for soil erosion prevention and management. » Maintenance must be undertaken regularly on all vehicles and construction/maintenance machinery to prevent hydrocarbon spills; » Any waste generated during construction must be stored into designated containers and removed from the site by the construction teams; » Any left-over construction materials must be removed from site; » The construction site must be monitored by the Environmental Control Officer (ECO) to detect any early signs of fuel and oil spills and waste dumping; » Ensure battery transport and installation by accredited staff / contractors; and » Compile (and adhere to) a procedure for the safe handling of battery cells during transport and installation.		

8.6 Cumulative Impacts on Heritage (including archaeology and palaeontology)

The proposed renewable energy facilities are located within a belt of approved renewable energy facilities located inland of Kleinzee and within the Springbok REDZ. In addition, this area is already impacted by the numerous active mines located here.

In terms of impacts to heritage resources, it is preferred that this kind of infrastructure development is concentrated in one location and is not sprawled across an otherwise culturally significant landscape. The proposed development is therefore unlikely to result in unacceptable risk or loss, nor will the proposed development result in a complete change to the sense of place of the area or result in an unacceptable increase in impact. The facility is not likely to result in an unacceptable increase in impact due to its location, considering it is one of several renewable energy facilities in this area. Furthermore, this development is located within the Springbok REDZ, an area that has been pre-identified as suitable for renewable energy development. As such, cumulative impact is expected within this area, but the preference is for the consolidation of infrastructure to areas where existing impacts occur. The anticipated cumulative impact is expected to be of low significance, which is considered to be acceptable from a heritage perspective.

Nature: Cumulative Impact to the sense of place and known archaeological and palaeontological resources		
	Overall impact of the proposed project	**Cumulative impact of the project and**

	considered in isolation	other projects in the area
Magnitude	Low (4)	Moderate (5)
Duration	Medium-term (3)	Long-term (4)
Extent	Low (1)	Low (1)
Probability	Improbable (2)	Probable (3)
Significance	**Low (16)**	**Low (30)**
Status	Neutral	Neutral
Reversibility	High	Low
Irreplaceable loss of resources	Unlikely	
Can impacts be mitigated	NA	
Confidence in findings: High		
Mitigation: None		

8.7 Cumulative Visual Impacts

Cumulative landscape and visual effects (impacts) result from additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments (associated with or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future. They may also affect how the landscape is experienced. Cumulative effects may be positive or negative. Where they comprise a range of benefits, they may be considered to form part of the mitigation measures.

Cumulative effects can also arise from the intervisibility of a range of developments and /or the combined effects of individual components of the proposed development occurring in different locations or over some time. The separate effects of such individual components or developments may not be significant, but together they may create an unacceptable degree of adverse effect on visual receptors within their combined visual envelopes. Intervisibility depends upon general topography, aspect, tree cover or other visual obstruction, elevation, and distance as this affects visual acuity, which is also influenced by weather and light conditions (LI-IEMA (2013)).

The anticipated cumulative visual impact is expected to be of low significance, which is considered to be acceptable from a visual perspective.

Kleinzee Solar PV Facility:
The higher lying western portion of the study area will predominately be exposed to all of the facilities resulting in a moderate cumulative visual exposure. Sensitive visual receptors likely to be cumulatively exposed to all facilities are Sonnekwa B and Graafwater. Additionally, areas located on the northern and western aspects of the line of hills extending from the south to the east of the study area (including Graafwater se Kop and Byneskop) are expected to have a cumulative visual exposure ranging from moderate (2 facilities) at the highest points to low (1 facility) at the base.

The PV Facility, although in line with current development and land use trends in the region and located within the Springbok REDZ, will contribute to the increased cumulative visual impact of renewable energy facilities in the region. The site falls within the Namakwa National Park Buffer Area and within a priority area for future park expansion. The impact of the Kleinzee Solar PV Facility on the potential future expansion of the Namakwa National Park or other protected area expansion is considered to be relatively low and is considered acceptable. The Namaqua National Park lies approximately 25km to the south east, just beyond the boundary of the Springbok REDZ. The park is not expected to be visually influenced by the proposed PV Cluster (Kleinzee and Daisy Solar PV).

The cumulative visual impact of the proposed PV Facilities is ultimately expected to be of moderate to low significance due to their remote location and the general low occurrence of potential sensitive visual receptors. The potential cumulative visual impact is therefore expected to be within acceptable limits, considering the REDZ planning criteria, the approved Wind Energy Facilities in the area and the existing mining disturbance within the region.

Nature: The potential cumulative visual impact of the PV facility on the visual quality of the landscape.		
	Overall impact of the proposed project considered in isolation.	**Cumulative impact of the project and other projects within the area**
Extent	Very short distance (4)	Medium to longer distance (2)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Moderate (42)**	**Moderate (36)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Generic best practise mitigation/management measures: Planning: » Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the development footprint where possible. Operations: » Maintain the general appearance of the facility as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.		
Residual impacts: The visual impact will be removed after decommissioning, provided the PV facility infrastructure is removed. Failing this, the visual impact will remain.		

Kleinzee Solar PV Facility Grid Connection:

The proposed power line infrastructure is located in the vicinity to an existing power line and various authorised renewable energy facilities with their associated grid connections still to be constructed. The visual amenity along this power line corridor has already been or is already proposed to be compromised to a large degree. Admittedly, the frequency of visual exposure to power line infrastructure is expected to increase, but it is still preferable to consolidate the linear infrastructure as much as possible. To this end, the cumulative visual impact associated with the proposed power line is considered to be within acceptable limits, especially considering it is located within the Northern Corridor of the Strategic Transmission Corridors

and the existing mining disturbance within the region. The construction of the grid connection infrastructure for the Kleinzee Solar PV facility may increase the cumulative visual impact of industrial type infrastructure within the region.

The anticipated cumulative visual impact of the proposed grid connection infrastructure is expected to be of moderate significance. This is considered to be acceptable from a visual impact perspective.

Nature: The potential cumulative visual impact of the grid connection infrastructure on the visual quality of the landscape.		
	Overall impact of the project considered in isolation	**Cumulative impact of the project and other projects within the area**
Extent	Very short distance (4)	Medium to longer distance (2)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	High (8)
Probability	Improbable (2)	Probable (3)
Significance	**Moderate (32)**	**Moderate (42)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Generic best practise mitigation/management measures: Planning: » Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude. Operations: » Maintain the general appearance of the servitude as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.		
Residual impacts: The visual impact will be removed after decommissioning, provided the grid infrastructure is removed. Failing this, the visual impact will remain.		

8.8 Cumulative Social Impacts

The potential cumulative impacts on the areas sense of place will be largely linked to potential visual impacts. In this regard the Scottish Natural Heritage (2005) describes a range of potential cumulative landscape impacts associated with wind farms on landscapes. These issues are also likely to be relevant to solar facilities and associated infrastructure. The relevant issues identified by Scottish Natural Heritage study include:

» Combined visibility (whether two or more facilities will be visible from one location).
» Sequential visibility (e.g. the effect of seeing two or more facilities along a single journey, e.g. road or walking trail).
» The visual compatibility.
» Perceived or actual change in land use across a character type or region.
» Loss of a characteristic element (e.g. viewing type or feature) across a character type caused by developments across that character type.

This Solar PV Facility has cumulative impacts; especially, the installation of several Solar PV facilities (in combination with Wind) in the Local Municipality will offer socio-economic prospects for the area, resulting in a positive social benefit. Job creation, skill development, and downstream business opportunities are positive cumulative effects. Local, regional, and national economies could profit from job creation and service procurement if many renewable energy installations are established. This value will be considerably increased if a critical mass is reached that allows local enterprises to develop the capabilities to support building and maintenance activities and to manufacture renewable energy facility components in South Africa. The cumulative impact at the municipal level could be good, encouraging O&M companies to focus on education and training.

The construction of the PV facility and additional power line near would impact existing visual impacts. Given the area's current 'sense of place', the anticipated cumulative visual impact of the facility and grid connection infrastructure is expected to be of moderate significance. This is considered to be acceptable from a visual impact perspective[30].

Nature: An increase in employment opportunities, skills development, and business opportunities with the establishment of a solar PV facility.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local -regional (3)	Local-regional (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Medium (39)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	N/A	N/A
Can impacts be mitigated?	Yes	
Confidence in findings: High.		
Mitigation: The establishment of a number of solar energy plants in the area has the potential to have a positive cumulative impact on the area in terms of job prospects, skill development, and business opportunities. The positive benefits will be magnified if developers hire local service providers and follow local employment policies to maximize project opportunities available to the local community.		

Nature: Negative impacts and change to the local economy with an in-migration of labourers, businesses, and jobseekers to the area.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local-regional (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Low (4)
Probability	Very improbable (1)	Improbable (2)
Significance	**Low (7)**	**Low (22)**

[30] Refer to cumulative assessment in Section 8.7.

Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Confidence in findings: High.		
Mitigation: • Develop a recruitment policy/process (to be implemented by contractors), which will ensure the sourcing of labour locally, where available • Work together with government agencies to ensure that service provision is in line with the development needs of the local area • Form joint ventures with community organisations, through Trusts, which can provide local communities with benefits, such as employment opportunities and services • Develop and implement a recruitment protocol in consultation with the municipality and local community leaders. Ensure that the procedures for applications for employment are clearly communicated		

8.9 Conclusion regarding Cumulative Impacts

Cumulative impacts are expected to occur with the development of the Kleinzee Solar PV Facility and grid connection corridor throughout all phases of the project life cycle and within all areas of study considered as part of this BA Report. The main aim for the assessment of cumulative impacts is to test and determine whether the development will be acceptable within the landscape proposed for the development, and whether the loss, from an environmental and social perspective, will be acceptable without whole-scale change.

The following conclusions can be drawn regarding the cumulative impacts associated with the project:

» There will be no unacceptable loss or impact on ecological aspects (vegetation types, species and ecological processes) due to the development of the Kleinzee Solar PV Facility and other renewable energy facilities within the surrounding area, provided recommended mitigation measures are implemented. The cumulative impact is therefore acceptable. The impact of the Kleinzee Solar PV Facility on the demarcated CBA2 area, the potential future expansion of the Namakwa National Park, or other protected area expansion is considered to be relatively low and is considered acceptable.
» There will be no unacceptable risk to avifauna with the development of the Kleinzee Solar PV Facility and other renewable energy projects within the surrounding area, provided recommended mitigation measures are implemented. The cumulative impact is therefore acceptable. Cumulative impacts of grid connection infrastructure requires mitigation to be considered in the design stage.
» There will be no unacceptable loss of land capability due to the development of the Kleinzee Solar PV Facility and other renewable energy projects within the surrounding areas, provided recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
» Change to the sense of place and character of the area is expected with the development of renewable energy facilities. However, the change is not considered to be a fatal flaw. The anticipated cumulative visual impact of the facility and grid connection infrastructure is expected to be of moderate significance. The site is located well outside of the Namaqua National Park viewshed protection zone.
» There will be no unacceptable loss of heritage resources associated with the development of the Kleinzee Solar PV Facility and other renewable energy projects within the surrounding areas. The cumulative impact is therefore acceptable.

» No unacceptable social impacts are expected to occur. The cumulative impact is therefore acceptable.

A summary of the cumulative impacts is included in **Table 8.2** below.

Table 8.2: Summary of the cumulative impact significance for the Kleinzee Solar PV Facility and grid connection corridor

Specialist assessment	Overall significance of impact of the proposed project considered in isolation	Cumulative significance of impact of the project and other projects in the area (with Mitigation)
Terrestrial Ecology	Low	Low
Avifauna	Low	Medium to High
Land use, soil and agricultural potential	Low to Medium (depending on the impact being considered)	Low to Medium (depending on the impact being considered)
Heritage (archaeology and palaeontology)	Low	Low
Visual	Medium	Medium
Social	Low to Medium (depending on the impact being considered)	Low to Medium (depending on the impact being considered)

The location of the Kleinzee Solar PV facility, the Daisy Solar PV facility, and the surrounding wind farms being considered as part of this cumulative impact assessment within a REDZ is considered to assist with the concentration of the negative impacts within an area, as well as the focussing of positive impacts and benefits. The REDZ are considered to be areas within which significant negative impacts on the natural environment are limited and socio-economic benefits are enhanced. Therefore, the development of renewable energy projects within a REDZ reduces the negative impacts in areas located outside of the REDZ and concentrates the positive impacts within the REDZ thereby creating a positive contribution to the communities present. This supports and contributes the need and desirability of the Kleinzee Solar PV facility within the development area.

Based on the specialist cumulative assessment and findings, the development of the Kleinzee Solar PV Facility and grid connection corridor, and its contribution to the overall impact of all renewable energy facilities to be developed within a 30km radius, it can be concluded that the Kleinzee Solar PV Facility cumulative impacts will be of a medium to low significance. It was concluded that the development of the Kleinzee Solar PV Facility and associated infrastructure will not result in unacceptable, high cumulative impacts and will not result in a whole-scale change of the environment.

CHAPTER 9: CONCLUSIONS AND RECOMMENDATIONS

Energy Team (Pty) Ltd is proposing the development of the Kleinzee Solar PV Facility, a photovoltaic (PV) solar energy facility and associated grid connection infrastructure to add new capacity to the national electricity grid. A project site consisting of five affected properties, has been identified as the preferred area for the development of the solar PV facility and the associated infrastructure:

PV Facility: Portion 4 of the Farm Zonnekwa 328
Grid line corridor: Portions 2, 3 and 4 of the Farm Zonnekwa 328, and Farm Zonnekwa 326 and Portion 1 of Farm Zonnekwa 326

A main access road up to ~4km in length and up to 8m in width will provide access to the facility, and ultimately to both planned solar PV sites (that is, a shared access route). The access to the facility/ies will be via an existing (unnamed) gravel road off the DR2964 between Komaggas and Kleinsee. This gravel road is well established, however it's likely portions of this road will require upgrading to accommodate the movement of heavy vehicles. This existing road traverses only Farm Zonnkewa 326. From this point, a planned access road up to ~7.5km in length and up to 8m in width located within the 300m grid connection corridor will traverse Farm Zonnkewa 326, Portion 1 of Farm Zonnekwa 326, Portions 2, 3 and 4 of Farm Zonnkewa 328.

A development area[31] of approximately 300ha has been identified within the study area by the Applicant. This development area has been fully considered within this Basic Assessment (BA) process and assessed in terms of its suitability from an environmental and social perspective. The development area is suitable for the construction of a contracted capacity of up to 200MW PV facility and provided the opportunity for the optimal placement of the infrastructure, ensuring avoidance of major identified environmental sensitivities. The infrastructure associated with the PV facility includes:

- Solar PV array comprising PV modules and mounting structures
- Inverters and transformers
- Low voltage cabling between the PV modules to the inverters
- 33kV cabling between the project components and the facility substation
- 132kV onsite facility substation
- 132kV power line to connect to the grid at the authorised Zonnequa Collector Substation within a 300m wide and 8.5km long corridor
- Battery Energy Storage System (BESS)
- Site offices and maintenance buildings, including workshop areas for maintenance and storage
- Laydown areas
- Site access and internal roads

From a regional perspective, the Kleinzee area is considered favourable for the development of a solar energy facility by virtue of prevailing climatic conditions, relief, aspect, the extent of the affected property, the availability of a direct grid connection (i.e., a point of connection to the national grid) and the

[31] The development area is that identified area where the 200MW PV facility is planned to be located. This area has been selected as a practicable option for the facility, considering technical preference and constraints. The development area is ~300ha in extent.

availability of land on which the development can take place. The full extent of the development area and grid connection corridor is located within the Springbok Renewable Energy Development Zone (REDZ)[32] as well as the Northern Corridor of the Strategic Transmission Corridors[33]. Four authorised wind farm facilities are located north and west of the development area for the Kleinzee Solar PV Facility. The proposed site for the Kleinzee Solar PV Facility falls within the already authorised development area of the Namas Wind Energy Facility.

The facility is proposed in response to identified objectives of the national and provincial government, and local and district municipalities to develop renewable energy facilities for power generation purposes. It is the Developer's intention to bid the solar PV facility under the Department of Mineral Resource and Energy's (DMRE) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme or other public or private off-taker programmes. The development of the facility will assist in achieving the energy mix (through a process of diversification) as set out in the Integrated Resources Plan (IRP), as well as aiding in the stabilisation of the country's electricity supply.

As the project has the potential to impact on the environment, an Environmental Impact Assessment process is required to be completed in support of an application for Environmental Authorisation prior to the commencement of construction and operation of the Kleinzee Solar PV Facility and Grid Connection.

9.1 Legal Requirements as per the EIA Regulations, 2014 (as amended). For the undertaking of a Basic Assessment Report

This chapter of the BA Report includes the following information required in terms of Appendix 1: Content of the BA Report:

Requirement	Relevant Section
3(k) where applicable, a summary of the findings and impact management measures identified in 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	A summary of the findings of the specialist studies undertaken for the Kleinzee Solar PV Facility and Grid Connection has been included in **section 9.2**
3(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.	An environmental impact statement containing the key findings of the environmental impacts of the Kleinzee Solar PV Facility and Grid Connection has been included as **section 9.5**. Sensitive environmental features located within the study area and development area, overlain with the proposed development footprint have been identified and are shown in **Figure 9.1**.

[32] The REDZ are zones identified by the Department of Forestry Fisheries and the Environment (DFFE) as geographical areas of strategic importance for the development of large-scale solar PV and wind energy development activities and which have been earmarked for the development of renewable energy facilities within South Africa as per GNR114 of February 2018 and GNR142 of February 2021.

[33] The Strategic Environmental Assessment for Electricity Grid Infrastructure (EGI) in South Africa has identified five Strategic Transmission Corridors that are of strategic importance for the rollout of the supporting large-scale electricity transmission and distribution infrastructure in terms of Strategic Integrated Project 10: Electricity Transmission and Distribution. The Northern Corridor is one of these five Strategic Transmission Corridors as per GNR113 of February 2018.

Requirement	Relevant Section
3(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.	A reasoned opinion as to whether the Kleinzee Solar PV Facility and Grid Connection should be authorised has been included in **section 9.6**.
3(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.	All conditions required to be included in the Environmental Authorisation of the Kleinzee Solar PV Facility and Grid Connection have been included in **section 10.6**.

9.2 Evaluation of Kleinzee Solar PV Facility and Grid Connection

The preceding chapters of this report together with the specialist studies contained within **Appendices D-I** provide a detailed assessment of the potential impacts that may result from the development of proposed Kleinzee Solar PV Facility and associated infrastructure. This chapter concludes the environmental assessment of Kleinzee Solar PV Facility by providing a summary of the results and conclusions of the assessment of the development area. In so doing, it draws on the information gathered as part of the BA process, the knowledge gained by the environmental specialists and the EAP and presents a combined and informed opinion of the environmental impacts associated with the project.

No environmental fatal flaws were identified in the detailed specialist studies conducted, provided that the recommended mitigation measures are implemented. These measures include, amongst others, the avoidance of no-go features or buffers within the project development area by the development footprint and the undertaking of monitoring, as specified by the specialists.

The potential environmental impacts associated with the Kleinzee Solar PV Facility and grid connection infrastructure identified and assessed through the BA process include:

- Impacts on ecology, including flora and fauna
- Impacts on avifauna
- Impacts to soils and agricultural potential
- Impacts on heritage resources, including archaeology and palaeontology
- Visual impacts
- Social impacts.

9.2.1 Impacts on Ecology (including flora and fauna)

The Terrestrial Biodiversity Assessment (**Appendix D**) undertaken determined that there are no impacts associated with the Kleinzee Solar PV Facility and associated infrastructure that cannot be mitigated to an acceptable level and as such, the assessed layout was considered acceptable.

The Kleinzee PV Facility falls within the Namaqualand Stranded vegetation type, which has been impacted to a relatively limited extent by transformation to date and is classified as Least Threatened. The field assessment found that the site has a relatively low abundance of plant SCC and only *Wahlenbergia asparagoides* (VU) was observed present. There are no significant biodiversity features within the site, and it is considered relatively low sensitivity. The development footprint falls within a NPAES Priority Focus Area and identified expansion area for the Namakwa National Park, with the loss of 300 ha representing less than

0.01% of the Focus Area. Solar PV facilities do not have a large edge effect in terms of noise and disturbance, so their proximity to protected areas is not likely to represent a significant threat to biodiversity.

The development is deemed acceptable from a terrestrial ecological impact perspective, with no impacts that cannot be mitigated. It is the specialist opinion that the development should be authorised subject to mitigation and avoidance measures.

9.2.2 Impacts on Avifauna

The Avifauna Impact Assessment (**Appendix E**), which considered the results of a desktop and two-season site visit of birds on the proposed Kleinzee Solar Energy Facility site indicated a medium level of activity in terms of Passage Rates of Priority species, and medium activity of Red Data species. Low overall species richness (46 species) and medium-low reporting rates for the four species of Priority birds. National Bird Atlas data (SABAP2) suggests that six Red Data species can occur in the area, but only one was seen on this small site. The DFFE Screening Tool Assessment indicated a low risk for the Avian theme. No small, threatened larks (Vulnerable Red Lark, or Near Threatened Barlow's Lark) were recorded on site. This suggests that the avian impact will be low for the proposed PV solar farm site at Kleinsee. The power lines exporting power to the grid pose a medium risk to the birds after mitigation, given their short length and the ability for the proposed line to be aligned and pylons staggered with those of the Gromis-Juno 400kV power line.

Due to the low avian diversity, low Passage Rates, and paucity of highly threatened species on this small site no mitigation measures are required for the solar farm, but the best form of mitigation is the staggered pylon idea (Pallett et al. 2022). No fatal flaws were identified during the assessment. The avian specialists consider the site and facility suitable for development from an avian perspective.

9.2.3 Impacts on Soil and Agricultural Potential

Following the data analysis and impact assessment, the Kleinzee Solar PV Facility and associated infrastructure is considered an acceptable development within the development area in terms of soil and agricultural potential (**Appendix F**).

The total area assessed, has Low land capability and sensitivity. The land capability was calculated by using 30% terrain and soil, and 40% climate capability of the area. The calculations showed that Low land capability has been assigned to soils of the Namib and Coega soil form because of the regic sand and shallow depth that has a very low water holding capacity and structure. The low land capabilities of the soils within the development area is confirmed by the absence of crop field boundaries within the Kleinzee Solar PV Facility development area. With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of impacts of Kleinzee Solar PV is expected to have a Medium and Low impact on soils and agricultural potential, depending on which impact is being considered.

9.2.4 Impacts on Heritage Resources (archaeological and paleontological)

The overall archaeological sensitivity of the Namaqualand with regard to the preservation of Early, Middle and Later Stone Age archaeology as well as Khoe and San heritage, early colonial settlement and the Namaqualand Copper Mining landscape is regarded as very high. The field assessment conducted for this project has demonstrated that the specific area proposed for development has low sensitivity for impacts to significant heritage resources. None of the heritage resources identified fall within the area PV layout provided and as such, no direct impact to any heritage resources is anticipated.

No impact to significant palaeontological heritage is therefore anticipated. However, it is recommended that the Chance Fossil Finds Procedure (**Appendix G**) is implemented during the course of construction activities. The field assessment conducted for this project has demonstrated that the specific area proposed for development has low sensitivity for impacts to significant archaeological heritage. There is no objection to the proposed development of the Kleinzee Solar PV Facility in terms of impacts to heritage resources with the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of impacts of the Kleinzee Solar PV Facility will be low. From the outcomes of the studies undertaken, it is concluded that the solar PV facility can be developed.

9.2.5 Visual Impacts

The significance of the visual impacts for the Kleinzee Solar PV Facility and its associated grid connection infrastructure is expected to range from moderate to low due to the undeveloped landscape and remote location of the project infrastructure. There are a very limited number of potential sensitive visual receptors within a 3km radius of the proposed facility. Likelihood of visual impacts on sensitive visual receptors, including the Namakwa National Park, and observers travelling the along the secondary road are not considered to be fatal flaws. The site is located well outside of the National Park viewshed protection zone. Mitigation measures have been proposed to reduce the significance of the anticipated visual impacts, but they are considered to be good practice and should be implemented and maintained throughout the construction, operation and decommissioning phases of the proposed facility. If mitigation is undertaken as recommended, it is concluded that the significance of most of the anticipated visual impacts will remain at or be managed to acceptable levels, allowing the solar PV facility and associated grid connection infrastructure to be authorised.

9.2.6 Social Impacts

The social impacts identified (including all positive and negative impacts) will be either of a low or medium significance. No negative impacts with a high significance rating have been identified to be associated with the development of the Kleinzee Solar PV Facility and associated infrastructure. All negative social impacts are within acceptable limits with no impacts considered as unacceptable from a social perspective. The recommendations proposed for the project are appropriate and suitable for the mitigation of the negative impacts and the enhancement of the positive impacts. Kleinzee Solar PV Facility is supported at a national, provincial, and local level, and that the proposed project will contribute positively towards a number of targets and policy aims.

Based on the findings of the SIA (**Appendix I**) the proposed establishment of the Kleinzee Solar PV is supported.

9.2.7 Assessment of Cumulative Impacts

Cumulative impacts and benefits on various environmental and social receptors will occur to varying degrees with the development of several renewable energy facilities in South Africa and within the surrounding areas of the development area. The degree of significance of these cumulative impacts is difficult to predict without detailed studies based on more comprehensive data/information on each of the receptors and the site-specific developments. The alignment of renewable energy developments with South Africa's National Energy Response Plan and the global drive to move away from the use of non-renewable energy resources and to reduce greenhouse gas emissions is undoubtedly positive. The economic benefits of renewable energy developments at a local, regional, and national level have the potential to be significant.

Based on the specialist cumulative assessment and findings (**Appendix D** to **Appendix I** and **Chapter 8** of the BA), the development of the Kleinzee Solar PV facility, and its contribution to the overall impact of all proposed wind energy facilities within a 30km radius, it can be concluded that cumulative impacts will be of a low to moderate significance. There are no impacts or risks identified to be considered as unacceptable with the development of Kleinzee Solar PV and other renewable energy facilities within the surrounding area. In addition, no impacts which will result in whole-scale change are expected.

9.3 Environmental Sensitivity Mapping

As part of the specialist investigations undertaken within the project development area, specific environmental features were identified which could be impacted by the placement of the Kleinzee Solar PV facility and grid connection corridor. No features of high sensitivity are required to be avoided or buffered by the PV facility development area. Only ecological sensitivities were identified adjacent to the project site and development area, and these are illustrated in **Figure 9.1**. Only the grid connection corridor and main access road traverse the calcrete feature (which is considered to be of high ecological sensitivity). The facility layout overlain on the sensitivity map is included in **Figure 9.2**. The nature of the infrastructure and the current condition of the environmental feature identified informs the sensitivity rating and its capacity for disturbance and change associated with the proposed development.

In addition, priority areas for meeting conservation targets have also been considered for the broader area. As these are not environmental features, these are not mapped on the environmental sensitivity map in Figure 9.1.

The following provides a description of the ecological sensitivities assessed:

- The impact to the calcrete feature is not considered acceptable owing to the nature of power line, and the existing gravel track in this area.
- The overall impact of the development on CBAs and broader scale ecological processes is considered to be relatively low and no major impacts to dispersal ability or faunal movement patterns are likely to be generated by the development.
- The development would result in some impact on the affected CBA and ESA within the site through habitat loss and disturbance.
- The site falls within the Namakwa National Park Buffer Area and within a priority area for future park expansion. Development of the site would therefore place some limitations on the future expansion of traditional formalised conservation into the affected area. The total area of the affected Focus Area is 377 266ha, and the loss of 300 ha of this represents less than 0.01% of the Focus Area. As a result, this loss

is, on its own is not considered to represent a significant loss. The impact of the Kleinzee Solar PV Facility on the potential future expansion of the Namakwa National Park or other protected area expansion is considered to be relatively low and is considered acceptable.

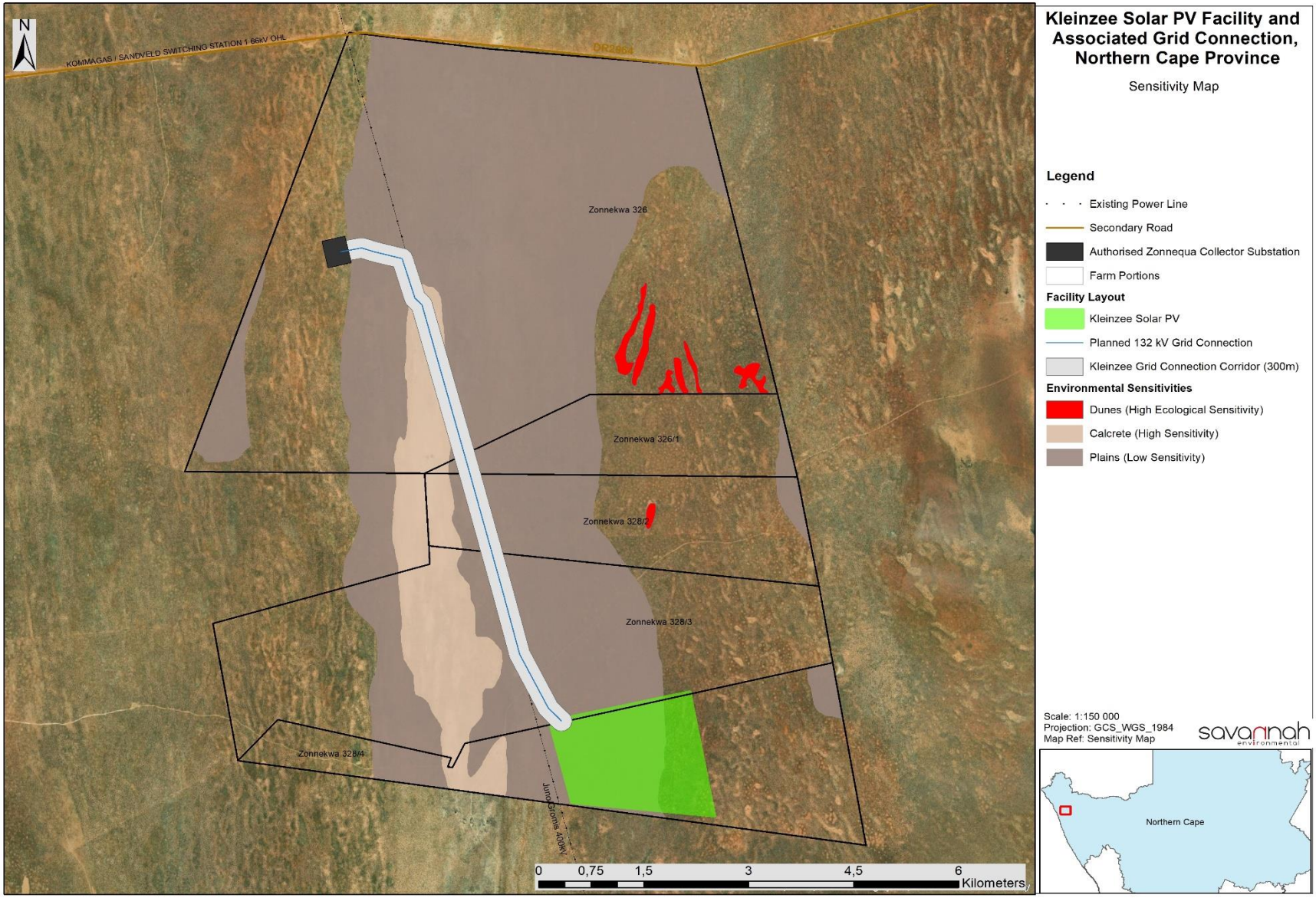


Figure 9.1: Sensitivity map of the development footprint for the Kleinzee Solar PV Facility and grid connection, as was assessed as part of the BAR

9.4 Environmental Costs of the Solar PV Facility versus Benefits of the Solar PV Facility

Environmental costs (including those to the natural environment, economic and social environment) can be anticipated at a local and site-specific level and are considered acceptable provided the mitigation measures as outlined in the Basic Assessment Report and the EMPr are implemented and adhered to. No fatal flaws have been identified.

These environmental costs could include:

- A loss of biodiversity, flora and fauna due to the clearing of land for the construction and utilisation of land for the PV facility. The cost of loss of biodiversity has been minimised/avoided through the implementation of recommendations provided by the specialist. The development will result in a loss of a NPAES area impacting the ecological and conservation value of the broader area. The resulting impact is, however, considered to be acceptable loss.
- Impacts on birds due to a loss of habitat. The impact is however considered to be acceptable without any impact of high significance.
- Heritage impacts associated with the PV facility may occur. The heritage resources are outside of the facility development footprint and have a no-go buffer which is required to be adhered to. Mitigation measures that have been recommended will reduce the anticipated impacts.
- Loss of soil. Soil in the project area will have Low sensitivity, depending on the successful implementation of mitigation measures to prevent soil erosion, compaction, and pollution.
- Visual impacts associated with the PV facility. The PV facility is expected to have a low visual impact pre-mitigation and post mitigation on sensitive receptors. No sensitive receptors are located in close proximity to the proposed PV facility.
- Impacts on the social environment. Socio-economic impacts include impacts on the sense of place the effect on social and economic infrastructure, and crime and social conflicts in the area that could be created during only the construction phase. These impacts though will only affect local communities either temporarily or over the long term. These impacts are not highly significant and can be traded off for the net positive impact created by the project in terms of production, employment, government revenue, community benefits and households' earnings.

Benefits of the Kleinzee Solar PV Facility and grid connection include the following:

- The project will result in important economic benefits at the local and regional scale through job creation, income and other associated downstream economic development. These will persist during the preconstruction, construction, operation and decommissioning phases of the project.
- The project provides an opportunity for a new land use on the affected properties which is considered as a more efficient use of the land and provides an opportunity for financial benefits to the current land use.
- The project contributes towards the Provincial and Local goals for the development of renewable energy as outlined in the respective IDPs.
- The project serves to diversify the economy and electricity generation mix of South Africa through the addition of solar energy.
- The water requirement for a solar facility is negligible compared to the levels of water used by coal-based technologies. This generation technology is therefore supported in dry climatic areas.
- South Africa's per capita greenhouse gas emissions are amongst the highest in the world due to the reliance on fossil fuels. The Kleinzee Solar PV Facility will contribute to achieving goals for implementation of renewable energy and sustaining a 'green' economy within South Africa.

The benefits of the Kleinzee Solar PV Facility are expected to occur at a national, regional, and local level. As the costs to the environment at a site-specific level have been largely limited through the appropriate placement of infrastructure on the project site within lower sensitive areas through the avoidance of features and areas considered to be sensitive, the benefits of the project are expected to partially offset the localised environmental costs of the PV facility.

9.5 Overall Conclusion (Impact Statement)

The preferred activity was determined by the developer to be the development of a renewable energy facility on site using solar irradiation as the preferred technology, due to the availability of a suitable solar resource. Independent specialists were appointed to undertake the assessment of potential impacts associated with the project. The specialists considered desktop data, results from field work, existing literature and the National Web-based Environmental Screening Tool to inform the identification of sensitivities. No environmental sensitivities to avoid were identified, and proposed layout was designed to maximise the use of the available 300ha development area. The specialist findings have indicated that there are no identified fatal flaws associated with the implementation of the project within the development area, or the linear corridor (for the grid connection and access road).

From a review of the relevant policy and planning framework, it was concluded that the project is well aligned with the policy framework, and a clear need for the project is seen from a policy perspective at a local, provincial and National level. Even though the project development area is located within a NPAES Focus Area associated with the expansion of the Namakwa National Park, and within a Critical Biodiversity Areas (CBA2), the development area is still considered to be acceptable by the ecology specialist. When considering biodiversity and socio-economic benefits and impacts on the affected and surrounding areas, the following is concluded from the specialist studies undertaken within this EIA process.

From the specialist assessments, there are no specific long-term impacts likely to be associated with the development of the Kleinzee Solar PV Facility that cannot be reduced to a moderate or low significance. There are no fatal flaws associated with the development that should prevent it from proceeding. Identified ecological sensitivities were identified outside the PV development area, and therefore all sensitivities identified are avoided and recommended buffer areas are honoured. This approach is in line with the application of the mitigation hierarchy, where all the sensitive environmental features which could be impacted by the development have been avoided by the location or siting of the development area (i.e. tier 1 of the mitigation hierarchy). In addition, appropriate mitigation has been proposed to minimise impacts. It was concluded by the ecologist that the project does not adversely impact on the ecological integrity of the area.

The Social Impact Assessment has identified short-term (construction related) impact indicators and operational related socio-economic impact indicators. The assessment of the proposed facility, and its net effect from a socio-economic perspective, indicates that the project would generate greater socio-economic benefits during both the construction and operational phases than the potential losses that could occur as a result of its establishment.

As detailed in the cost-benefit analysis, the benefits of the Kleinzee Solar PV Facility and Grid Connection are expected to occur at a national, regional and local level. The costs to the environment at a site-specific level has been largely limited through the appropriate siting of the development area to avoid

environmental features considered to be sensitive. From an economic perspective, both positive and negative impacts are expected.

Based on the conclusions of the specialist studies undertaken, it can be concluded that the development of the Kleinzee Solar PV Facility based on the current layout as provided by the Applicant will not result in unacceptable environmental impacts (subject to the implementation of the recommended mitigation measures).

9.6 Overall Recommendation

Considering the findings of the independent specialist studies, the impacts identified, the development footprint proposed by the developer within the development site, the avoidance of the sensitive environmental features within the project development area, as well as the potential to further minimise the impacts to acceptable levels through mitigation, it is the reasoned opinion of the EAP that the Kleinzee Solar PV Facility and associated infrastructure (include the grid connection corridor and access road) is acceptable within the landscape and can reasonably be authorised. The proposed layout as provided by the Applicant (**Figure 9.2**) is considered to be acceptable from an environmental perspective.

The following infrastructure would be included within an authorisation issued for the 200MW Solar PV facility project:

PV Facility: Portion 4 of the Farm Zonnekwa 328
Grid line corridor: Portions 2, 3 and 4 of the Farm Zonnekwa 328, and Farm Zonnekwa 326 and Portion 1 of Farm Zonnekwa 326 including:

- Solar PV array comprising PV modules and mounting structures
- Inverters and transformers
- Low voltage cabling between the PV modules to the inverters
- 33kV cabling between the project components and the facility substation
- 132kV onsite facility substation
- 132kV power line to connect to the grid at Zonnequa Collector Substation within a 300m wide and 8.5km long corridor
- Battery Energy Storage System (BESS)
- Site offices and maintenance buildings, including workshop areas for maintenance and storage
- Laydown areas
- Site access and internal roads.

A main access road up to ~4km in length and up to 8m in width will provide access to the facility, and ultimately to both planned solar PV sites (that is, a shared access route). The access to the facility/ies will be via an existing (unnamed) gravel road off the DR2964 between Komaggas and Kleinsee. This gravel road is well established, however it's likely portions of this road will require upgrading to accommodate the movement of heavy vehicles. This existing road traverses only Farm Zonnkewa 326. From this point, a planned access road up to ~7.5km in length and up to 8m in width located within the 300m grid connection corridor will traverse Farm Zonnkewa 326, Portion 1 of Farm Zonnekwa 326, Portions 2, 3 and 4 of Farm Zonnkewa 328.

The grid connection for the facility will consist of underground cabling within the facility, an on-site facility substation and switching substation to be connected to the authorised Zonnequa Substation (located on Farm Zonnekwa 326) via overhead power line (located ~8.5km north of the site). The grid connection infrastructure is to be located within an assessment corridor of 300m wide.

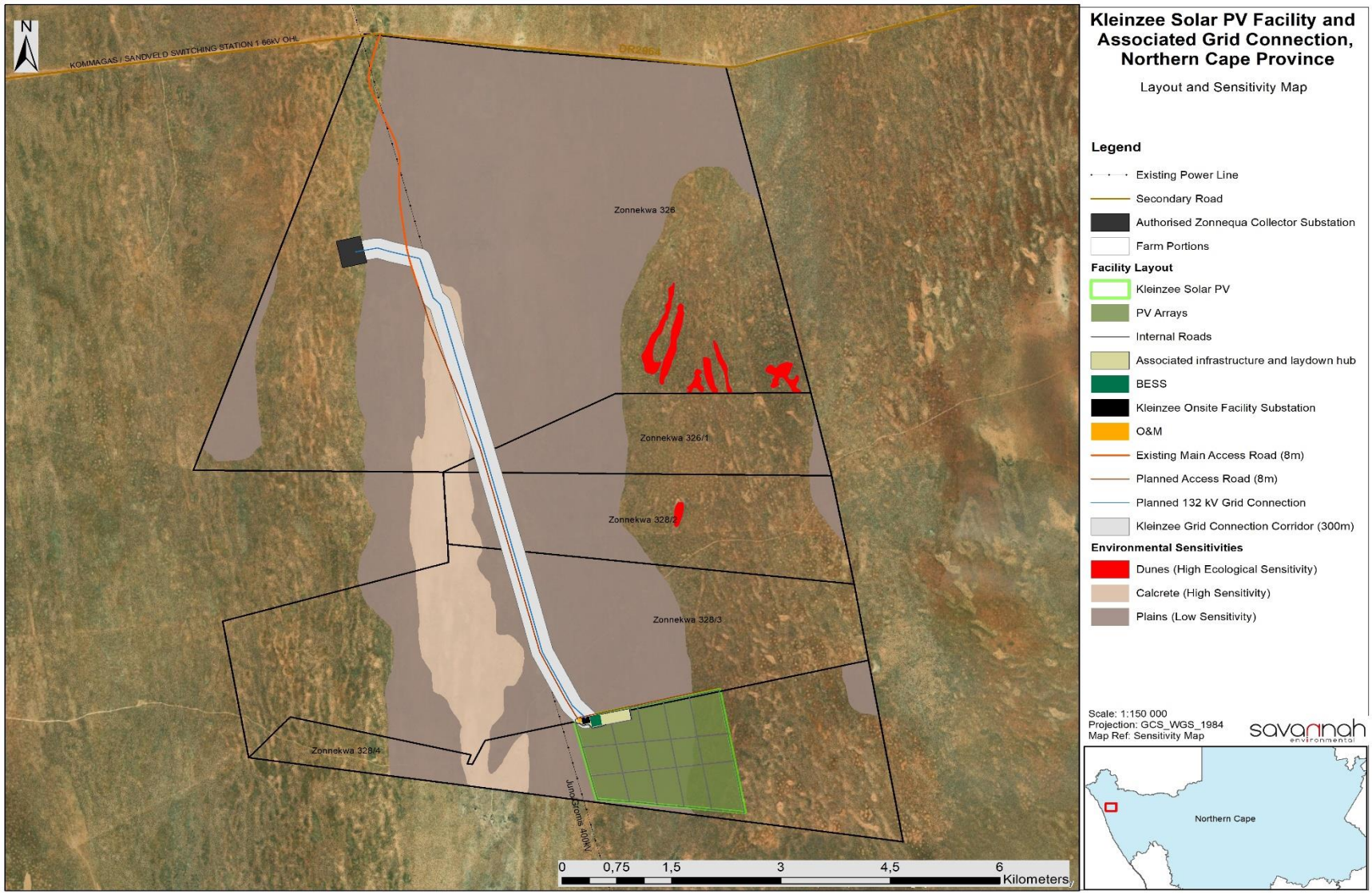


Figure 9.2: Facility layout and sensitivity map of the development footprint for the Kleinzee Solar PV Facility and grid connection, as was assessed as part of the BAR

The following key conditions would be required to be included within an authorisation issued for the Kleinzee Solar PV Facility:

- All mitigation measures detailed within this BA report, as well as the specialist reports contained within **Appendices D to I** are to be implemented.
- The EMPr as contained within **Appendix K** of this BA report should form part of the contract with the Contractors appointed to construct and maintain the solar facility in order to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the Kleinzee Solar PV Facility is considered key in achieving the appropriate environmental management standards as detailed for this project.
- Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan.
- Prior to construction commencing, permits must be obtained from the relevant national and provincial authorities for disturbance or destruction of any protected flora or fauna species.
- A detailed site-specific eradication and management programme for alien invasive plants must be developed and implemented.
- Implement a chance finds procedure for the rescuing of any fossils or heritage resources discovered during construction.
- If any archaeological material or human burials are uncovered during construction activities, work in the immediate area should be halted, the find reported to the heritage authorities and inspected by an archaeologist. Such heritage is the property of the State and may require excavation and curation in an approved institution.
- Monitor all rehabilitated areas for one year following decommissioning and implement remedial actions as and when required.

A validity period of 10 years of the Environmental Authorisation is requested, should the project obtain approval from DFFE.

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Heritage

Heritage Impact Assessments				
Nid	**Report Type**	**Author/s**	**Date**	**Title**
252883	HIA	Jayson Orton	04/07/2012	Heritage Impact Assessment Report for Kleinzee Wind Energy Facility
252884	PIA Desktop	J Pether		Desktop Study - Palaeontological Impact Assessment for the Kleinzee Wind Farm
4476	AIA Phase 1	Dave Halkett, Timothy Hart	01/06/1997	An Archaeological Assessment of the Coastal Strip, and a Proposed Heritage Management Plan For: De Beers Namaqualand Mines Volume 2
4479	AIA Phase 1	Dave Halkett, Timothy Hart	01/03/2001	An Initial Assessment of Heritage Resources on the Coastal Farm, Brazil, Namaqualand
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