ALLEPAD PV THREE

Northern Cape Province
Environmental Impact Assessment Report
February 2019
DEA Reference No.: 14/12/16/3/3/2/1107

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PROJECT DETAILS

DEA Reference No.	:	14/12/16/3/3/2/1107
Title	:	Environmental Impact Assessment Process: Environmental Impact Assessment Report for Allepad PV Three and associated infrastructure proposed on a site near Upington, in the Northern Cape Province
Authors	:	Savannah Environmental (Pty) Ltd Karen Jodas Thalita Botha Nicolene Venter
Applicant	:	ILEnergy Development (Pty) Ltd
Report Status	:	Environmental Impact Assessment Report for Public Review from **28 February 2019 – 01 April 2019**
Date	:	February 2019

When used as a reference this report should be cited as: Savannah Environmental (2018) Environmental Impact Assessment Report for Allepad PV Three and associated infrastructure proposed on a site near Upington, in the Northern Cape Province.

PURPOSE OF THE EIA REPORT AND INVITATION TO COMMENT

ILEnergy Development (Pty) Ltd, proposes the development of Allepad PV Three on a site near Upington in the Northern Cape Province. Allepad PV Three comprises a commercial solar energy generation facility and associated infrastructure and is intended to form part of the Department of Energy's (DoE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme. The REIPPP Programme aims to secure 14 725MW[1] of new generation capacity from Renewable Energy (RE) sources (in accordance with South Africa's Integrated Resource Plan for Electricity (IRP) 2010 – 2030)[2], while simultaneously diversifying South Africa's electricity mix, and positively contributing towards socio-economic, and environmentally sustainable growth. Allepad PV Three will be designed to have a contracted capacity of up to 100MW, and will make use of photovoltaic (PV) solar technology.

In terms of NEMA, the 2014 EIA Regulations (GNR 326), and Listing Notices (Listing Notice 1 (GNR 327), Listing Notice 2 (GNR 325), and Listing Notice 3 (GNR 324)), the development of Allepad PV Three requires Environmental Authorisation (EA) from the National Department of Environmental Affairs (DEA) subject to the completion of a full Scoping and EIA process, as prescribed in Regulations 21 to 24 of the 2014 EIA Regulations (GNR 326). The need for EA subject to the completion of a full Scoping and EIA process is triggered by the inclusion of, amongst others, Activity 1 of Listing Notice 2 (GNR 325).

The EIA report is available for review from **28 February 2019 – 01 April 2019** at the following locations:

» Dawid Kruiper Public Library, Corner of Mark and Mutual Streets, Upington
» www.savannahSA.com

Please submit your comments to:
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The due date for comments on the Scoping Report is **01 April 2019**

Comments can be made as written submission via fax, post or e-mail.

[1] Source: https://www.ipp-renewables.co.za/

[2] Several updates have been made to the promulgated IRP for electricity 2010 – 2030 released in 2011, the most recent of which was released for public comment on 22 August 2018 (Draft IRP 2018). None of these updates were promulgated to replace the IRP 2010 – 2030. The original IRP for electricity 2010 – 2030 released in 2011 therefore remains applicable until such time as an updated IRP is finalised, accepted by Cabinet and promulgated.

EXECUTIVE SUMMARY

The applicant, ILEnergy Development (Pty) Ltd proposes the development of Allepad PV Three on a site near Upington in the Northern Cape Province. Allepad PV Three comprises a commercial solar energy generation facility and associated infrastructure and is intended to form part of the Department of Energy's (DoE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme. The REIPPP Programme aims to secure 14 725MW[3] of new generation capacity from Renewable Energy (RE) sources (in accordance with South Africa's Integrated Resource Plan for Electricity (IRP) 2010 – 2030)[4], while simultaneously diversifying South Africa's electricity mix, and positively contributing towards socio-economic, and environmentally sustainable growth.

The Remaining Extent of Erf 5315 Upington has been identified by the applicant as suitable for a solar PV energy development from a technical perspective due to the available solar resources, access to the electricity grid, current land use, land availability and site-specific characteristics including accessibility.

Allepad PV Three is proposed on the Remaining Extent of Erf 5315 Upington (the project site), which is located approximately 11km north-west of Upington, in the Dawid Kruiper Local Municipality (LM), of the ZF Mgcawu District Municipality (DM), in the Northern Cape Province (refer to **Figure 1**). The project will be designed to have a contracted capacity of up to 100MW, and will make use of either fixed-tilt, single-axis tracking, or dual-axis (double-axis) tracking photovoltaic (PV) solar technology for the generation of electricity.

The proposed project will comprise the following key infrastructure and components:

- Arrays of PV panels with a generation capacity of up to 100MW.
- Mounting structures to support the PV panels.
- Combiner boxes, on-site inverters (to convert the power from Direct Current (DC) to Alternating Current (AC)), and distribution power transformers.
- A 132kV on-site substation up to 1ha in extent to facilitate the connection between the solar energy facility and the Eskom electricity grid.
- A new 132kV double-circuit power line (which will make use of a loop-in and loop-out configuration utilising a double-circuit monopole construction), approximately 9.5km in length, between the on-site substation and Eskom grid connection point.
- Cabling between the project's components (to be laid underground where practical).
- Meteorological measurement station.
- An energy storage area up to 2ha in extent.
- Access road and internal access road network.

[3] Source: https://www.ipp-renewables.co.za/

[4] Several updates have been made to the promulgated IRP for electricity 2010 – 2030 released in 2011, the most recent of which was released for public comment on 22 August 2018 (Draft IRP 2018). None of these updates were promulgated to replace the IRP 2010 – 2030. The original IRP for electricity 2010 – 2030 released in 2011 therefore remains applicable until such time as an updated IRP is finalised, accepted by Cabinet and promulgated.

- On-site buildings and structures, including a control building and office, ablutions and guard house.
- Perimeter security fencing, access gates and lighting.
- Temporary construction camp up to 1ha in extent, including temporary site offices, parking and chemical ablution facilities.
- Temporary laydown area up to 1ha in extent, for the storage of materials during the construction and concrete batching plant.

Electricity generated by the project will feed into Eskom's national electricity grid via a new 132kV double-circuit power line which will connect the on-site substation to the upgraded 132kV double-circuit power line running between the new Upington Main Transmission Substation (MTS) (currently under construction approximately 15km south of the project site), and the Gordonia Distribution Substation (located in Upington town). The point of connection is located approximately 5km east of the project site and will make use of a loop-in and loop-out configuration, utilising a double-circuit monopole structure. The proposed power line required for the project will be constructed within a 31m wide servitude (31m in the Northern Cape and up to 36m in other areas of the country). A 300m wide power line corridor has been identified for investigation along the southern boundary of the site, running immediately north of, and parallel to, the N10 national road[5].

In terms of NEMA, the 2014 EIA Regulations (GNR 326), and Listing Notices (Listing Notice 1 (GNR 327), Listing Notice 2 (GNR 325), and Listing Notice 3 (GNR 324)), the development of Allepad PV Three requires EA from the National Department of Environmental Affairs (DEA), and is subject to the completion of a full Scoping and EIA process, as prescribed in Regulations 21 to 24 of the 2014 EIA Regulations (GNR 326).

The EIA process comprises two phases – i.e. a Scoping and EIA Phase – and involves the identification and assessment of environmental impacts though specialist studies, as well as public participation. The process followed in these two phases can be described as follows:

- The **Scoping Phase** includes the identification and description of potential impacts associated with the proposed project through a desktop study considering existing available information, and consultation with affected parties and key stakeholders. This phase considers the broader project site in order to identify and delineate any environmental fatal flaws, "no-go", or sensitive areas which should be avoided. Following a public review of the Scoping Report, the Scoping Phase culminates in the preparation and submission of a Final Scoping Report and Plan of Study for EIA to the competent authority for acceptance, and approval to continue to the EIA Phase. The Final Scoping Report and Plan of Study for EIA for Allepad PV Three was submitted to DEA on **16 November 2018**, and acceptance was

[5] A total of four 100MW PV projects are proposed for development on the project site (i.e. Allepad PV Three, Allepad PV Two, Allepad PV Three and Allepad PV Three). Should more than one PV project be constructed on the site, the additional plants will be interconnected to each other via the on-site power line corridor (in loop-in and loop-out configurations), and then ultimately be connected to existing Eskom infrastructure in the area, including the possibility of a direct connection to the Upington MTS by additional power lines (the route and details of which are not known at this stage). This transmission inter-connection will be assessed through a separate application for EA at a later stage once routing information and design requirements are given by Eskom.

received on **05 December 2018**, thus marking the start of the EIA Phase.

» The **EIA Phase** includes a detailed assessment of potentially significant positive and negative direct, indirect, and cumulative impacts identified during the Scoping Phase. The EIA Phase considers a proposed development footprint within the identified project site and includes detailed specialist investigations, field work, and public consultation. Following a public review of the EIA Report, the EIA Phase culminates in the preparation and submission of a Final EIA Report and Environmental Management Programme (EMPr), including recommendations of practical and achievable mitigation and management measures, to the Competent Authority for review and decision-making.

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 highly sensitive features within the project site by the development footprint and the undertaking of monitoring, as specified by the specialists. The potential environmental impacts associated with Allepad PV Three identified and assessed through the EIA process include:

Ecology Impacts

During the construction phase, the impacts expected to occur include impacts on vegetation and listed protected plant species and faunal impacts. The significance of the construction phase impacts ranges from medium to low, following the implementation of the recommended mitigation measures by the specialist. No impacts of a high significance were identified prior to the implementation of mitigation.

During the operation phase, the anticipated impacts include faunal impacts, negative impacts on broad-scale ecological processes, an increased erosion risk and potential for increased alien plant invasion. The significance of the impacts for the operation phase are low, following the implementation of the recommended mitigation measures by the specialist. No impacts of a high significance were identified for the project.

It can be concluded that no impacts of high ecological significance were identified which would hinder the development of Allepad PV Three and its associated infrastructure within the proposed development area. The proposed development is considered to be appropriate and acceptable from an ecological perspective at the proposed location, and will not result in detrimental impacts to ecosystems and habitat features present within the project site and within the surrounding properties. The specialist has therefore indicated that the development may be authorised, constructed and operated, subject to the implementation of the recommended mitigation measures.

Impacts on Avifauna

During the construction phase of Allepad PV Three and the grid connection, a loss of habitat and disturbance due to clearance of vegetation is expected to occur. The significance of these impacts can be reduced to medium to low with the implementation of the recommended mitigation measures.

Impacts associated with the operation phase of Allepad PV Three include disturbance and collision with PV panels, as well as disturbance, electrocution and collision with power line infrastructure. The significance of the impacts will be low with the implementation of mitigation measures.

From the results of the avifauna assessment, it can be concluded that no fatal-flaws will be associated with the development of Allepad PV

Three from an avifaunal perspective. The specialist has therefore indicated that the development may be authorised, constructed and operated, subject to the implementation of the recommended mitigation measures.

Impacts on Heritage Resources (Archaeological and Palaeontological)

Impacts on palaeontological and archaeological resources are expected to occur during the construction phase of Allepad PV Three. The impacts relate to the excavations required for the construction of the facility and will occur only in the event that an archaeological or palaeontological resource is present. The significance of the impact will be low and no mitigation has been recommended by the specialist due to the lack of significant heritage resources within the area. The requirement for the development and implementation of a chance find procedure in the event of a heritage find has been included.

Visual Impacts

During the construction phase the undertaking of construction activities will impact on sensitive visual receptors in close proximity to Allepad PV Three. The construction phase will result in a noticeable increase in heavy vehicles utilising the roads which may cause a visual nuisance to other road users and landowners in the area. The construction phase visual impacts will have a low significance following the implementation of the recommended mitigation measures.

Visual impacts expected to occur during the operation phase includes impact on sensitive visual receptors in close proximity (i.e. within 3km) of the facility, visual impact on sensitive visual receptors within the broader region (i.e. within 3-6km), lighting impacts, visual impact of the ancillary infrastructure, the visual impact on sensitive visual receptors located within a 500m radius of the associated power line infrastructure, and a visual impact on the sense of place in the region. The significance of the visual impacts range from low to moderate with the implementation of the recommended mitigation measures. Due to the limited number of sensitive receptors in the area, and due to the presence of other similar in the region, visual impacts are not considered to be a fatal flaw for the development. No mitigation is possible for the visual impact on sensitive visual receptors within 500m of the power line infrastructure, therefore only best practise measures can implemented and have been recommended by the specialist. The specialist has indicated support for the development of Allepad PV Three from a visual perspective provided that recommended mitigation measures are implemented.

Social Impacts

During the construction phase the positive impacts expected to occur include direct and indirect employment opportunities and skills development and socio-economic stimulation. The significance of these impacts are medium with the implementation of the recommended enhancement measures. The negative social impacts expected to occur during the construction phase includes an influx of construction workers and change in population, increase in crime, increased risk of HIV infections, impacts on daily living and moving patterns, nuisance impacts (i.e. noise and dust), hazard exposure and disruption to social and community infrastructure and visual impacts. The significance of the negative construction phase impacts will be low to medium to high with the implementation of the recommended mitigation measures.

During the operation phase the positive impacts expected to occur includes direct and indirect employment opportunities and skills development and a contribution to Local Economic Development (LED) and social upliftment. The significance of the positive operation impacts will

be medium to high with the implementation of the recommended enhancement measures. The negative impacts expected during the operation phase includes a visual and sense of place. The significance of the negative operation impacts will be high with the implementation of the recommended mitigation measures.

Cumulative Impacts

Based on the specialists' cumulative assessments and findings regarding the development of Allepad PV Three and its contribution to the overall impact of all solar energy facilities (PV and CSP) to be developed within a 20km radius, it can be concluded that Allepad PV Three cumulative impacts are expected to be both positive and negative and will be of a low to high significance. There are however no impacts or risks identified to be considered as unacceptable with the development of Allepad PV Three and other solar energy facilities within the surrounding area. In addition, no impacts which will result in whole-scale change are expected.

From the specialist investigations undertaken for Allepad PV Three, the following sensitive areas/environmental features have been identified and demarcated within the project site:

» **Ecology** – The majority of the 300m power line corridor and the development footprint for Allepad PV One has been identified as being of a low ecological sensitivity based on the widely distributed habitat in the region and the fact that the area does not support an extensive tree layer, besides scattered *Parkinsonia africana*. A small section of sandy habitat is traversed by the development footprint of Allepad PV Three which is considered to be acceptable from an ecological perspective. The western half of the site on undulating sandy soils is considered to be low sensitivity and suitable for development apart from the extensive area of mobile dunes which is considered to be medium or high sensitivity and not suitable for development as the loose sands are very vulnerable to erosion. There are dunes located in the north west and central part of this area and then the shrubby plains of the south and central part of the site. The dunes are considered to be medium or high sensitivity and not suitable for development as the loose sands are very vulnerable to erosion. Isolated dunes of medium ecological sensitivity is situated within the 300m power line corridor located adjacent to the main entrance road. The dunes are unlikely to fulfil the same ecological services as the contiguous dune fields located well beyond the development footprint and is considered acceptable. The eastern half of the project site occurs on shallow calcrete soils and has numerous drainage lines as well as a few small pans present. Due to the presence of the drainage system and the difficulty involved in avoiding impact to this feature should development encroach on it, this area is considered to be of very high ecological sensitivity and largely unsuitable for development. Areas of very high and high ecological sensitivity have been avoided by the development footprint. A small pan of high sensitivity is located within the 300m power line corridor and can easily be avoided by the power line route.

» **Bird Habitat and Sensitive Areas** – The project site supports three main avifaunal microhabitats, i.e. the gravel plains, sandy plains, and dunes habitat. These three habitats have different sensitivities, due to the subtle differences in the avifaunal assemblages that they support, especially with respect to red-listed species. The gravel plains located within the eastern section of the project site are considered to be of high sensitivity, due firstly to the habitat diversity of the area and the fact that it supports several pairs of the Near-Threatened Karoo Korhaan (resident) and the Endangered Ludwig's Bustard (nomadic). The drainage lines also

intersect the gravel plains throughout and therefore the ecological functioning of these two habitats are intertwined. The dune habitat located within the western portion of the project site is well represented within the bioregion, but due to the deeper soils, supports a number of protected tree species, such as the *Acacia erioloba, A. haematoxylon* and *Boscia albitrunca, B. foetida subsp. foetida.* These tree species, in turn, provide important nesting and roosting sites for birds, including large raptors. This habitat is therefore considered to be of medium sensitivity due to its importance to a wide variety of avifaunal species. The 300m power line corridor traverse some isolated dunes of medium sensitivity, which is considered acceptable due to the isolated location of the dune. These dunes is also located adjacent the main entrance road to the project site, and therefore is unlikely to fulfil the same ecological services as the contiguous dunes fields located well beyond the development footprint.

The sandy plains habitat represents the most widely distributed habitat in the region, and occurs primarily on shallower soils that do not support an extensive tree layer, besides scattered *Parkinsonia africana*. This habitat is therefore regarded to be of low sensitivity. The development footprint for Allepad PV Three is located within sandy plains considered to be of low sensitivity.

The 300m power line corridor traverse the sandy plains and gravel plains identified within the project site. There are also a number of minor features along the power line corridor, including a small rocky outcrop, a stand of *Acacia mellifera* shrubs, a stand of alien *Prosopis* trees near human habitation, a very small ephemeral pan, as well as some small sewage ponds. These features lie directly adjacent the N10 road and may attract raptors and waterbirds on occasion, although no large red-listed species are expected to be supported by these features. In particular, the small pan is considered far too insignificant in size to support either waterbirds when inundated or coursers when dry. Therefore, the entire length of the 300m power line corridor, which follows the N10 road, is considered to be of low ecological sensitivity.

» **Heritage -** Two heritage sites of some significance were identified within the broader project site and are avoided by the development footprint of Allepad PV Three and the 300m power line corridor. A possible burial site (Grade IIIA) (Site 0506) has been identified within the eastern section of the project site and a no-go buffer of 30m has been recommended by the specialist. A concentration of artefacts (Grade IIIB) (Site 0526) has been identified directly north of the possible burial site and a no-go buffer of a 100m was recommended by the specialist.

The specialist findings have indicated that there are no identified environmental fatal flaws associated with the implementation of Allepad PV Three within the project site. The developer has proposed a technically viable and suitable layout for the project and associated infrastructure which has been assessed as part of the independent specialist studies. All impacts associated with the preferred layout can be mitigated to acceptable levels or enhanced through the implementation of the recommended mitigation or enhancement measures.

Through the assessment of the development of Allepad PV Three within the project site it can be concluded that the development of the PV facility is environmentally acceptable (subject to the implementation of the recommended mitigation measures).

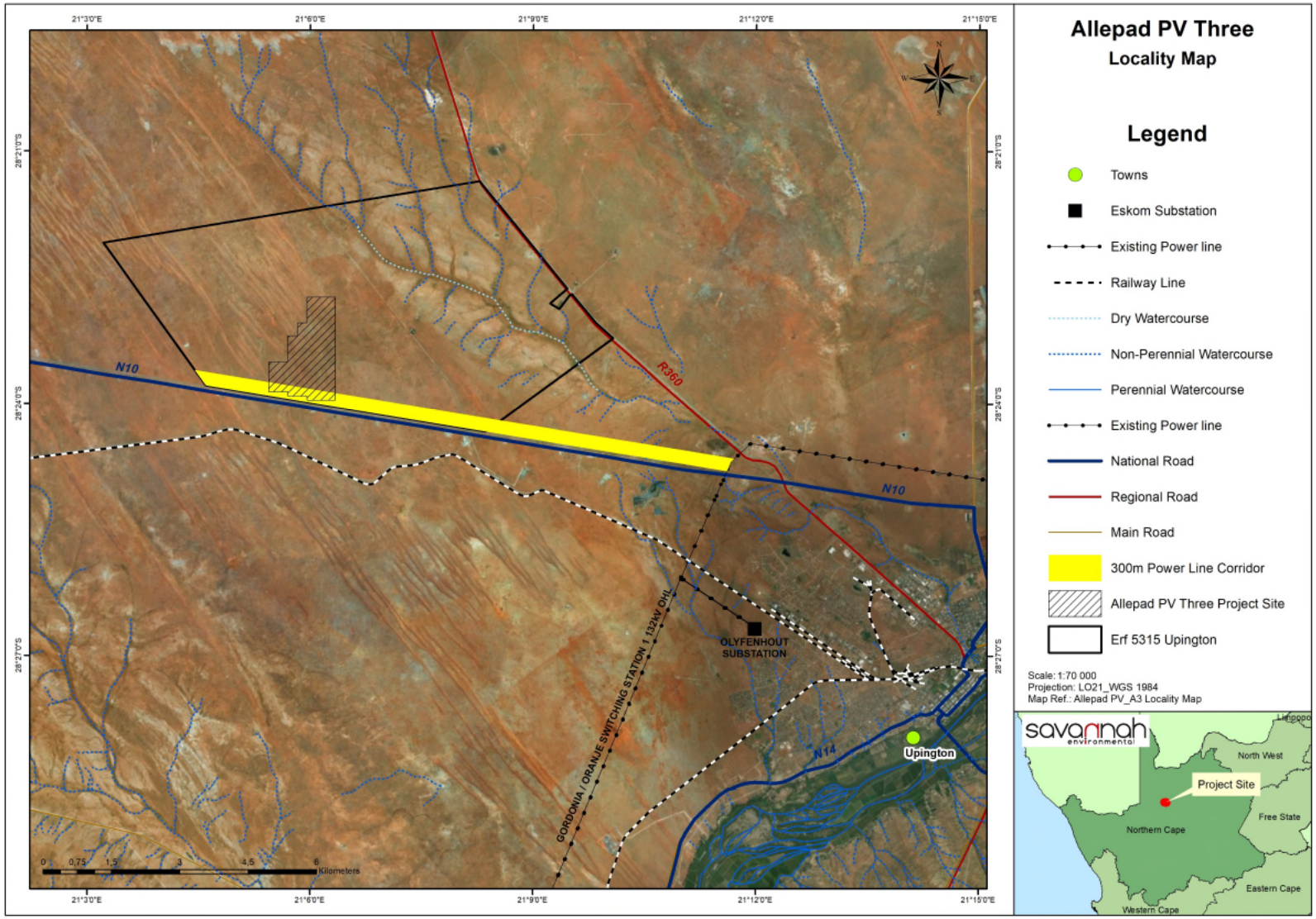

Figure 0: **Locality map illustrating the location of the project site under investigation for the establishment of Allepad PV Three.**

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.

Archaeological material: Remains resulting from human activities which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.

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 as long as such investigation or feasibility study does not constitute a listed activity or specified activity.

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 have an effect on 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.

Perennial and non-perennial: Perennial systems contain flow or standing water for all or a large proportion of any given year, while non-perennial systems are episodic or ephemeral and thus contains flows for short periods, such as a few hours or days in the case of drainage lines.

Photovoltaic effect: Electricity can be generated using photovoltaic solar panels which are comprised of individual photovoltaic cells that absorb solar energy to directly produce electricity. The absorbed solar radiation excites the electrons inside the cells and produces what is referred to as the Photovoltaic Effect.

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).

Riparian: the area of land adjacent to a stream or river that is influenced by stream-induced or related processes. Riparian areas which are saturated or flooded for prolonged periods would be considered wetlands and could be described as riparian wetlands. However, some riparian areas are not wetlands (e.g. an area where alluvium is periodically deposited by a stream during floods but which is well drained).

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.

Waste: means—

a) any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or

object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to this Act; or

b) any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister

Watercourse: as per the National Water Act means -
(a) a river or spring;
(b) a natural channel in which water flows regularly or intermittently;
(c) a wetland, lake or dam into which, or from which, water flows; and
(d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks

Wetlands: land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which under normal circumstances supports or would support vegetation typically adapted to life in saturated soil (Water Act 36 of 1998); land where an excess of water is the dominant factor determining the nature of the soil development and the types of plants and animals living at the soil surface (Cowardin et al., 1979).

ACRONYMS

BGIS	Biodiversity Geographic Information System
BNCA	Bophuthatswana Nature Conservation Act (No. 03 of 1973)
CBA	Critical Biodiversity Area
DAFF	Department of Agricultural, Forestry and Fisheries (National)
DEA	Department of Environmental Affairs (National)
DWS	Department of Water and Sanitation
CBA	Critical Biodiversity Area
CBIPPP	Coal Baseload Independent Power Producer Procurement
CR	Critically Endangered
CSIR	Council for Scientific and Industrial Research
CSP	Concentrated Solar Power
DM	District Municipality
DoE	Department of Energy
EAP	Environmental Assessment Practitioner
EGIS	Environmental Geographic Information System
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
EN	Endangered
EP	Equator Principles
ESA	Ecological Support Area
GA	General Authorisation
GHG	Greenhouse Gas
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
LNG	Liquid Natural Gas
m	Metre
m^2	Square meters
m^3	Cubic meters
m amsl	Metres Above Mean Sea Level
MTS	Main Transmission Substation

MW	Megawatts
NDP	National Development Plan
NEMA	National Environmental Management Act (No. 107 of 1998)
NEM:AQA	National Environmental Management: Air Quality Act (No. 39 of 2004)
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
RE	Renewable Energy
READ	North West Department of Rural, Environmental, and Agricultural Development
REIPPP	Renewable Energy Independent Power Producer Procurement
SABAP	South African Bird Atlas Project
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SAIAB	South African Institute for Aquatic Biodiversity
SANBI	South African National Biodiversity Institute
SANParks	South African National Parks
SDF	Spatial Development Framework
TOPS	Threatened or Protected Species
TNCO	Transvaal Nature Conservation Ordinance (No. 12 of 1983)
UNESCO	United Nations Educational, Scientific and Cultural Organisation
VU	Vulnerable
WB	World Bank
WUL	Water Use License
WWF	World Wide Fund for Nature

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APPENDICES LIST

CHAPTER 1 INTRODUCTION

ILEnergy Development (Pty) Ltd proposes the development of Allepad PV Three on a site near Upington in the Northern Cape Province. Allepad PV Three comprises a commercial solar energy generation facility and associated infrastructure and is intended to form part of the Department of Energy's (DoE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme. The REIPPP Programme aims to secure 14 725MW[6] of new generation capacity from Renewable Energy (RE) sources (in accordance with South Africa's Integrated Resource Plan for Electricity (IRP) 2010 – 2030)[7], while simultaneously diversifying South Africa's electricity mix, and positively contributing towards socio-economic, and environmentally sustainable growth. Allepad PV Three will be designed to have a contracted capacity of up to 100MW, and will make use of photovoltaic (PV) solar technology.

1.1. Project Background

Allepad PV Three is proposed on the Remaining Extent of Erf 5315 Upington (the project site), which is located approximately 11km north-west of Upington, in the Dawid Kruiper Local Municipality (LM), of the ZF Mgcawu District Municipality (DM), in the Northern Cape Province (refer to **Figure 1.1**). The project will be designed to have a contracted capacity of up to 100MW, and will make use of either fixed-tilt, single-axis tracking, or dual-axis (double-axis) tracking photovoltaic (PV) solar technology for the generation of electricity.

The proposed project will comprise the following key infrastructure and components:

- Arrays of PV panels with a generation capacity of up to 100MW.
- Mounting structures to support the PV panels.
- Combiner boxes, on-site inverters (to convert the power from Direct Current (DC) to Alternating Current (AC)), and distribution power transformers.
- A 132kV on-site substation up to 1ha in extent to facilitate the connection between the solar energy facility and the Eskom electricity grid.
- A new 132kV double-circuit power line (which will make use of a loop-in and loop-out configuration utilising a double-circuit monopole construction), approximately 9.5km in length, between the on-site substation and Eskom grid connection point.
- Cabling between the project's components (to be laid underground where practical).
- Meteorological measurement station.
- An energy storage area up to 2ha in extent.
- Access road and internal access road network.
- On-site buildings and structures, including a control building and office, ablutions and guard house.
- Perimeter security fencing, access gates and lighting.

[6] Source: https://www.ipp-renewables.co.za/

[7] Several updates have been made to the promulgated IRP for electricity 2010 – 2030 released in 2011, the most recent of which was released for public comment on 22 August 2018 (Draft IRP 2018). None of these updates were promulgated to replace the IRP 2010 – 2030. The original IRP for electricity 2010 – 2030 released in 2011 therefore remains applicable until such time as an updated IRP is finalised, accepted by Cabinet and promulgated.

- Temporary construction camp up to 1ha in extent, including temporary site offices, parking and chemical ablution facilities.
- Temporary laydown area up to 1ha in extent, for the storage of materials during the construction and concrete batching plant.

Electricity generated by the project will feed into Eskom's national electricity grid via a new 132kV double-circuit power line which will connect the on-site substation to the upgraded 132kV double-circuit power line running between the new Upington Main Transmission Substation (MTS) (currently under construction approximately 15km south of the project site), and the Gordonia Distribution Substation (located in Upington town). The point of connection is located approximately 5km east of the project site and will make use of a loop-in and loop-out configuration, utilising a double-circuit monopole structure. The proposed power line required for the project will be constructed within a 31m wide servitude (31m in the Northern Cape and up to 36m in other areas of the country). A 300m wide power line corridor has been identified for investigation along the southern boundary of the site, running immediately north of, and parallel to, the N10 national road[8].

The key infrastructure components proposed as part of Allepad PV Three are described in greater detail in **Chapter 2** of this EIA Report.

1.2. Requirements for Environmental Authorisation (EA)

Section 24 of South Africa's National Environmental Management Act (No. 107 of 1998) (NEMA) pertains to Environmental Authorisations (EAs), 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. The 2014 EIA Regulations, as amended (GNR 326) published under NEMA prescribe the process to be followed when applying for EA, while the Listing Notices (Listing Notice 1 (GNR 327), Listing Notice 2 (GNR 325), and Listing Notice 3 (GNR 324)) contain those activities which may not commence without EA from the Competent Authority.

In terms of NEMA, the 2014 EIA Regulations (GNR 326), and Listing Notices (Listing Notice 1 (GNR 327), Listing Notice 2 (GNR 325), and Listing Notice 3 (GNR 324)), the development of Allepad PV Three requires EA from the National Department of Environmental Affairs (DEA), and is subject to the completion of a full Scoping and EIA process, as prescribed in Regulations 21 to 24 of the 2014 EIA Regulations (GNR 326). The need for EA subject to the completion of a full Scoping and EIA process is triggered by the inclusion of, amongst others, Activity 1 of Listing Notice 2 (GNR 325)[9], namely:

[8] A total of four 100MW PV projects are proposed for development on the project site (i.e. Allepad PV One, Allepad PV Two, Allepad PV Three and Allepad PV Four). Should more than one PV project be constructed on the site, the additional plants will be interconnected to each other via the on-site power line corridor (in loop-in and loop-out configurations), and then ultimately be connected to existing Eskom infrastructure in the area, including the possibility of a direct connection to the Upington MTS by additional power lines (the route and details of which are not known at this stage). This transmission inter-connection will be assessed through a separate application for EA at a later stage once routing information and design requirements are given by Eskom.

[9] Refer to **Chapter 6** for a full list of applicable listed activities.

"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20MW or more."

In terms of GNR 779 of 01 July 2016, the National DEA has been determined as the Competent Authority (CA) for all projects which relate to the IRP 2010 – 2030, and any updates thereto. The Provincial Northern Cape Department of Environment and Nature Conservation (DENC) is therefore a Commenting Authority on the project.

1.3. Overview of the Environmental Impact Assessment (EIA) Process

The EIA process comprises two phases – i.e. a Scoping and EIA Phase – and involves the identification and assessment of environmental impacts though specialist studies, as well as public participation. The process followed in these two phases can be described as follows:

- The **Scoping Phase** includes the identification and description of potential impacts associated with the proposed project through a desktop study considering existing available information, and consultation with affected parties and key stakeholders. This phase considers the broader project site in order to identify and delineate any environmental fatal flaws, "no-go", or sensitive areas which should be avoided. Following a public review of the Scoping Report, the Scoping Phase culminates in the preparation and submission of a Final Scoping Report and Plan of Study for EIA to the competent authority for acceptance, and approval to continue to the EIA Phase. The Final Scoping Report and Plan of Study for EIA for Allepad PV Three was submitted to DEA on **16 November 2018**, and acceptance was received on **05 December 2018**, thus marking the start of the EIA Phase.
- The **EIA Phase** includes a detailed assessment of potentially significant positive and negative direct, indirect, and cumulative impacts identified during the Scoping Phase. The EIA Phase considers a proposed development footprint within the identified project site and includes detailed specialist investigations, field work, and public consultation. Following a public review of the EIA Report, the EIA Phase culminates in the preparation and submission of a Final EIA Report and Environmental Management Programme (EMPr), including recommendations of practical and achievable mitigation and management measures, to the Competent Authority for review and decision-making.

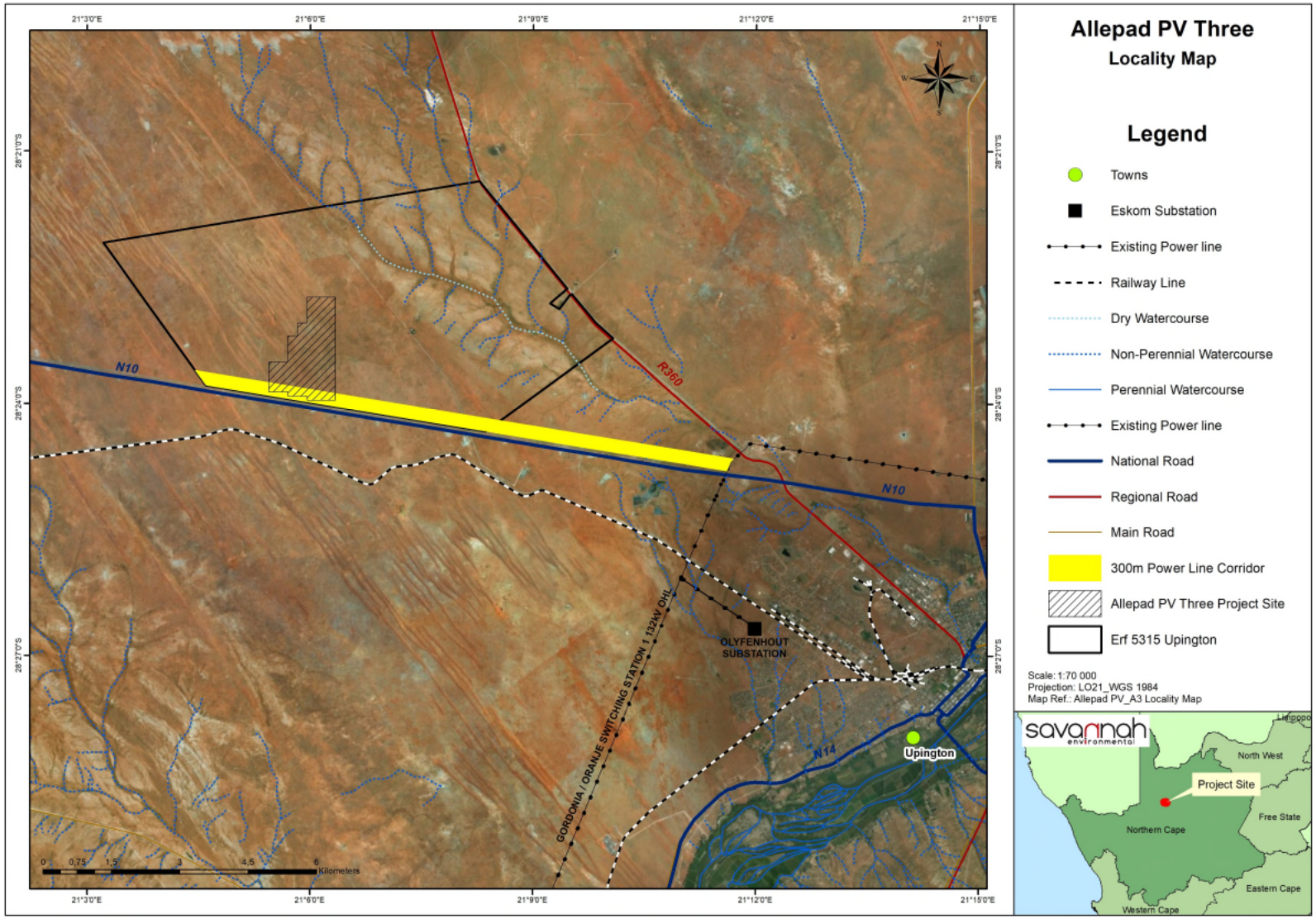

Figure 1.1: Locality map illustrating the location of the project site under investigation for the establishment of Allepad PV Three.

1.4. Overview of the Environmental Impact Assessment (EIA) Process

The EIA process comprises two phases – i.e. a Scoping and EIA Phase – and involves the identification and assessment of environmental impacts though specialist studies, as well as public participation. The process followed in these two phases can be described as follows:

- The **Scoping Phase** includes the identification and description of potential impacts associated with the proposed project through a desktop study considering existing available information, and consultation with affected parties and key stakeholders. This phase considers the broader project site in order to identify and delineate any environmental fatal flaws, "no-go", or sensitive areas which should be avoided. Following a public review of the Scoping Report, the Scoping Phase culminates in the preparation and submission of a Final Scoping Report and Plan of Study for EIA to the competent authority for acceptance, and approval to continue to the EIA Phase. The Final Scoping Report and Plan of Study for EIA for Allepad PV Three was submitted to DEA on **16 November 2018**, and acceptance was received on **05 December 2018**, thus marking the start of the EIA Phase.
- The **EIA Phase** includes a detailed assessment of potentially significant positive and negative direct, indirect, and cumulative impacts identified during the Scoping Phase. The EIA Phase considers a proposed development footprint within the identified project site and includes detailed specialist investigations, field work, and public consultation. Following a public review of the EIA Report, the EIA Phase culminates in the preparation and submission of a Final EIA Report and Environmental Management Programme (EMPr), including recommendations of practical and achievable mitigation and management measures, to the Competent Authority for review and decision-making.

1.5. Appointment of an Independent Environmental Assessment Practitioner (EAP)

In accordance with Regulation 12 of the 2014 EIA Regulations (GNR 326) the applicant has appointed Savannah Environmental (Pty) Ltd as the independent environmental consultants responsible for managing the application for EA and supporting Scoping and EIA process, inclusive of comprehensive, independent specialist studies. The application for EA, and Scoping and EIA process, is being managed in accordance with the requirements of NEMA, the 2014 EIA Regulations (GNR 326), and all other relevant applicable legislation.

Neither Savannah Environmental nor any of its specialist consultants are subsidiaries of, or are affiliated to the applicant. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed solar facility. A signed Environmental Assessment Practitioner (EAP) declaration of interest confirming Savannah Environmental's independence is included in **Appendix J** of this EIA Report.

1.5.1. Details and Expertise of the Environmental Assessment Practitioner (EAP)

Savannah Environmental is a leading provider of integrated environmental and social consulting, advisory and management services with considerable experience in the fields of environmental assessment and management. The company is wholly woman-owned (51% black woman-owned), and is rated as a Level 2 Broad-based Black Economic Empowerment (B-BBEE) Contributor. Savannah Environmental's team have been actively involved in undertaking environmental studies over the past 13 years, for a wide variety of projects throughout South Africa, including those associated with electricity generation and infrastructure development.

This EIA process is being managed by Karen Jodas. She is supported by Thalita Botha and Nicolene Venter.

» ***Karen Jodas*** is a Director at Savannah Environmental (Pty) Ltd, and is the registered EAP for the EIA for this project. Karen holds a Master of Science Degree in Geography (M.Sc. Geomorphology) from Rhodes University, and is registered as a Professional Natural Scientist (Pr.Sci.Nat) with the South African Council for Natural Scientific Professions (SACNASP) in the field of Environmental Science (Registration No.: 400106/99). She has more than 20 years of consulting experience in the field of environmental management, impact assessment and compliance. Her key focus is on strategic environmental assessment and advice, management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines, compliance reporting, the identification of environmental management solutions and mitigation / risk minimising measures, and strategy and guideline development. Karen is currently responsible for the project management of EIAs for several renewable energy projects across the country.

» **Thalita Botha** the principle author of this report. She holds a Bachelor degree with Honours in Environmental Management and has three years of experience in the environmental field. Her key focus is on environmental impact assessments, public participation, environmental management plans and programmes, as well as mapping using ArcGIS for a variety of environmental projects. She is currently involved in several EIAs for energy generation projects across South Africa.

» **Nicolene Venter** is a Social and Public Participation Consultant at Savannah Environmental. Nicolene has a Higher Secretarial Certificate from Pretoria Technicon, and a Certificate in Public Relations from the Public Relation Institute of South Africa at Damelin Management School. Nicolene has over 21 years of experience as a Public Participation Practitioner and Stakeholder Consultant, and is a Board Member of the International Association for Public Participation Southern Africa (IAP2SA). Nicolene's experience includes managing the stakeholder engagement components of large and complex environmental authorisation processes across many sectors, with particular experience in the power sector. Most notably on large linear power lines and distribution lines, as well as renewable energy projects. Nicolene is well versed with local regulatory requirements as well as international best practice principles for community consultation and stakeholder engagement, as well as international guidelines and performance standards. Nicolene is responsible for managing the Public Participation process required as part of the EIA for this project.

Curricula Vitae (CVs) detailing the Savannah Environmental team's expertise and relevant experience are provided in **Appendix A** to this EIA Report.

1.5.2. Details of the Independent Specialist Team

A number of independent specialist consultants have been appointed as part of the EIA project team in order to adequately identify and assess potential impacts associated with the project (refer to **Table 1.1**). The specialist consultants have provided input into this EIA Report as well as the EMPr (refer to **Appendix I**).

Table 1.1: Specialist Consultants which form part of the EIA project team

Specialist Study	Specialist Company	Specialist Name
Ecology (Flora and Fauna)	3Foxes Biodiversity Solutions	Simon Todd
Avifauna	3Foxes Biodiversity Solutions	Simon Todd and Eric Hermann
Visual	LOGIS	Lourens du Plessis
Heritage (Archaeology and Palaeontology)	CTS Heritage	Jenna Lavin
Social	Dr. Neville Bews and Associates	Dr. Neville Bews

CVs detailing the independent specialist consultants' expertise and relevant experience are provided in **Appendix A** to this EIA Report.

1.6. Structure of this EIA Report

This EIA Report has been prepared as part of the Scoping and EIA process being conducted in support of the application for EA for Allepad PV Three. This EIA Report has been prepared in accordance with the Plan of Study for EIA (PoSEIA), prepared as part of the Scoping Phase and accepted by DEA on 05 December 2018, and Appendix 3 of the 2014 EIA Regulations (GNR 326). It provides details of the nature and extent of the proposed project, as well as potential impacts associated with the construction, operation, and decommissioning, of the project. It describes the scope of assessment, the consultation process undertaken throughout the EIA process to date, and includes a draft EMPr which provides recommended management and mitigation measures with which to minimise impacts and enhance benefits associated with the project.

An overview of the contents of this EIA Report, as prescribed by Appendix 3 of the 2014 EIA Regulations (GNR 326), and where the corresponding information can be found within the report is provided in **Table 1.2**.

Table 1.2: Summary of where the requirements of Appendix 3 of the 2014 NEMA EIA Regulations, as amended, (GNR 326) are provided in this EIA Report.

Requirement	Location in this EIA Report
(a) Details of – (i) The EAP who prepared the report. (ii) The expertise of the EAP, including a curriculum vitae.	Chapter 1 Appendix A
(b) The location of the development footprint of the activity on the approved site as contemplated in the accepted Scoping Report, including – (i) The 21 digit Surveyor General code of each cadastral land parcel. (ii) Where available, the physical address and farm name. (iii) Where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties.	Chapter 2
(c) A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is – (i) A linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken. (ii) On land where the property has not been defined, the coordinates within which the activity is to be undertaken.	Chapter 2 Chapter 10 Appendix M
(d) A description of the scope of the proposed activity, including – (i) All listed and specified activities triggered and being applied for.	Chapter 2 Chapter 6

Requirement	Location in this EIA Report
(ii) A description of the associated structures and infrastructure related to the development.	
(e) A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context.	Chapter 4 Chapter 6
(f) A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted Scoping Report.	Chapter 5
(g) A motivation for the preferred development footprint within the approved site as contemplated in the accepted Scoping Report.	Chapter 3 Chapter 8 Chapter 10
(h) A full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted Scoping Report, including –	
(i) Details of the development footprint alternatives considered.	
(ii) Details of the public participation process undertaken in terms of Regulation 41 of the Regulations, including copies of the supporting documents and inputs.	
(iii) A summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them.	
(iv) The environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.	Chapter 2
(v) The impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts –	Chapter 3 Chapter 6 Chapter 7
(aa) Can be reversed.	Chapter 8
(bb) May cause irreplaceable loss of resources	Chapter 9
(cc) Can be avoided, managed or mitigated.	Chapter 10
(vi) The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks.	Appendix C Appendix D – H Appendix I
(vii) Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.	
(viii) The possible mitigation measures that could be applied and level of residual risk.	
(ix) If no alternative development footprints for the activity were investigated, the motivation for not considering such.	
(x) A concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted Scoping Report.	
(i) A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted Scoping Report through the life of the activity, including –	Chapter 6 Chapter 8 Chapter 9
(i) A description of all environmental issues and risks that were identified during the environmental impact assessment process.	Appendix D – H

Requirement	Location in this EIA Report
(ii) An assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.	
(j) An assessment of each identified potentially significant impact and risk, including – (i) Cumulative impacts. (ii) The nature, significance and consequences of the impact and risk. (iii) The extent and duration of the impact and risk. (iv) The probability of the impact and risk occurring. (v) The degree to which the impact and risk can be reversed. (vi) The degree to which the impact and risk may cause irreplaceable loss of resources. (vii) The degree to which the impact and risk can be mitigated.	Chapter 8 Chapter 9 Appendix D – H
(k) Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report.	Chapter 7 Chapter 8 Chapter 9 Appendix D – H Appendix I
(l) An environmental impact statement which contains – (i) A summary of the key findings of the environmental impact assessment. (ii) A map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted Scoping Report indicating any areas that should be avoided, including buffers. (iii) A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.	Chapter 10
(m) Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.	Chapter 8 Chapter 9 Chapter 10 Appendix D – H Appendix I
(n) The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment.	Chapter 3 Chapter 8 Chapter 9 Chapter 10
(o) Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation.	Chapter 8 Chapter 9 Chapter 10 Appendix D – H Appendix I
(p) A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed.	Chapter 8 Chapter 9 Chapter 10 Appendix D – H Appendix I
(q) A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.	Chapter 10 Appendix D – H

Requirement	Location in this EIA Report
(r) Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised.	N/A
(s) An undertaking under oath or affirmation by the EAP in relation to – (i) The correctness of the information provided in the reports. (ii) The inclusion of comments and inputs from stakeholders and I&APs. (iii) The inclusion of inputs and recommendations from the specialist reports where relevant. (iv) Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties.	Appendix A
(t) Where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts.	N/A
(u) An indication of any deviation from the approved Scoping Report, including the plan of study, including – (i) Any deviation from the methodology used in determining the significance of potential environmental impacts and risks. (ii) A motivation for the deviation.	N/A
(v) Any specific information that may be required by the competent authority.	N/A
(w) Any other matters required in terms of Section 24(4)(a) and (b) of the Act.	N/A
(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to an Environmental Impact Assessment Report the requirements as indicated in such notice will apply.	N/A

CHAPTER 2 PROJECT DESCRIPTION

This Chapter provides a description of Allepad PV Three, comprising a solar PV energy facility and associated infrastructure proposed for development. It must be noted that the project description presented in this Chapter is subject to change to some extent based on the outcomes and recommendations of detailed engineering and other technical studies, the findings and recommendations of the EIA and supporting specialist studies, and any licencing, permitting, and legislative requirements.

2.1. Project Site Overview

The applicant proposes the development of Allepad PV Three on a site near Upington, in the Northern Cape Province. The Remaining Extent of Erf 5315 Upington (hereafter referred to as the project site) is located approximately 11km[10] north-west of Upington, and falls within Wards 11 and 13 of the Dawid Kruiper LM, of the ZF Mgcawu DM, in the Northern Cape Province. The N10 national road forms the southern boundary of the project site, while the R360 regional road forms the north-eastern boundary of the project site. Access to the site is obtained via an existing official farm entrance point, which is accessed directly off the N10 national road.

Electricity generated by the project will feed into Eskom's national electricity grid via a new 132kV double-circuit power line which will connect the on-site substation to the upgraded 132kV double-circuit power line running between the new Upington MTS (currently under construction approximately 15km south of the project site), and the Gordonia Distribution Substation (located in Upington town). The point of connection is located approximately 5km east of the project site and will make use of a loop-in and loop-out configuration utilising a double-circuit monopole structure. The proposed power line required for the project will be constructed within a 31m wide servitude (31m in the Northern Cape and up to 36m in other areas of the country). A 300m wide power line corridor immediately north of, and running parallel to, the N10 national road has been assessed as part of the EIA process being conducted for the project identified for investigation.

A total of four 100MW PV projects are proposed for development on the project site (i.e. Allepad PV One, Allepad PV Two, Allepad PV Three and Allepad PV Four). Should more than one PV project be constructed on the site, the additional plants will be interconnected to each other via the on-site power line corridor (in loop-in and loop-out configurations), and then ultimately be connected to existing Eskom infrastructure in the area, including the possibility of a direct connection to the Upington MTS by additional power lines (the route and details of which are not known at this stage). This transmission inter-connection will be assessed through a separate application for EA at a later stage once routing information and design requirements are given by Eskom.

[10] Measured from the edge of the south eastern corner of project site i.e. the Remaining Extent of Erf 5315 Upington.

Table 2.1 provides information regarding the proposed project site identified for Allepad PV Three, and also includes information regarding the properties that may be impacted by the grid connection.

Table 2.1: A description of the project site identified for Allepad PV Three and the grid connection.

Province	Northern Cape Province		
District Municipality	ZF Mgcawu DM		
Local Municipality	Dawid Kruiper LM		
Ward Number(s)	Wards 11 and 13		
Nearest Town(s)	» Upington (approximately 11km south-east of the project site)		
Farm Portion(s), Name(s) and Number(s)	**Allepad PV Three:** » Remaining Extent of Erf 5315 Upington **Proposed grid connection:** » Remaining Extent of Erf 5315 Upington » Erf 01 Upington		
SG 21 Digit Code (s)	**Allepad PV Three:** » C02800070000531500000 **Proposed grid connection:** » C02800070000531500000 » C02800070000000100000		
Current Zoning	Agriculture		
Current land use	Agriculture (i.e. Cattle grazing)		
Site Extent	**Allepad PV Three:** » 3 889ha		
Development Footprint	» ~250ha		
Project Site Co-ordinates		**Latitude**	**Longitude**
	Northern extent	28° 21' 21.62" S	21° 08' 16.64" E
	Western extent	28° 22' 05.50" S	21° 03' 13.23" E
	South-western extent	28° 23' 47.45" S	21° 04' 36.13" E
	Southern extent	28° 24' 20.20" S	21° 08' 21.81" E
	Eastern extent	28° 23' 13.52" S	21° 10' 04.64" E
Power Line Corridor Co-ordinates		**Latitude**	**Longitude**
	Northern extent	28° 23' 36.23" S	21° 04' 26.79" E
	Eastern extent	28° 24' 39.30" S	21° 11' 42.56" E
	Southern extent	28° 24' 48.31" S	21° 11' 36.54" E
	Western extent	28° 23' 47.46" S	21° 04' 36.11" E

2.2. Layout Selection Process

An Environmental Sensitivity Map which illustrates potentially sensitive areas identified within the project site was compiled for the project as part of the Scoping Phase (refer to **Figure 2.1**). The Scoping Phase environmental sensitivity map provided an illustration of sensitivity within the project site. The detail was based on the desktop review of the available baseline information for the study area, specialist inputs and limited field surveys. The environmental sensitivity map was intended to inform the location and layout of the PV facility and associated infrastructure, and was to be used as a tool by the developer to, as far as possible, avoid those areas flagged to be of potential high sensitivity. Specific sensitivities identified within the scoping study are summarised below.

Ecology:

The eastern half of the project site occurs on shallow calcrete soils and has numerous drainage lines as well as a few small pans present. This area is considered largely unsuitable for development. The western half of the site comprises undulating sandy soils and is considered to be of low sensitivity and suitable for development apart from the extensive area of mobile dunes which is considered to be moderate high sensitivity and not suitable for development as the loose sands are very vulnerable to erosion. In addition, it is likely that significant soil disturbance would be required in this area as the dunes would likely need to be at least partly levelled before construction.

The power line corridor route was inspected at a desktop level, and no visible features of high significance along the proposed route were identified. Minor features such as the occasional stands of trees present can likely be avoided though adjustment of the final route within the 300m corridor to be assessed.

Avifauna:

The study area supports three main avifaunal microhabitats, which are referred to as the gravel plains, sandy plains, and dunes habitat. These three habitats have different sensitivities, due to the subtle differences in the avifaunal assemblages that they support, especially with respect to red-listed species. The gravel plains are considered to be of High Sensitivity, as this area supports several pairs of the Near-Threatened Karoo Korhaan, which are presumably resident in the area. The dune habitat is well represented within the bioregion, but due to the deeper soils, supports a number of protected tree species, such as *Acacia erioloba, A.haematoxylon* and *Boscia albitrunca, B.foetida subsp. foetida*. These tree species provide important nesting and roosting sites for birds, including large raptors. This habitat is therefore considered to be of medium sensitivity due to its importance to a wide variety of avifaunal species. The sandy plains habitat represents the most widely distributed habitat in the region, and occurs primarily on shallower soils that do not support an extensive tree layer, besides scattered *Parkinsonia africana*. This habitat is therefore regarded to be of low to medium sensitivity.

Soils, Land Use, Land Capability and Agricultural Potential:

Sensitive areas identified on site from a soils, land use and agricultural potential perspective include:

- The dune fields in the west, as these comprise shifting sands with bare surface areas, where wind erosion could be especially severe.
- The stream channel network in the east, where any disturbance due to construction of infrastructure could lead to disruption of surface flow and possible water erosion. Although periods of heavy rainfall are rare in this dry environment, rainfall can occur sporadically and may very occasionally be heavy.

These areas have been classified as soil sensitive areas as opposed to no-go areas.

Development Area:

While the findings of the desktop Scoping Study indicated that no environmental fatal flaws associated with the proposed development of Allepad PV Three on the Remaining Extent of Erf 5315 Upington had been identified at the time, the recommendation was made that the focus areas for the development of the facility be considered outside of the identified areas of very high sensitivity as far as possible, in order to ensure that the proposed development does not have a detrimental impact on the environment.

With an understanding of which areas within the project site were considered sensitive to the development of the proposed facility, the project applicant prepared a detailed infrastructure layout. **Figure 2.2** provides an overview of the layout identified for the project in relation to the sensitivities identified as part of the Scoping Phase environmental sensitivity mapping. In terms of this proposed layout, it is clear that the development footprint identified for Allepad PV Three is located completely outside of any identified areas of very high sensitivity.

This layout has been assessed within this EIA Report. The detailed specialist studies which have been conducted as part of the EIA Phase are in line with the Plan of Study. Specialists' recommendations are included in **Chapter 10** of this EIA Report (as well as within the detailed specialist reports contained in **Appendix D** to **Appendix H**, and the recommendation for a final layout is made. Specialists' recommendations for mitigation and management measures which would be applicable to the final preferred layout and which are required to ensure it retains an acceptable level of environmental impact have also been incorporated into the EMPr prepared for the project, and attached as **Appendix I** to this EIA Report.

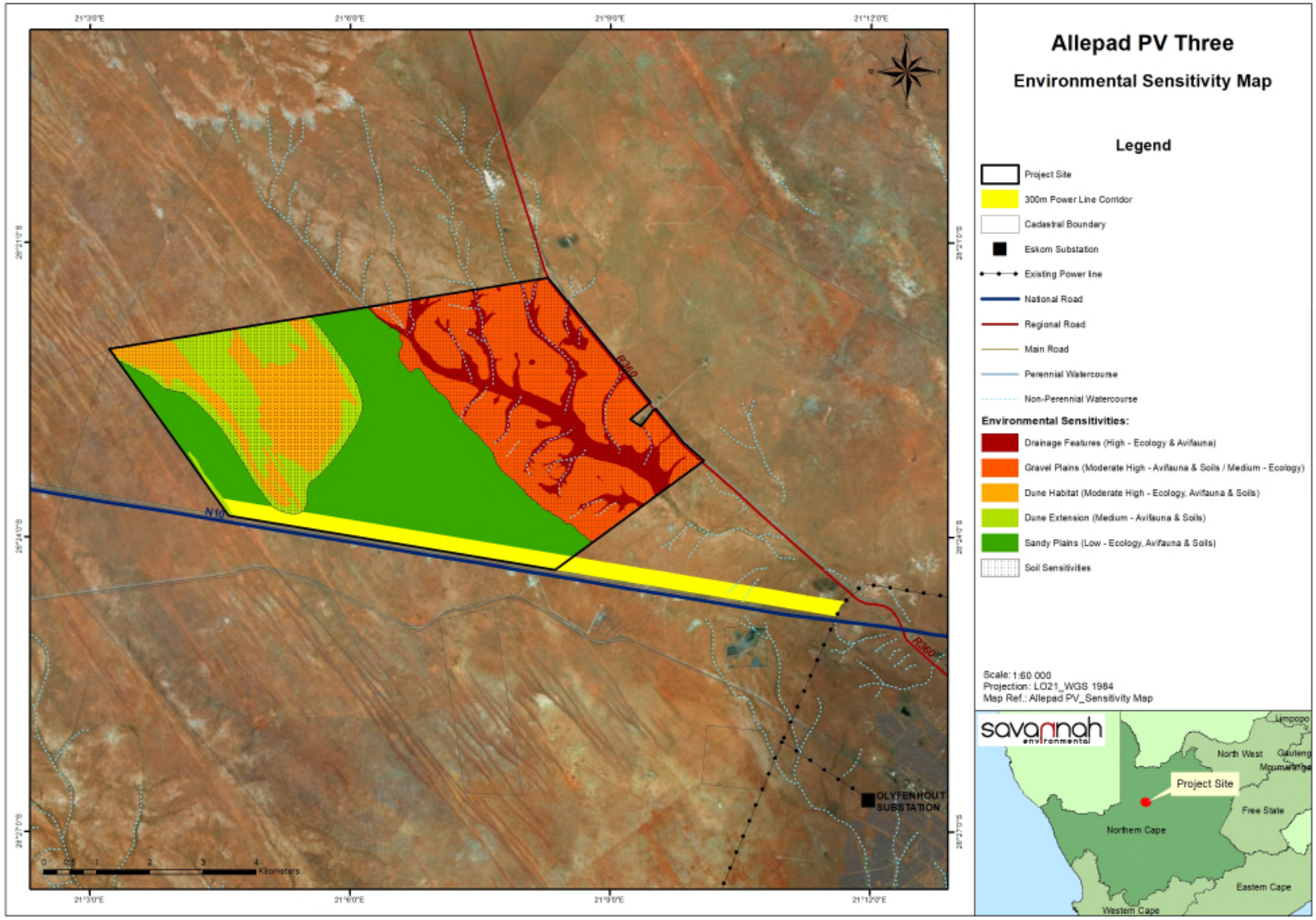

Figure 2.1: Scoping Phase Environmental Sensitivity Map prepared for Allepad PV Three.

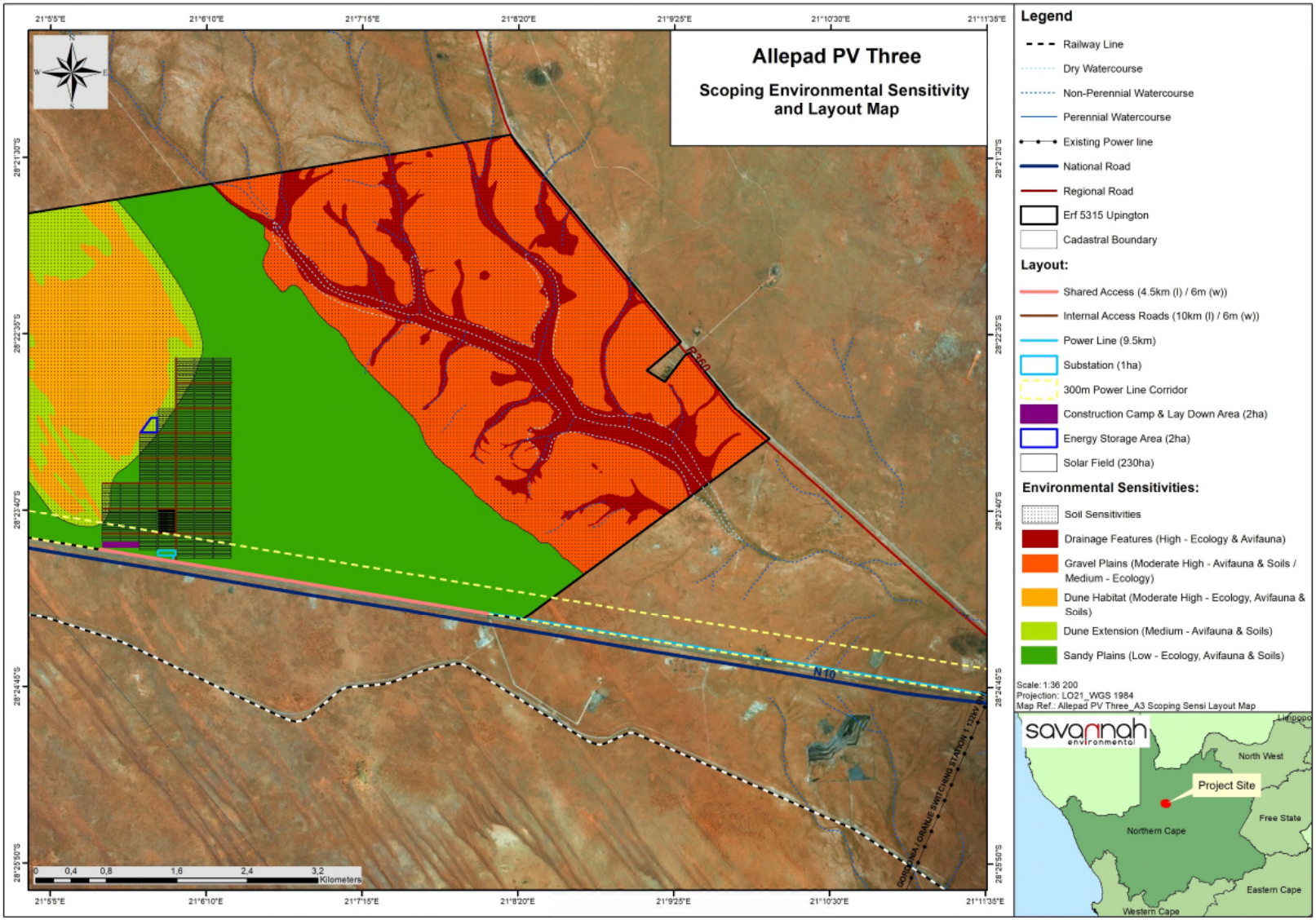

Figure 2.2: Project layout prepared in response to the Scoping Phase Environmental Sensitivity Map prepared for Allepad PV Three.

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

Allepad PV Three will have a generation capacity of 100MW and will make use of PV technology. Solar energy facilities, such as those which utilise PV technology, use the energy from the sun to generate electricity through a process known as the Photovoltaic Effect (refer to **Figure 2.3**).

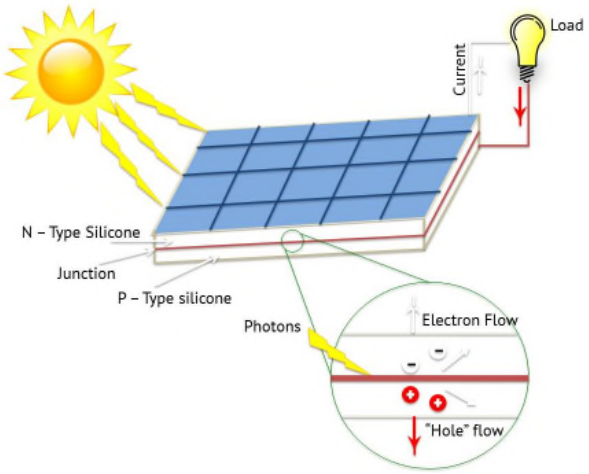

Figure 2.3: Diagram illustrating the Photovoltaic Effect (Source: Centre for Sustainable Energy).

Generating electricity using the Photovoltaic Effect is achieved through the use of the following components:

PV Cells

A PV cell is made of silicone (Si) that is doped (i.e. another element is introduced to the Si-structure to enhance its electrical properties) 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 2.4**).

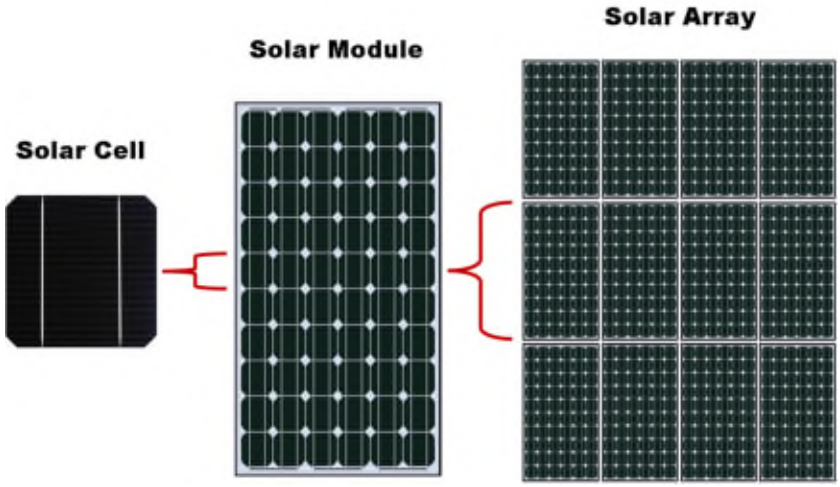

Figure 2.4: Overview of a PV cell, module and array / panel (Source: pveducation.com).

Inverters

Inverters are used to convert electricity produced by the PV cells from DC into AC, to enable the facility to be connected to the national Eskom AC electricity grid. In order to connect a large solar facility such as the one being proposed to the national electricity grid, numerous inverters will be arranged in several arrays to collect, and convert power produced by the facility.

Transformers

Transformers are required to transform (i.e. step-up) the power generation by the PV facility from a low voltage to a higher voltage to allow for it to be integrated into the national electricity grid.

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.

PV panels are designed to operate continuously for more than 20 years, mostly unattended and with low maintenance.

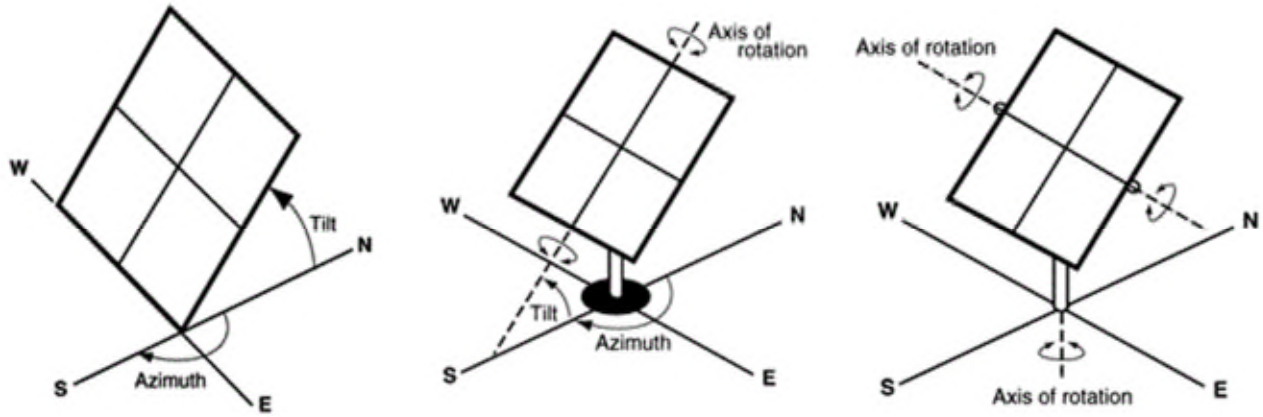

Figure 2.5: Overview of different PV tracking systems (from left to right: fixed-tilt, single-axis tracking, and double-axis tracking (Source: pveducation.com)).

2.4. Description of the Project Infrastructure

A summary of the associated infrastructure proposed as part of Allepad PV Three is provided in **Table 2.2**, and described in more detail under the sub-headings below. **Figure 2.6** provides an overview of the layout identified for the project.

Table 2.2: Planned infrastructure proposed as part of Allepad PV Three

Infrastructure	Dimensions/ Details
Solar Facility	» PV technology. » Solar panels up to 3.5m in height. » Fixed-tilt, single-axis tracking, or dual-axis (double-axis) tracking systems. » Combiner boxes, on-site inverters (to convert the power from DC to AC), and distribution power transformers. » PV structures / modules approximately 230ha in extent (depending on the type of support structure selected for implementation (i.e. static vs tracking)). » Centralised or distributed self-contained inverter stations approximately 2m tall.
Energy Storage	» Up to 2ha in extent. » Batteries will be stored in self-contained units comprising of up to 40 standard ("45 foot") specially adapted shipping containers.
Supporting Infrastructure	» On-site buildings and structures up to 1ha in extent, including a control building and office, » Meteorological measurement station located close the control building. » Ablutions and guard house. » Perimeter security fencing, access gates and lighting up to 2.8m in height. » Temporary construction equipment camp up to 1ha in extent, including temporary site offices, parking and chemical ablution facilities. » Temporary laydown area up to 1ha in extent, for the storage of materials during the construction including a batching plant.
On-site substation	» On-site substation at 132kV and approximately 120MVA capacity. » Will occupy an area up to 1ha in extent.
Grid Connection	» A 132kV double-circuit power line, which will make use of a loop-in and loop-out configuration utilising a double-circuit monopole construction. » The power line will be approximately 9.5km in length. » A 300m wide power line corridor (i.e. 150m on either side of the centreline of the power line) has been identified along the southern boundary of the project site, immediately north of, and running parallel to, the N10 national road, within which a power line servitude will be established. » The power line servitude will be 31m (but could be up to 36m wide i.e. up to 18m on either side of the centre-line due to building restrictions). » The towers required to support the power line will be 20m to 30m in height.
Access road	» Access to the PV site will be via the existing official farm entrance which is accessed off the N10 national road. » Permanent access roads will be constructed as follows: * Main access road (to be gravel) – 6m wide and approximately 2.3km in length. * Internal access road – 6m wide and approximately 7.7km in length (to be gravel). * Shared access road - 6m wide and approximately 4.5km in length (to be gravel).
Water Supply	» Approximately 2 800m³ of water per year is required during construction (up to18 months). * Up to 800m³ for the batching plant * Up to 2 000m³ for dust suppression » Up to 2 000m³ of water is required per year for operation (anticipated for at least 20 years) for washing of the solar panels.

Infrastructure	Dimensions/ Details
	» The following water supply options are currently being considered: * Sourcing potable water from the Dawid Kruiper LM (already piped on-site). * Sourcing raw water from the Dawid Kruiper LM (Upington water treatment works or nearest bulk water supply point).

2.4.1. Project Footprint

An area of approximately 250ha (equivalent to 6.5% of the total project site) is required for the development of Allepad PV Three. The PV structures / modules will occupy an area approximately 230ha in extent, while supporting infrastructure such as internal roads (up to 9ha), on-site buildings and structures (up to 1ha), energy storage (up to 2ha) and an on-site substation (up to 1ha) will occupy the remaining extent. During construction, a temporary construction camp of up to 1ha in extent, including temporary site offices, parking and chemical ablution facilities will be required as well as a temporary laydown area (including a batching plant) of up to 1ha in extent.

The type of technology selected for implementation, outcomes of the EIA process, and the completion of additional technical studies (e.g. geotechnical and other surveys) to be conducted as part of the detailed design phase will ultimately influence the final project layout and development footprint. The final facility design is required to be approved by DEA prior to any construction activities commencing on-site. Should any substantive changes or deviations from the original scope or layout of the project reflected in the EIA process occur, DEA would need to be notified thereof, and where applicable additional approval may need to be obtained.

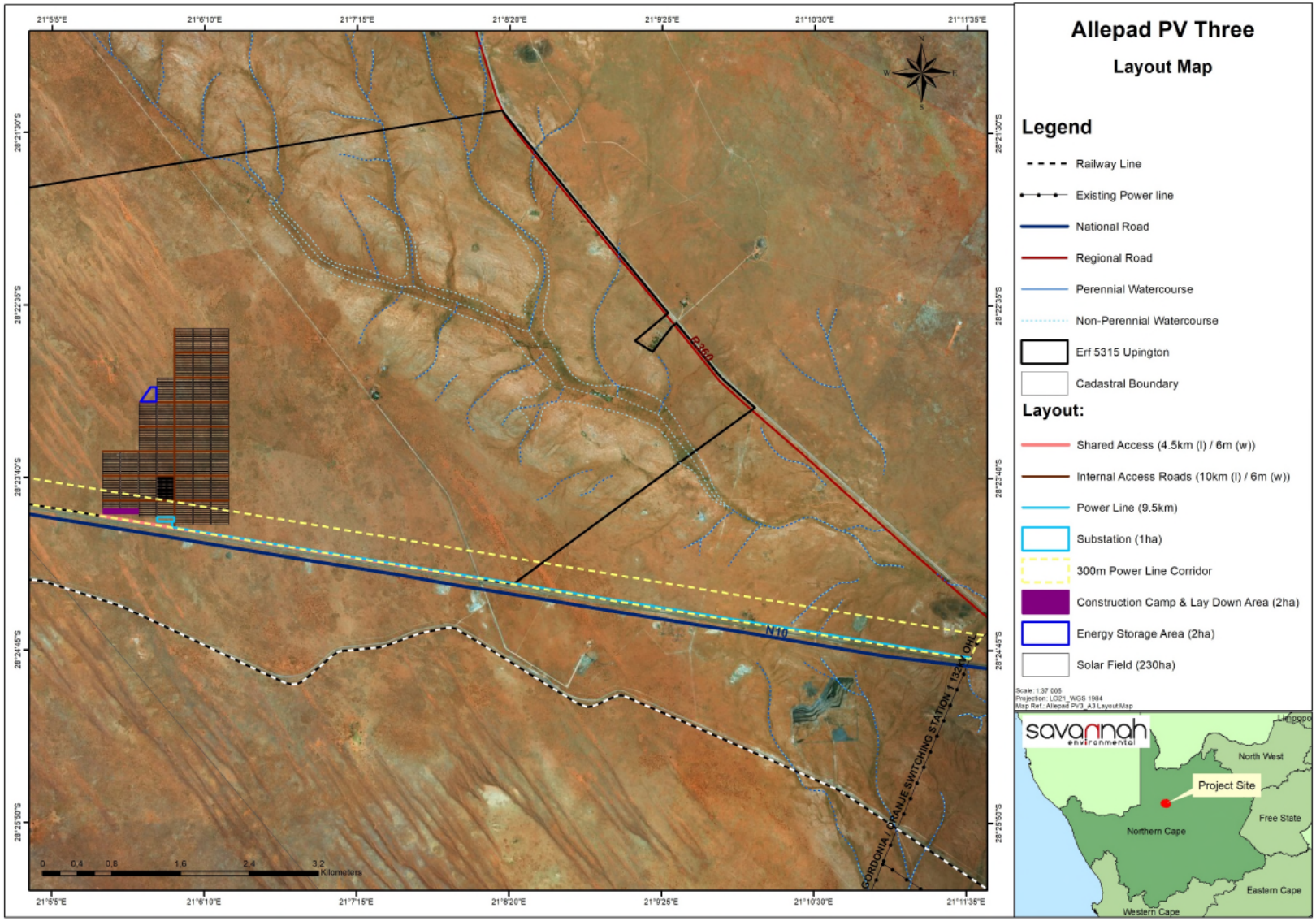

Figure 2.6: Map illustrating the proposed project layout prepared for Allepad PV Three.

2.4.2. Details of the proposed PV infrastructure

Allepad PV Three will be designed to have a net generating capacity (i.e. contracted capacity) of 100MW. The project will make use of fixed-tilt, single-axis tracking, or double-axis tracking PV technology. PV technology is considered by the developer to be more suitable than Concentrated Solar Power (CSP) technology as it has negligible water requirements, is not associated with the generation of any effluent, is more competitive from an economic / cost perspective, and has a reduced visual impact. With recent advances in battery technology for use as large scale storage medium in PV plants even the CSP molten salt storage abilities will be neutralised.

The project will comprise solar panels which, once installed, will stand up to 3.5m above ground level. The solar panels will include centralised or distributed self-contained inverter stations at a height of up to approximately 2m. Additional Medium Voltage (MV) distribution transformers could additionally be used, located next to the inverter stations for step-up requirements and internal power distribution at 11kV or 22kV. These MV transformers could also be self-contained and up to 2m tall.

The main transformer capacity varies according to detailed design and client / project specific requirements. It is anticipated however that 1 x 120MVA transformer will be used, located in the main plant substation, stepping up from plant internal distribution voltages of 11kV or 22kV to 132kV for evacuation into the national Eskom electricity grid.

2.4.3. Grid Connection

A 132kV substation occupying an area up to 1ha in extent will be constructed on site. A new 132kV double-circuit power line which will make use of a loop-in and loop-out configuration utilising a double-circuit monopole construction, is required to evacuate electricity from the on-site substation for integration into the national electricity grid.

A power line corridor of 300m in width (i.e. up to 150m on either side of the centre-line of the power line) has been identified for investigation along the southern boundary of the project site, immediately north of, and running parallel to, the N10 national road, within which a power line servitude will be established. The power line servitude will be 31m wide (could be up to 36m wide i.e. up to 18m on either side of the centre-line due to building restrictions). Once constructed, the grid connection infrastructure which connects Allepad PV Three to the Eskom national electricity grid will be handed over to Eskom to become part of its asset base.

2.4.4. Energy Storage

Energy generated by the project will be stored in the batteries for use after hours, when the PV facility is no longer generating electricity (i.e. at night or on cloudy days). The batteries will be housed in fully self-contained units comprising of up to 40 standard ("45 foot"), specially adapted shipping containers. The energy storage area will occupy an area up to 2ha in extent.

2.4.5. Water Supply

Allepad PV Three will utilise water during both construction and operation. Water is required during construction for use in the batching plant (up to 800m³), located within the laydown area, and for dust suppression (up to 2 000m³), while potable water will be required on site for the construction crew. During operation, water is required to clean the PV panels, for human consumption, and for use in the auxiliary buildings (i.e. for use in the office building, ablutions, etc.).

It is anticipated that panels will be washed up to four times a year during operation, however the washing schedule will ultimately be determined based on the region's weather patterns and panel soiling rates. Only clean water (i.e. with no cleaning products), or non-hazardous biodegradable cleaning products will be utilised for the washing of panels. Wastewater generated by washing panels can be allowed to run-off under the panels. Approximately 2 800m³ of water is required over a 12 to 18 month period during construction, and approximately 2 000m³ of water is required per year over the 20 year anticipated operational lifespan of the project.

The following water supply options are currently being considered for the project:

» Sourcing potable water from the Dawid Kruiper LM (already piped and existing on site in sufficient quantities).
» Sourcing raw water from the Dawid Kruiper LM (Upington water treatment works or nearest bulk water supply point). As this water will have undergone basic treatment by the Dawid Kruiper LM, no further treatment is required.

Water will be transported to site utilising either an existing pipeline, or by means of a water bowser which will transport water to the site from the nearest municipal raw water supply point.

2.4.6. Effluent and Wastewater

During construction, chemical toilets will be used. These will be serviced regularly and effluent will be disposed of at a registered wastewater treatment works. Any other effluent discharge during construction will be collected in sealed containers / tanks, and collected by a registered service provider (i.e. the LM / Contractor) to be disposed of at an approved facility off-site.

Apart from normal sewage from site and operation staff, no effluent will be produced during operation. Sewage will be collected and treated as per normal standards using a septic tank. In cases where the LM does not permit the use of septic tanks, sewage will be stored in a conservancy tank and collected by a registered service provider (the LM / Contractor) to be treated at an approved facility off-site.

2.4.7. Waste

Solid waste generated during construction will mainly be in the form of construction material, excavated substrate and domestic solid waste. All waste will be disposed of in scavenger proof bins and temporarily placed in a central location for removal by an appropriate contractor. Where possible, waste will be recycled. Non-recyclable solid construction waste will be disposed of at an appropriately licensed landfill site. Any other waste and excess material will be removed once construction is complete and disposed of at a registered waste facility.

During construction use of the following hazardous substances are anticipated: petrol / diesel for trucks, cranes, bulldozers etc., and limited amounts of transformer oils. Dangerous goods required to be stored during construction (e.g. limited quantities of fuel, oil, lubricants etc.) will be done in compliance with relevant legislation (i.e. stored in covered area / bin and disposed of at a registered hazardous waste site). Hazardous waste will be appropriately stored and disposed of.

2.5. Proposed Activities during the Project Development Stages

A series of activities are proposed as part of the design, pre-construction, construction, operation, and decommissioning phases associated with the development of Allepad PV Three. These are discussed in more detail under the respective sub-headings below.

2.5.1. Design and Pre-Construction Phase

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 or associated infrastructure. While an objective of the Engineering, Procurement and Construction (EPC) Contractor, who will be responsible for the overall construction 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 may take place. This EIA 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 DEA. Importantly, should there be any substantive changes or deviations from the original scope or layout of the project, the DEA will need to be notified and where relevant, approval obtained.

Conduct Surveys

Prior to initiating construction, a number of surveys will be required including, but not limited to confirmation of the micro-siting footprint (i.e. the precise location of the PV panels, substation and the plant'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 project site. The purpose is to design earthworks and foundations for structures and to execute earthwork repairs necessitated due to changes in the subsurface environment.

2.5.2. Construction Phase

The construction phase will take approximately 18 months to complete, and will entail a series of activities including:

Procurement and employment

At the peak of construction the project is likely to create up to 300 direct employment opportunities. These employment opportunities will be temporary, and will last for a period of up to 18 months (i.e. the length of construction). Employment opportunities generated during the construction phase will include unskilled, semi-skilled, and highly-skilled opportunities. Solar PV projects make use of high levels of unskilled and semi-skilled labour so there will be good opportunity to use local labour. Employment opportunities for the proposed solar PV facility will peak during the construction phase and significantly decline during the operation phase. The injection of income into the area in the form of wages will represent an opportunity for the local economy and businesses in the area.

The majority of the labour force is expected to be sourced from the Upington area. No labour will be accommodated on-site during the construction period.

Establishment of an Access Road to the Site

Access to the project site will be established for the construction of the facility. Access to the project site is obtained via the existing official farm entrance which is accessed off the N10 national road. Within the facility development footprint itself, access will be required from new / existing roads for construction purposes (and limited access for maintenance during operation). The final layout will be determined following the identification of site related sensitivities.

Undertake Site Preparation

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

Transport of Components and Equipment to Site

The national, regional, secondary and proposed internal access roads will be used to transport all components and equipment required during the construction phase of the solar facility. Some of the components (i.e. substation transformer) may be defined as abnormal loads in terms of the National Road Traffic Act (No. 93 of 1996) (NRTA)[11] 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

Laydown and storage areas will be required for typical construction equipment. Once the required equipment has been transported to site, a dedicated equipment construction camp and laydown area will need to be established adjacent to the workshop area. The equipment construction camp serves to confine activities and storage of equipment to one designated area to limit the potential ecological impacts associated with this phase of the development. The laydown area will be used for the assembly of the PV panels and the general placement / storage of construction equipment and batching plant. A temporary laydown area approximately 1ha in extent is required during construction. The temporary laydown area will be included within the 250ha development footprint.

Erect PV Cells and Construct Substation and Invertors

The construction phase involves installation of the PV solar panels and structural and electrical infrastructure required for the operation of the facility. In addition, preparation of the soil and improvement of the access roads is likely to continue for most of the construction phase. For array installations, 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, micropile or drilled post / pile could be used. The posts will hold the support

[11] A permit will be required in accordance with Section 81 of the NRTA which pertains to vehicles and loads which may be exempted from provisions of Act.

structures (tables) on which the PV modules 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 solar facility's on-site substation.

The construction of the substation will require a survey of the site, site clearing and levelling and construction of access road(s) (where applicable), 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 a power line for connection to the Eskom national grid, control room, workshop, storage and laydown areas, gatehouse and security complex, as well as a temporary contractor's equipment camp.

The establishment of the ancillary infrastructure and support buildings will require the clearing of vegetation and levelling of the development site, and the excavation of foundations prior to construction. Laydown areas for building materials and equipment associated with these buildings will also be required.

Construction of the power line

A power line is constructed by surveying the power line route, constructing foundations for the towers, installing the towers, stringing the conductors, and finally rehabilitating disturbed areas and protecting erosion sensitive areas.

Undertake Site Rehabilitation

Once construction is completed and all construction equipment has been removed, the site will be rehabilitated where practical and reasonable. In addition on full commissioning of the solar energy facility, any access points which are not required during operation must be closed and rehabilitated accordingly.

2.5.3. Operation Phase

The proposed solar energy facility is expected to operate for a minimum of 20 years. The facility will operate continuously, 7 days a week, during daylight hours. While the solar facility will be largely self-sufficient, monitoring and periodic maintenance activities will be required. Key elements of the Operation and Maintenance (O&M) plan include monitoring and reporting the performance of the solar facility, conducting preventative and corrective maintenance, receiving visitors, and maintaining security.

2.5.4. Decommissioning Phase

Depending on the continued economic viability of the solar energy facility following the initial 20-year operational lifespan, the 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 dissembled and replaced with new, more efficient technology / infrastructure available at the time. If the decision is made to decommission the solar facility, the following decommissioning activities will take place:

Site Preparation

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

Disassembly and Removal of Existing Components

When the solar energy facility is ultimately decommissioned, the equipment to be removed will depend on the land use proposed for the site at the time. All above ground facilities that are not intended for future use at the site will be removed. 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 solar facility would be deconstructed and recycled, or disposed of in accordance with applicable regulatory requirements. The site will be rehabilitated and can be returned to agriculture or another beneficial land-use.

Future plans for the site and infrastructure after decommissioning

The generation capacity of the facility would have degraded by approximately 15% over the 20-year operations lifespan. The solar facility will potentially have the opportunity to generate power for a Merchant Market operation (i.e. the client would sell power on a bid basis to the market). Another option for the site after decommissioning is for agricultural activities to resume.

CHAPTER 3 CONSIDERATION OF ALTERNATIVES

In accordance with the requirements of Appendix 3 of the 2014 EIA Regulations (GNR 326), an EIA Report must contain a consideration of alternatives, which can include site (i.e. development footprint), activity, technology and site access alternatives, as well as the "do-nothing" alternative. Alternatives are required to be assessed in terms of social, biophysical, economic and technical factors.

The DEA Guideline 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.

In this instance, 'the project' refers to a 100MW PV energy generation facility and associated infrastructure proposed to be developed by an Independent Power Producer (IPP) and is intended to form part of the DoE's REIPPP Programme. This Chapter provides an overview of the various alternatives considered for Allepad PV Three as part of the EIA Process.

3.1. Consideration of Fundamentally Different Alternatives

Fundamentally different alternatives are usually assessed at a strategic level, and as a result project-specific EIAs 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 DoE's current Integrated Resource Plan for Electricity 2010 – 2030 (IRP)[12], and will continue to be addressed as part of future revisions thereto. In this regard, the need for renewable energy power generation (including solar and wind) has been identified as part of the technology mix for power generation in the country in the next 20 years. The site is considered most suitable for the development of a solar PV energy facility as the local solar resource is amongst the highest in the country and there are no other sustainable renewable energy resources suitable for power generation in the project area. Therefore, fundamentally different alternatives to the proposed project are not considered within this EIA process.

3.2. 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 to:

» The property on which, or location where the activity is proposed to be undertaken.
» The type of activity to be undertaken.

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

» The design or layout of the activity.
» The technology to be used in the activity.
» The operational aspects of the activity.

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

These alternatives are discussed under the respective subheadings below.

3.2.1. Property or Location Alternatives

The placement of a solar energy facility is strongly dependent on several factors including climatic conditions (solar irradiation levels), topography, the location of the site, availability of grid connection, the extent of the site and the need and desirability for the project (discussed in Detail in Chapter 5). The applicant considers the proposed project site to be highly favourable from a technical perspective and the most suitable site for the development of a solar PV facility due to the following site characteristics:

» **Solar resource**: The economic viability of a solar facility is directly dependent on the annual direct solar irradiation values. The Upington region and other parts of the Northern Cape Province are characterised as having the highest solar irradiation values in South Africa (and which are comparable on a global scale). The Global Horizontal Irradiation (GHI) for the proposed project site is in the region of approximately 2 282kWh/m^2/annum, which is ideally suited to the development of a commercial solar PV facility.

» **Topography**: A surface area with favourable topography facilitates the work involved in construction and maintenance of the PV facility, while limiting the environmental impact due to extensive cut-and-fill operations. The proposed project site is characterised as having very flat topography with slopes typically less than 0.5% across the site (i.e. 900m to 870m across 7km).

» **Site extent:** The project site is approximately 3 889ha in extent, which is sufficient for the installation of the facility allowing for avoidance of site sensitivities. The development footprint of the facility would occupy an area equivalent to approximately 6.4% of the full project site.

» **Site access**: Access to the project site is obtained via the existing official farm entrance which is accessed directly off the N10 national road.

» **Grid access:** A key factor in the siting of any project is that the project must have a viable grid connection. Grid connection for Allepad PV Three is available by means of a new 132 kV double-circuit power line which will connect the on-site substation with Eskom's upgraded 132kV double-circuit power line running between the new Upington MTS (currently under construction approximately 15km south of the project site), and the Gordonia Distribution Substation (located in Upington town). The point of connection is located approximately 5km east of the project site and will make use of a loop-in and loop-out configuration utilising a double-circuit monopole construction. The presence of existing power lines within such close proximity of the proposed project site provides opportunity for the project to connect to the national grid with minimal linear transmission impact (i.e. of less than 10km). The principle to minimise associated infrastructure and the resulting impacts is also supported.

» **Land suitability:** The current land use of the site 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 cattle. Agricultural (i.e. grazing) land is preferred as the majority of farming practices can continue in tandem with the operation of the solar energy facility once construction and commissioning of the project is complete, without significantly impacting on the agricultural productivity of the site. In addition, sites that facilitate easy construction conditions (i.e. relatively flat topography, lack of major rock outcrops, limited watercourse crossing etc.) are also favoured during site selection.

» **Geographic location**: The proposed site is located within an area which has become a node for solar energy projects, with several projects in operation, under construction and being developed. The project therefore corresponds well within an area identified as ideal for solar development. It should also be noted that many of the projects in operation and under development are concentrating solar power (CSP) projects that aim to provide power to the grid during peak power demand periods. The Allepad PV Three project is considered to be complementary to these CSP projects as it will provide power to the grid during daytime periods when the CSP plants are storing up energy and will assist in balancing and stabilising the supply to the local network. The proposed project site therefore compliments existing and future land use.

» **Landowner support**: The selection of a site where the landowner is supportive of the development of renewable energy is essential for ensuring the success of the project. The landowner welcomes the project and does not view the development as a conflict with their current or proposed future land use requirements.

Based on these considerations, the applicant considers the proposed site as highly preferred from a technical perspective for the development of a solar PV facility and expects that this development will be able to draw on synergies with the projects proposed and / or currently under development or operating within the vicinity of the proposed project site. As a result, no site alternatives are proposed as part of this EIA process.

3.2.2. Design and Layout Alternatives

Allepad PV Three will have a development footprint of up to 250ha, to be located within a broader site of 3 889ha. Specialist field surveys and assessments were undertaken in order to provide the developer with site specific information regarding the larger project site considered for the development (refer to **Appendices D-H**). Areas to be avoided by the development were identified, specifically relating to ecological features and sensitivities present within the project site. The identified sensitivities were utilised as a tool by the developer to identify and locate the development footprint of the solar energy facility within the project site. This was undertaken with the aim of avoiding possible highly sensitive areas within the development footprint so as to limit impacts associated with the development.

This preferred location of the development footprint within the project site is considered as the most feasible and appropriate location for Allepad PV Three, based on the following considerations:

i) the proposed development footprint avoids high environmental sensitivities identified,
ii) the identified development footprint is located in close proximity to the proposed grid connection considered for the facility, which shortens the length of the power line required to be constructed for the connection into the national grid,

iii) The development proposes to make use of the existing farm access of the N10 and will not require the creation of new site access,
iv) the landowner provided consent for the development footprint of the solar energy facility within that particular portion of the project site to be constructed and operated, and
v) the development footprint is considered suitable for the development of a solar energy facility (i.e. the use of photovoltaic (PV) panels) from a technical perspective to ensure the success of the development.

As the project site complies with the above characteristics, this is considered to be the most reasonable and feasible alternative site for the development.

3.2.3. Technology Alternatives

Few technology options are available for solar power generation facilities, and the selection of those that are preferred are usually differentiated by weather, resource and terrain-related conditions that prevail on the project site, to optimise the final economic solution. Solar energy is considered to be the most suitable renewable energy technology for this site, based on the site location, ambient conditions and energy resource availability. Solar PV was determined as the most suitable option for the proposed site as large volumes of water are not required for power generation purposes compared to Concentrated Solar Power (CSP) technology. PV is also preferred when compared to CSP technology because of the substantially lower visual profile.

Two solar PV energy technology alternatives are being considered for the proposed project and include:
» 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 technologies available, which affect the potential for environmental impacts, relate to the extent of the facility, or land-take (disturbance or loss of habitat), as well as the height of the facility (visual impacts). For example, 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.

Both technologies are considered to be environmentally acceptable for implementation from an environmental perspective. 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 technology selected for implementation. The technology preference will therefore be determined on the basis of technical considerations. The worst-case scenario in terms of land take has been considered (i.e. the largest area required) within this EIA process so that either technology can be implemented.

3.2.4. The 'Do-Nothing' Alternative

The 'do-nothing' alternative is the option of not constructing Allepad PV Three. Should this alternative be selected, there would be no environmental impacts on site as a result of construction and operation activities associated with a solar PV facility. The 'do-nothing' alternative has been assessed as part of the EIA Phase (refer to **Chapter 8** and **Chapter 10** of this EIA Report).

CHAPTER 4 POLICY AND LEGISLATIVE CONTEXT

This Chapter provides an overview of the policy and legislative context within which Allepad PV Three is being proposed. It identifies legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments which may be applicable, or may have relevance to the proposed project, and which have been considered as part of the EIA process.

4.1. Strategic Electricity Planning in South Africa

The need to expand electricity generation capacity in South Africa is based on national policy, and is informed by ongoing strategic planning undertaken by the DoE. The hierarchy of policy and planning documentation that supports the development of Independent Power Producer (IPP) projects is illustrated in **Figure 4.1**. These policies are discussed in more detail in the relevant subsections, along with provincial and local policies or plans that have relevance to the development of the project.

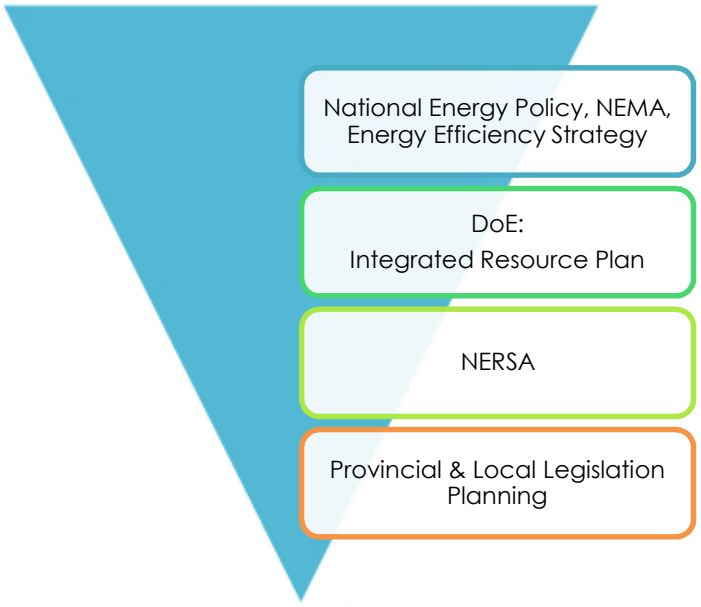

Figure 4.1: Hierarchy of Electricity Policy and Planning Documentation.

4.2. Regulatory Hierarchy

The regulatory hierarchy for energy generation projects consists of three tiers of authorities who exercise control through both statutory and non-statutory instruments, namely National, Provincial and Local levels.

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

- **Department of Energy (DoE):** DoE is responsible for policy relating to all energy forms, and is responsible for compiling and approving the Integrated Resource Plan (IRP) for Electricity.
- **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 Environmental Affairs (DEA):** DEA is responsible for environmental policy and is the controlling authority in terms of NEMA and the 2014 EIA Regulations (GNR 326). The DEA is the competent authority for this project (as per GNR 779 of 01 July 2016), and is charged with granting the relevant EA for the project.
- **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):** SANRAL is responsible for the regulation and maintenance of all national roads and routes.
- **Department of Water and Sanitation (DWS):** DWS is responsible for effective and efficient water resources management to ensure sustainable economic and social development. DWS is also responsible for evaluating and issuing licenses pertaining to water use (i.e. Water Use Licenses (WULs) and / or registration of General Authorisations (GAs)).
- **Department of Agriculture, Forestry and Fisheries (DAFF):** DAFF is the custodian of South Africa's agricultural, forestry, and fishery resources and is primarily responsible for the formulation and implementation of policies governing the Agriculture, Forestry and Fisheries Sector. DAFF is also responsible for the issuing of permits for the disturbance or destruction of protected tree species.
- **Department of Mineral Resources (DMR):** Approval from the DMR will be required to use land surface contrary to the objects of the Mineral and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA) in terms of Section 53 of the Act. In terms of the MPRDA approval from the Minister of Mineral Resources is required to ensure that proposed activities do not sterilise a mineral resource that may occur on site.
- **Department of Rural Development and Land Reform (DRDLR):** DRDLR is dedicated to the social and economic development of rural South Africa, and is responsible for providing a framework for rural development.

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

- **Northern Cape Department of Environment, and Nature Conservation (DENC):** DENC is the Commenting Authority for the project, and is also responsible for issuing any biodiversity and conservation-related permits. DENC's involvement relates specifically to sustainable resource management, conservation of protected species and land care.
- **Northern Cape Department of Roads and Public Works (NCDRPW):** NCDRPW is responsible for roads and the granting of exemption permits for the conveyance of abnormal loads on public roads.
- **Ngwao Boswa Kapa Bokone (NBKB):** NBKB, the Northern Cape Provincial Heritage Resources Authority is responsible for the identification, conservation and management of heritage resources, as well as commenting on heritage related issues within the Province.

At **Local Level** the local and municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. The project is proposed in the **Dawid Kruiper LM**, and **ZF Mgcawu DM**.

4.3. National Policy

4.3.1. The 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 into account environmental management requirements and interactions amongst economic sectors, as well as matters relating to renewable energy. The National Energy Act also provides for energy planning, increased generation and consumption of renewable energies, contingency energy supply, holding of strategic energy feedstocks and carriers, adequate investment in, appropriate upkeep and access to energy infrastructure. The Act provides measures for the furnishing of certain data and information regarding energy demand, supply and generation, and for establishing an institution to be responsible for promotion of efficient generation and consumption of energy and energy research.

The Act provides the legal framework which supports the development of power generation facilities, such as Allepad PV Three.

4.3.2. White Paper on the Energy Policy of South Africa, 1998

The South African Energy Policy, published by the then Department of Minerals and Energy (DME) in December 1998 identifies five key objectives, namely:

- Increasing access to affordable energy services.
- Improving energy sector governance.
- Stimulating economic development.
- Managing energy-related environmental impacts.
- Securing supply through diversity.

In order to meet these objectives and the developmental and socio-economic objectives of South Africa, the country needs to optimally use available energy resources. The South African Government is required to address what can be done to meet these electricity needs both in the short and long-term. The White Paper identifies key objectives for energy supply, such as increasing access to affordable energy services, managing energy-related environmental impacts and securing energy supply through diversifying South Africa's electricity mix.

This policy recognises that renewable energy applications have specific characteristics which need to be considered. The Energy Policy is "*based on the understanding that renewables are energy sources in their own right, and are not limited to small-scale and remote applications, and have significant medium- and long-term commercial potential*." In addition, the National Energy Policy states that "*Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future*".

The support for the Renewable Energy Policy is guided by a rationale that South Africa has a very attractive range of renewable 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. In

spite of this range of resources, the National Energy Policy acknowledges that the development and implementation of renewable energy applications has been neglected in South Africa.

Government policy on renewable energy is therefore concerned with addressing the following challenges:

» Ensuring that economically feasible technologies and applications are implemented.
» Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options.
» Addressing constraints on the development of the renewable industry.

4.3.3. White Paper on the Renewable Energy Policy, 2003

The White Paper on Renewable Energy Policy supplements the Government's overarching policy on energy as set out in its White Paper on the Energy Policy of the Republic of South Africa (DME, 1998). The White Paper on Renewable Energy Policy recognises the significance of the medium and long-term potential of renewable energy. The main aim of the policy is to create the conditions for the development and commercial implementation of renewable technologies. The position of the White Paper on Renewable Energy is based on the integrated resource planning criterion of:

"Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options."

The White Paper on Renewable Energy sets out the Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. It also informs the public and the international community of the Government's vision, and how the Government intends to achieve these objectives; and informs Government agencies and organs of their roles in achieving the objectives.

South Africa relies heavily on coal to meet its energy needs because it is well-endowed with coal resources in particular. However, South Africa is endowed with renewable energy resources that can be sustainable alternatives to fossil fuels, but which have so far remained largely untapped. This White Paper fosters the uptake of renewable energy in the economy and has a number of objectives that include:

» Ensuring that equitable resources are invested in renewable technologies.
» Directing public resources for implementation of renewable energy technologies.
» Introducing suitable fiscal incentives for renewable energy.
» Creating an investment climate for the development of renewable energy sector.

The objectives of the White Paper are considered in six focal areas, namely:

i) Financial instruments.
ii) Legal instruments.
iii) Technology development.
iv) Awareness raising.
v) Capacity building and education.
vi) Market based instruments and regulatory instruments.

The policy supports the investment in renewable energy facilities as they contribute towards ensuring energy security through the diversification of energy supply, reducing Greenhouse Gas (GHG) emissions and the promotion of renewable energy sources.

4.3.4. The Electricity Regulation Act (No. 04 of 2006) (ERA)

The Electricity Regulation Act (No. 04 of 2006) as amended by the Electricity Regulation Act (No. 28 of 2007), 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 ERA establishes a national regulatory framework for the electricity supply industry and made NERSA custodian and enforcer of the National Electricity Regulatory Framework. The ERA also provides for licences and registration as the manner in which the generation, transmission, distribution, reticulation, trading, and import and export of electricity is regulated.

4.3.5. 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.

4.3.6. Integrated Resource Plan (IRP) for Electricity 2010 - 2030

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.

The current iteration of the IRP, led to the Revised Balanced Scenario (RBS) that was published in October 2010. Following a round of public participation which was conducted in November / December 2010, several changes were made to the IRP model assumptions. The document outlines the proposed generation new-build fleet for South Africa for the period 2010 to 2030. This scenario was derived based on a cost-optimal solution for new-build options (considering the direct costs of new build power plants), which was then "balanced" in accordance with qualitative measures such as local job creation.

The Policy-Adjusted IRP reflected recent developments with respect to prices for renewables. In addition to all existing and committed power plants, the plan includes 9.6GW of nuclear, 6.25GW of coal, 17.8GW of renewables, and approximately 8.9GW of other generation sources such as hydro, and gas.

On 27 August 2018 the Draft IRP 2018 was released for comment. The Draft IRP 2018 is based on least-cost supply and demand balance and takes into account security of supply and the environment (i.e. with regards to minimising negative emissions and water usage). According to the Draft IRP 2018, key input assumptions that changed from the promulgated IRP 2010 – 2030 (2011) include, amongst others, technology costs, electricity demand projection, fuel costs and Eskom's existing fleet performance and additional commissioned capacity. For the period ending 2030, the Draft IRP 2018 proposes a number of policy adjustments to ensure a practical plan that will be flexible to accommodate new, innovative technologies that are not currently cost competitive, the minimisation of the impact of decommissioning of coal power plants, and the changing demand profile. The recommended updated Plan is as depicted in **Figure 4.2**.

Based on the Draft IRP 2018 there is currently 1 474MW of installed PV capacity, while an additional 814MW has been committed between 2020 and 2022, and an additional 5 670MW capacity has been allocated between 2025 and 2030. This plan is yet to be finalised and promulgated.

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

Installed Capacity
Committed / Already Contracted Capacity
New Additional Capacity (IRP Update)
Embedded Generation Capacity (Generation for own use allocation)

Figure 4.2: Proposed Updated plan for the Period Ending 2030 (Source: Draft IRP 2018).

4.3.7. New Growth Path (NGP) Framework, 23 November 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 term 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.

4.3.8. The National Development Plan (NDP) 2030

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. The NDP aims to achieve this by drawing on the energies of its people, growing and inclusive economy, building capabilities, enhancing the capacity of the state and promoting leaderships and partnerships throughout society.

While the achievement of the objectives of the NDP requires progress on a broad front, three priorities stand out, namely:

» Raising employment through faster economic growth
» Improving the quality of education, skills development and innovation
» Building the capability of the state to play a developmental, transformative role

In terms of the Energy Sector's 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.

Although electricity generation from coal is still seen as part of the energy mix within the NDP, the plan sets out steps that aim to ensure that, by 2030, South Africa's energy system looks very different to the current situation: coal will contribute proportionately less to primary-energy needs, while gas and renewable energy resources – especially wind, solar, and imported hydroelectricity – will play a much larger role.

4.3.9. 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 following objectives are set within the Bill:

a) Provide for the coordinated and integrated response to climate change and its impacts by all spheres of government in accordance with the principles of cooperative governance;
b) Provide for the effective management of inevitable climate change impacts through enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to building social, economic, and environmental resilience and an adequate national adaptation response in the context of the global climate change response;
c) Make a fair contribution to the global effort to stabilise greenhouse gas concentrations in the atmosphere at a level that avoids dangerous anthropogenic interference with the climate system within a timeframe and in a manner that enables economic, employment, social and environmental development to proceed in a sustainable manner.

Allepad PV Three comprises a renewable energy generation facility and would not result in the generation or release of emissions during its operation.

4.3.10. National Climate Change Response Policy, 2011

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.

As an integral part of the policy, a set of near-term priority flagship programmes will be implemented to address the challenges of climate change, one of which includes the Renewable Energy Flagship Programme. This flagship programme includes a scaled-up renewable energy programme, based on the current programme specified in the IRP 2010, and using the evolving South African Renewables Initiative led by the Department of Public Enterprise and Department of Trade and Industry (DTI), as a driver for the deployment of renewable energy technologies. The programme will be informed by enhanced domestic manufacturing potential and the implementation of energy efficiency and renewable energy plans by local government.

The development of Allepad PV Three is aligned with the Renewable Energy Flagship Programme identified under South Africa's NCCRP and could therefore be argued to be aligned with the country's approach to addressing climate change.

4.3.11. 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 and 9 of the energy SIPs supports the development of the solar energy facility:

- SIP 8: Green energy in support of the South African economy: Support sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the Integrated Resource Plan (IRP 2010 – 2030) and supports bio-fuel production facilities.
- SIP 9: Electricity generation to support socio-economic development: The proposed Allepad PV Three is a potential SIP 9 Project as electricity will be generated and social and economic upliftment, development and growth will take place within the surrounding communities. It would become a SIP 9 project if selected as a Preferred Bidder project by the Department of Energy. SIP 9 supports the acceleration of the construction of new electricity generation capacity in accordance with the IRP 2010 to meet the needs of the economy and address historical imbalances.

Allepad PV Three could be registered as a SIP project once selected as a preferred bidder under the REIPPP Programme. The project would then contribute to the above-mentioned SIPs.

4.4. Provincial Policy and Planning Context

4.4.1. 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 considers the release of greenhouse gas (GHG) emissions created by human activity as the key cause of global warming, which in turn could result in major negative effects and disasters in the short- and medium-term. This effect would increasingly undermine human development gains. Innovative strategies would have to be implemented to reduce the impact of global deterioration.

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 Northern Cape PSDF also discusses economic development and that it typically responds to the availability of environmental capital (e.g. water, suitable agricultural soil, mining resources etc.) and infrastructural capital (e.g. roads, electricity, bulk engineering services etc.); over time this has resulted in the distinct development regions and corridors. The development corridors of the Northern Cape are indicated in **Figure 4.3**, with the Solar Corridor situated in the Northern Cape represented in yellow.

Considering the need for the development of renewable energy facilities in order to achieve the objective of sustainability the development of the proposed solar energy facility within the Northern Cape and within the study area is considered to be aligned with the Northern Cape PSDF.

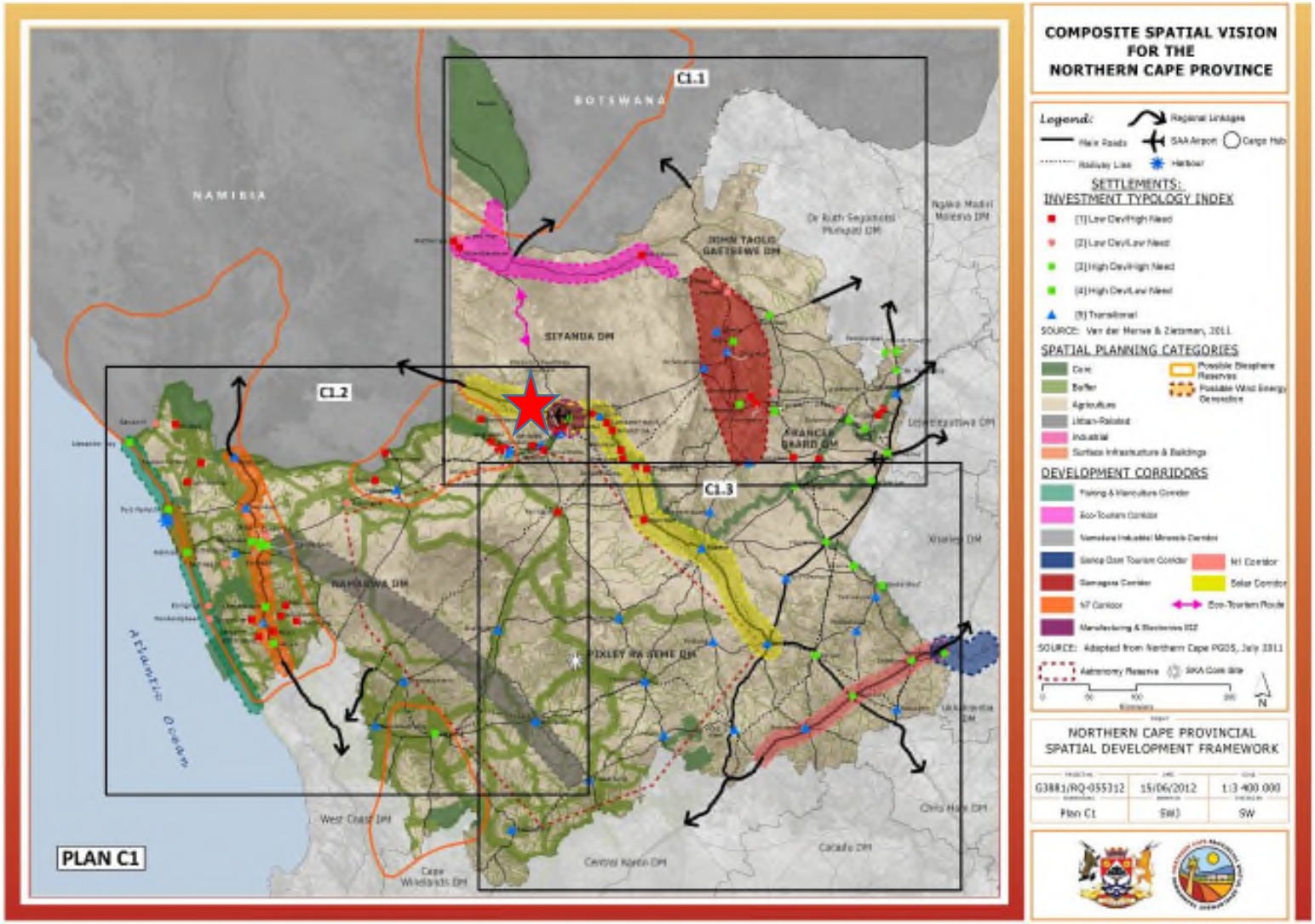

Figure 4.3: **Development regions and corridors of the Northern Cape (Source: Northern Cape PSDF 2012). The position of the Allepad PV Three site is indicated by the red star.**

4.5. Local Policy and Planning Context

4.5.1. ZF Mgcawu District Municipality Draft Integrated Development Plan (IDP) 2017 – 2022 (2018 / 2019)

The vision of the ZF Mgcawu DM as contained within its IDP 2017 – 2022 (2018 / 2019) is as follows:

"*Quality support to deliver quality services.*"

The mission of the ZF Mgcawu DM is:

"*Centre of excellence in providing quality basic services through support to local municipalities.*"

The following strategic objectives and development objectives have been identified for the ZF Mgcawu DM:

Strategic Objective	Dev Objective Linkage codes	Development Objective
(i) To monitor and determine the housing backlogs in the district as well as to eradicate sanitation & infrastructure backlogs	BSD: 1	01. Maintain and report on the housing requirements
	BSD: 2	02. Provide project management support to B-Municipalities
(ii) To assess and provide targeted support improving institutional capacity and service delivery capabilities of category B-municipalities	MIT: 1	03. Assess and report on the institutional capacity of B-municipalities to fulfil their statutory mandates
	MIT: 2	04. Assess and report on the service delivery capabilities of B-municipalities to fulfil their statutory mandates
	GGP: 1	05. Provide targeted support to B-municipalities (e.g. including legal support to B-municipalities regarding land use matters)
(iii) To promote environmental health and safety of communities in the ZF Mgcawu District through the proactive prevention, mitigation, identification and management of environmental health services, fire and disaster risks	BSD: 3	06. Providing environmental health services to B-municipalities
	GGP: 2	07. Implement special programmes (e.g. HIV / Aids)
(iv) To promote safety of communities in the ZF Mgcawu District through the proactive prevention, mitigation, identification and management of fire and disaster risks	BSD: 4	08. Establish disaster management mechanisms and programmes in the ZF Mgcawu District
(v) To Facilitate the Development of Sustainable regional land use, economic, spatial and environmental planning frameworks that will support and guide the development of a diversified, resilient and sustainable district economy	LED: 1	09. Establish a vehicle to ensure all businesses are co-operating (i.e. District LED Forum)
	LED: 2	10. Create investment opportunities in sectoral development (i.e. investment activities, Entrepreneurial business support programme)
	LED: 3	11. Enable an environment for business establishment and support initiatives (i.e.

Strategic Objective	Dev Objective Linkage codes	Development Objective
		Increase the number of businesses, entrepreneurial support)
(v) To market, develop and co-ordinate tourism in the ZF Mgcawu District	LED: 4	12. Promote the Green Kalahari tourism brand in the ZF Mgcawu district
(vi) To assess and monitor the status of infrastructure needs and requirements of B Municipalities	BSD: 5	13. Establish and provide selected infrastructure needs to targeted B Municipalities
(vii) To ensure efficient business operations and to fulfils the assurance statutory requirements of the ZF Mgcawu District Municipality	MFV: 1	14. Enable and improve financial viability and management through well-structured budget processes, financial systems, and MFMA compliance (i.e. promote good budget and fiscal management, Unqualified audits)
	MIT: 3	15. Enable efficient and effective administrative support and Planning processes (i.e. Maintaining sound labour relations, practices and overall administrative support, IDP planning etc.

The implementation of Allepad PV Three would contribute positively towards the strategic objective of supporting and guiding the development of a diversified, resilient and sustainable district economy, and the development objectives of creating investment opportunities in sectoral development (i.e. investment activities, Entrepreneurial business support programme), and enabling an environment for business establishment and support initiatives (i.e. Increase the number of businesses, entrepreneurial support) through the local content and local economic development requirements as prescribed under the REIPPP Programme.

4.5.2. Dawid Kruiper LM IDP 2017 / 2022 (2018 / 2019)

The vision of the Dawid Kruiper LM as contained within the IDP 2017 / 2022 (2018 / 2019) is as follows:

"*To provide an affordable quality service to Dawid Kruiper and its visitors and to execute the policies and programmes of the Council.*"

The mission of the Dawid Kruiper LM is as follows:

"*As an authority that delivers Municipal Services to Dawid Kruiper, we attempt by means of a motivated staff, to develop Dawid Kruiper increasingly as a pleasant, safe and affordable living and workplace for its residents and a hospitable relaxed visiting place for its visitors*."

According to the IDP 2017 / 2022 (2018 / 2019) the focus of the IDP is still on the present (status quo) situation, but with strategic development objectives set the focus is set to shifts to the future. Development objectives were aligned with national imperatives and frameworks, and in line with the powers and functions of the municipality.

Guidelines governing these development objectives and strategies include the national key priority (focal) areas:

» Focal Area 1: Basic Service Delivery
» Focal Area 2: To promote Local Economic Development
» Focal Area 3: To promote municipal Transformation and Organisational Development
» Focal Area 4: Ensure Financial Viability and Management
» Focal Area 5: Ensure Good Governance and Public Participation
» Focal Area 6: Spatial Development Framework

Six Key Priority Areas (KPAs) with ten Development Priorities were identified based on the challenges faced by the LM, and prioritised by both ward committees and the community during public participation processes. These KPAs were linked to the six National Key Performance Areas and the SDF development objectives of the municipality, and include the following:

Development Priority	Spatial Development, Town Planning and Land Use Management
Key Priority Area	**Development Objectives**
Spatial Development Framework	» Develop, manage and maintain essential bulk water infrastructure and facilities to accommodate the aspirations, needs and pressures of present and future industries, businesses and dependent communities. » Develop, manage and maintain necessary infrastructure and facilities required to improve the provision of water services.

Development Priority	Sewerage
Key Priority Area	**Development Objectives**
Service Delivery and Infrastructure Development	» Develop, manage and maintain essential bulk sewerage infrastructure and facilities to accommodate the aspirations, needs and pressures of present and future industries, businesses and dependent communities. » Develop, manage and maintain necessary infrastructure and facilities required to improve the provision of sewerage services.
Development Priority	Human Settlements and Housing
Key Priority Area	**Development Objectives**
Service Delivery and Infrastructure Development	» Eradicate housing backlogs in municipal area. » Provide for sustainable human settlements (housing).

Development Priority	Energy and Electricity
Key Priority Area	**Development Objectives**
Service Delivery and Infrastructure Development	» Provide, manage and maintain essential infrastructure required to improve the provision of electrical services

Development Priority	Roads, Transport and Stormwater Drainage

Key Priority Area	Development Objectives
Service Delivery and Infrastructure Development	» Develop, manage and maintain necessary Road, Transport and Storm Water infrastructure and facilities required to improve transportation in, and Aesthetic qualities of urban areas.

Development Priority	Sanitation, Waste Management and Waste Removal
Key Priority Area	**Development Objectives**
Service Delivery and Infrastructure Development	» Regulate and manage waste disposal to prevent pollution of the natural environment and natural resources.

Development Priority	Economic Growth and Job Creation
Key Priority Area	**Development Objectives**
Local Economic Development	» Promote the development of tourist infrastructure that will enhance tourism » Create an environment that promotes the development of a diversified and sustainable economy.

Development Priority	Community Development and Facilities
Key Priority Area	**Development Objectives**
Service Delivery and Infrastructure Development	» Pro-active prevention, mitigation, identification and management of environmental health, fire and disaster risks. » Provide safety to communities through law enforcement services and through legislative requirements. » Provide equal access to sport, park, recreational facilities and other public amenities to all residents.

Development Priority	Administrative and Institutional Capacity
Key Priority Area	**Development Objectives**
Institutional Development and Organisational Transformation Good Governance	» Enable and improve financial viability and management through well-structured budget processes, financial systems, and MFMA compliance through legislative requirements » Align institutional arrangements to provide an effective and efficient support service to deliver on organisational objectives » Provide quality basic services to all communities within the municipality (i.e. electricity, water, sanitation, refuse) » Manage and maintain municipal property, plant, equipment and vehicle fleet » Facilitate the establishment of good governance practices » Promote and improve public relations through stakeholder participation and good customer service.

The implementation of Allepad PV Three would contribute positively towards several of the development priorities and development objectives identified by the Dawid Kruiper LM, specifically with regards to economic growth and job creation, and could also contribute towards the LM achieving some of the other development priorities and objectives through the provision of increased revenue which would enable municipal spending.

4.5.3. Dawid Kruiper LM SDF (2017)

In addition, the IDP identified the following 8 pillars as being important for development and the Dawid Kruiper Council's envisagement of a self-sustaining ecology with long-term benefit for all inhabitants of Dawid Kruiper:

1. **Agriculture** as an optimally efficient and economically viable market-directed sector representing a socio-economic 'pivot' of Dawid Kruiper.
2. **Manufacturing and industry** as a viable sector which builds on the comparative economic advantages of Dawid Kruiper, and operates in accordance with the highest standards for environmental management.
3. **Tourism** as a sustainable industry, supporting or enhancing marginal industries and contributing significantly to the improvement of the quality of life of all the communities of Dawid Kruiper.
4. **Urban development** in a safe, healthy and aesthetically pleasing urban environment, with the architectural and spatial character depicting the historic and cultural background of the habitant communities.
5. **Rural development** in an environmentally sustainable manner with the infrastructure and services that is essential for the development of the rural communities of Dawid Kruiper whilst enhancing its unique rural character.
6. **Social Development** establishing an optimally developed and empowered society in harmony with its environment.
7. **Conservation** of natural habitats worthy to be consolidated into continuous tracts of conservation land, protecting natural biodiversity and providing community-supporting ecosystem services.
8. **Natural resources** as fundamental requirements for sustainable development in Dawid Kruiper Municipality.

The project site is located in Ward 11 of the Dawid Kruiper LM, while the portion of the grid connection which occurs outside of the project site is located in Ward 13 of the Dawid Kruiper LM. According to the Dawid Kruiper LM SDF the area under investigation is located within the C.a.2 Agriculture (Ward 11) and G.a.3 Vacant Land within Urban Edge (Ward 13) Spatial Planning Category (SPC) (refer to **Figure 4.4** and **Figure 4.5** respectively). These SPCs are described in more detail below:

C.a.2	**Agriculture:** The breeding of animals on natural veld, land and pasture, stock or auction pens, the processing of products produced on the farm, the cultivation of crops and at most one single residential house and other buildings that is reasonably relevant to the main agricultural activity on the farm, including bona-fide staff housing.
	Decision Making: This SPC covers the largest part of the DKLM area and contributes to the agricultural economy of the municipality. The protection of intensive agricultural areas, as is found on the banks of the Orange River, should enjoy critical protection from the pressures of urban development. Urban development on any area

	indicated as C.a.2 should immediately prompt the decision-making authority to request the inputs from the following departments or parastatals, namely: a) Department of Agriculture Forestry and Fisheries (DAFF), except where it may be proven that the involved land unit for development has been excluded from the provisions of Act No. 70 of 1970. b) Department of Environmental Affairs (DEA) to indicate if the development triggered a listed activity in accordance with NEMA. c) Department of Roads and Public Works (DRPW) stipulation 'No-Objection' regarding the development, access and prescribed building lines, if the property borders or makes use of a road in the jurisdiction of the said department. d) South African National Road Agency Limited (SANRAL) stipulation 'No-Objection' regarding the development, access and prescribed building lines, if the property borders or makes use of a road in the jurisdiction of the said parastatal. Urban development on any non-urban SPC should be excluded where such a development is outside of the urban edge, whereas the following SPCs are seen as complementary to Agriculture and the rezoning to being any of the following, can be considered under specific conditions and approvals: 1) D.f.1, Place of Worship, D.f.2, Place of Instruction and D.f.3 Institution. 2) D.g.1 Government Uses and D.g.2 Municipal Uses. 3) D.h.3 Accommodation Facilities 4) D.h.9 Small Holding 5) D.n.1 Cemeteries 6) D.o.1 Sports fields & Related Infrastructure 7) D.p.1 Airport and Related Infrastructure 8) D.q.1 Resort & Tourism Related Areas 9) E.a.1 Agricultural Industry 10) E.e.1 Extractive industry 11) SPC F. Surface Infrastructure 12) SPC G: Other, including Special Uses not clearly described in the LUMS and Vacant land within Urban Edge. C.a.2. May also be transformed to any land use within the A. to C's, subject to correct land use procedures being followed
G.a.3	**Vacant land within Urban Edge:** Vacant land inside the Urban Edge which may form part of the future expansion of Urban Related developments, but may include agriculture and other public amenities.
	Decision-Making: This SPC was indicated in and around the existing towns and settlements within the Urban Edge and in most cases include the commonage of the mentioned settlements and towns. This SPC may be rezoned to any of the SPCs included in this SDF document, specifically pertaining to the Policies included in this document.

The implementation of Allepad PV Three is not considered to be in contrast with the Dawid Kruiper LM SDF and the SPCs within which the project area is located. In addition, while application is being made to DEA for EA in terms of NEMA, DAFF, DRPW, and SANRAL are registered I&APs on the project. The implementation of Allepad PV Three would contribute towards addressing the Dawid Kruiper LM's key issue regarding high levels of poverty and unemployment, skills shortage, and inequalities, through the creation of employment opportunities, the provision of skills training opportunities, and local economic growth, including growth in personal income levels of those community members who would be employed on the project. In addition, the REIPPP Programme requires preferred bidders to make contributions towards local economic development and social upliftment, to be focused on benefitting local communities within the vicinity of the project site.

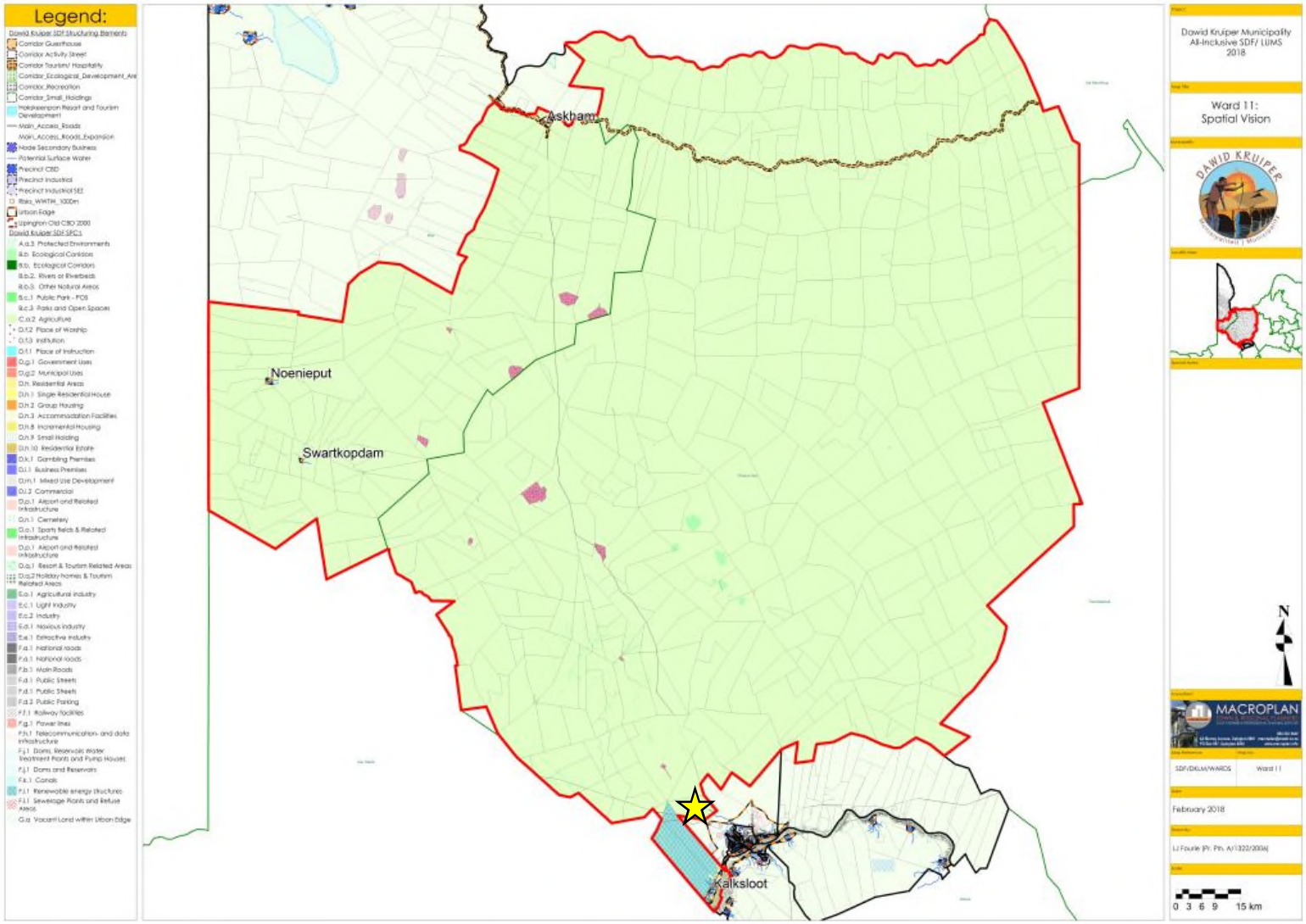

Figure 4.4: Dawid Kruiper LM SDF for Ward 11 (the location of the project site within the Ward 11 is indicated by the yellow star).

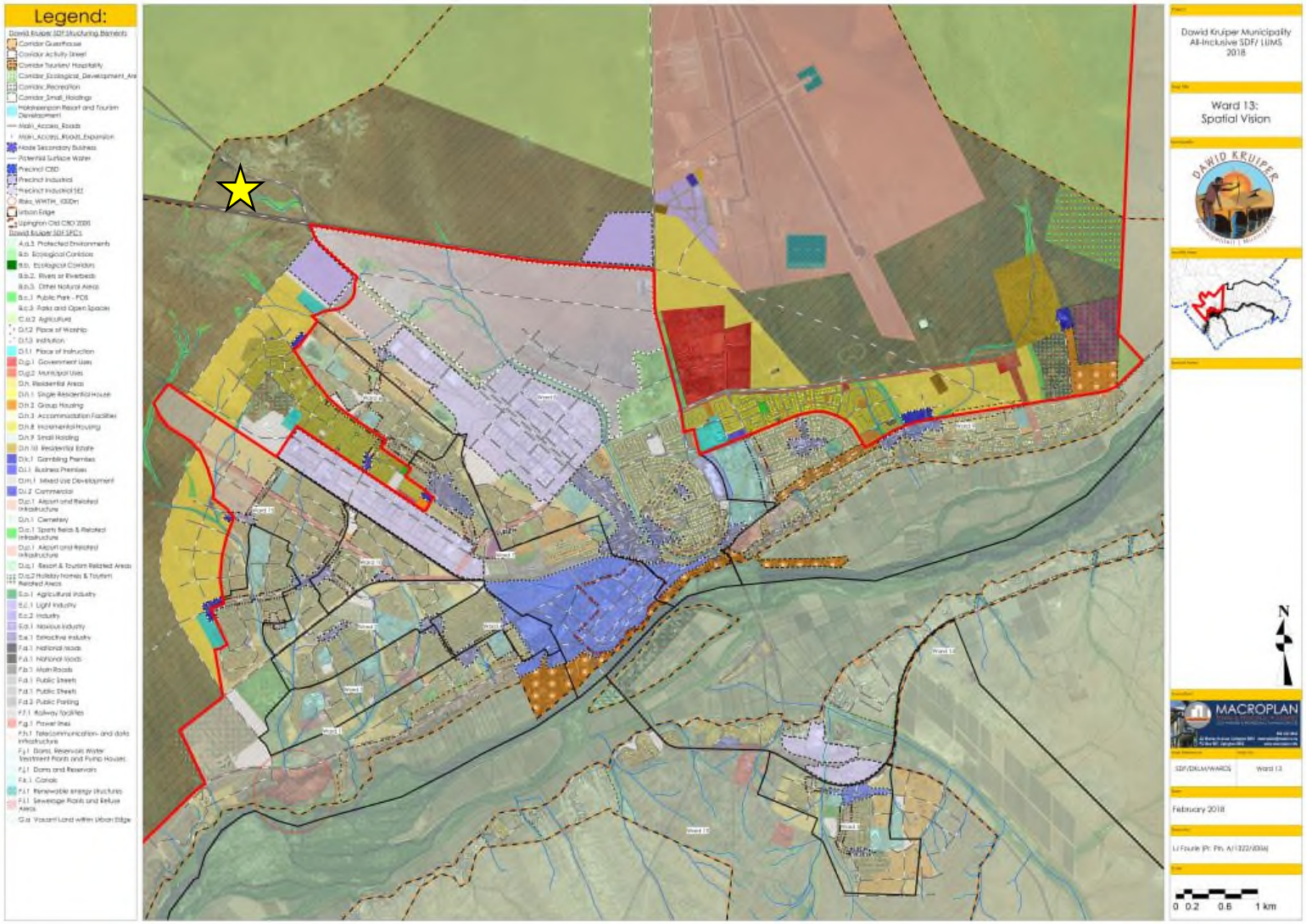

Figure 4.5: Dawid Kruiper LM SDF for Ward 13 (the location of the project site within the Ward 13 is indicated by a yellow star).

4.6. International Policy and Planning Context

4.6.1. United Nations Framework Convention on Climate Change (UNFCCC) and Conference of the Party (COP)

Climate change is one of the major global challenges of the 21st century that require global response. The adverse impacts of climate change include persistent drought and extreme weather events, rising sea levels, coastal erosion and ocean acidification, further threatening food security, water, energy and health, and more broadly efforts to eradicate poverty and achieving sustainable development. Combating climate change would require substantial and sustained reductions in GHG emissions, which together with adaptation, can limit climate change risks. The convention responsible for dealing with climate change is the United Nations Framework Convention on Climate Change (UNFCCC).

The UNFCCC was adopted in 1992 and entered into force in 1994. It provides the overall global policy framework for addressing the climate change issue and marks the first international political response to climate change. The UNFCCC sets out a framework for action aimed at stabilizing atmospheric concentrations of GHGs to avoid dangerous anthropogenic interference with the climate system.

The UNFCCC has established a variety of arrangements to govern, coordinate and provide for oversight of the arrangements described in the documentation. The oversight bodies take decisions, provide regular guidance, and keep the arrangements under regular review in order to enhance and ensure their effectiveness and efficiency. The Conference of Parties (COP), established by Article 7 of the Convention, is the supreme body and highest decision-making organ of the Convention. It reviews the implementation of the Convention and any related legal instruments, and takes decisions to promote the effective implementation of the Convention.

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 was open for signature and subject to ratification, acceptance or approval by States and regional economic integration organizations that are Parties to the Convention from 22 April 2016 to 21 April 2017, and thereafter open for accession.

The Paris Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:

(a) Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change.
(b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low GHG emissions development, in a manner that does not threaten food production.
(c) Making finance flows consistent with a pathway towards low GHG emissions and climate-resilient development.

In order to achieve the long-term temperature goal set out in Article 2 of the Agreement, Parties aim to reach global peaking of GHG emissions as soon as possible, recognizing that peaking will take longer for developing country Parties, and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of

GHGs in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty.

The Paris Agreement requires all Parties to put forward their best efforts through "Nationally Determined Contributions" (NDCs) and to strengthen these efforts in the years ahead. This includes requirements that all Parties report regularly on their emissions and on their implementation efforts. In 2018, Parties will take stock of the collective efforts in relation to progress towards the goal set in the Paris Agreement and to inform the preparation of NDCs. There will also be a global stocktake every 5 years to assess the collective progress towards achieving the purpose of the Agreement and to inform further individual actions by Parties.

In working towards this goal, advanced economies have already included renewables in their energy mix and have planned to increase their use in order to meet their mitigation goals: Japan aims to derive 22 – 24% of its electricity production from renewable sources by 2030 and the European Union plans for them to reach 27% of its final energy consumption. Developing countries are also playing their part, including South Africa which has included a goal of 17.8GW of renewables by 2030 within the IRP.

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 came into force internationally on 04 November 2016, thirty days after the date on which at least 55 Parties to the Convention accounting in total for at least an estimated 55% of the total global greenhouse gas emissions have deposited their instruments of ratification, acceptance, approval or accession with the Depositary.

COP 23 was held in Bonn, Germany from 06 to 17 November 2017, and is the second COP to be held since COP 21. One of the key outcomes of COP 23 was the launch of the "Powering Past Coal Alliance", led by the UK and Canada. More than 20 countries joined the alliance, including Denmark, Finland, Italy, New Zealand, Ethiopia, Mexico, and the Marshall Islands; as well as the United States (US) states of Washington and Oregon. The alliance notes that analysis shows that coal phase-out is needed by no later than 2030 in the OECD and EU28, and by no later than 2050 in the rest of the world to meet the Paris Agreement; however it does not commit signatories to any particular phase-out date. It also does not commit the signatories to ending the financing of unabated coal-fired power stations, but rather just restricting it.

4.6.2. The Equator Principles III (June, 2013)

The Equator Principles (EPs) III constitute a financial industry benchmark used for determining, assessing, and managing projects environmental and social risks. The EPs are primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. The EPs are applicable to large infrastructure projects and apply globally to all industry sectors.

The EPs comprise the following principles:

Principle 1: Review and Categorisation
Principle 2: Environmental and Social Assessment.
Principle 3: Applicable Environmental and Social Standards.
Principle 4: Environmental and Social Management System and Equator Principles Action Plan
Principle 5: Stakeholder Engagement
Principle 6: Grievance Mechanism

Principle 7: Independent Review
Principle 8: Covenants
Principle 9: Independent Monitoring and Reporting
Principle 10: Reporting and Transparency.

When a project is proposed for financing, the Equator Principle Financial Institution (EPFI) will categorise it based on the magnitude of its potential environmental and social risks and impacts.

Projects can be categorized as follows:

Category A: Projects with potential significant adverse environmental and social risks and / or impacts that are diverse, irreversible or unprecedented.
Category B: Projects with potential limited adverse environmental and social risks and / or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures.
Category C: Projects with minimal or no adverse environmental and social risks and / or impacts.

Based on the above-mentioned criteria, Allepad PV Three can be anticipated to be categorised as a Category B project.

Category A and Category B projects require that an assessment process be conducted to address the relevant environmental and social impacts and risks associated with the project. Such an assessment may include the following where applicable:

- An assessment of the baseline environmental and social conditions.
- Consideration of feasible environmentally and socially preferable alternatives.
- Requirements under host country laws and regulations, applicable international treaties and agreements.
- Protection and conservation of biodiversity (including endangered species and sensitive ecosystems in modified, natural and Critical Habitats) and identification of legally protected areas.
- Sustainable management and use of renewable natural resources (including sustainable resource management through appropriate independent certification systems).
- Use and management of dangerous substances.
- Major hazards assessment and management.
- Efficient production, delivery and use of energy.
- Pollution prevention and waste minimisation, pollution controls (liquid effluents and air emissions), and solid and chemical waste management.
- Viability of Project operations in view of reasonably foreseeable changing weather patterns / climatic conditions, together with adaptation opportunities.
- Cumulative impacts of existing Projects, the proposed Project, and anticipated future Projects.
- Respect of human rights by acting with due diligence to prevent, mitigate and manage adverse human rights impacts.
- Labour issues (including the four core labour standards), and occupational health and safety.
- Consultation and participation of affected parties in the design, review and implementation of the Project.
- Socio-economic impacts.
- Impacts on Affected Communities, and disadvantaged or vulnerable groups.

- Gender and disproportionate gender impacts.
- Land acquisition and involuntary resettlement.
- Impacts on indigenous peoples, and their unique cultural systems and values.
- Protection of cultural property and heritage.
- Protection of community health, safety and security (including risks, impacts and management of Project's use of security personnel).
- Fire prevention and life safety.

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 proposed Project. In terms of the EPs South Africa is a non-designated country, and as such the assessment process for projects located in South Africa evaluates compliance with the applicable International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability, and Environmental Health and Safety (EHS) Guidelines.

Allepad PV Three is currently being assessed in accordance with the requirements of the 2014 EIA Regulations, as amended (GNR 326), published in terms of Section 24(5) of NEMA, which is South Africa's national legislation providing for the authorisation of certain listed activities. Through this assessment, all potential social and environmental risks are identified and assessed, and appropriate mitigation measures proposed.

4.6.3. IFC's Performance Standards on Environmental and Social Sustainability (January 2012)

The IFC's Performance Standards 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.
- To do no harm to people or the environment.
- To fight climate change by promoting low carbon development.
- To respect human rights;
- To Promote gender equity;
- To provide information prior to project development, free of charge and free of external manipulation;
- To collaborate with the project developer to achieve the PS;
- To provide advisory services; and
- To notify countries of any Trans boundary impacts as a result of a Project.

The Performance Standards comprise the following:

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

Performance Standard 1 establishes the importance of:

i) Integrated assessment to identify the social and environmental impacts, risks, and opportunities of projects.
ii) Effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them.
iii) The management of social and environmental performance throughout the life of a project through an effective Environmental and Social Management System (ESMS).

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. Performance Standard 1 is the overarching standard to which all the other standards relate. Performance Standard 2 through 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, Performance Standard 2 through 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 Allepad PV Three it is anticipated at this stage of the EIA process that Performance Standards 1, 2, 3, 4, 6, and 8 may be applicable to the project.

CHAPTER 5 NEED AND DESIRABILITY

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 within the approved site as contemplated in the accepted Scoping Report*", as per Appendix 3 of the 2014 EIA Regulations, as amended. 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 is of land within the proposed development site.

This Chapter provides an overview of the suitability of Allepad PV Three being developed at the preferred location from a national, regional, and site specific perspective.

5.1. Need and Desirability from an International Perspective

The need and desirability of Allepad PV Three, 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	Mobilized 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	7.B.1	Investments in energy efficiency as a percentage of GDP and the amount of foreign direct investment in financial transfer for infrastructure

Targets	Indicators
developing States, and land-locked developing countries, in accordance with their respective programmes of support.	and technology to sustainable development services.

The development of Allepad PV Three would contribute positively towards Goal 7 of the SGDs through the following means:

- By generating up to 100MW 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.

5.2. Need and Desirability from a National Perspective

Allepad PV Three is proposed in specific response to a national government initiative, namely the DoE's REIPPP Programme. This programme was initiated in order to give effect to the requirements of 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 4**). The following key plans 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 above-mentioned 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 planning and dictate national priorities for energy production.

The IEP is intended to provide a roadmap of South Africa's future energy landscape which guides future energy infrastructure investments and policy development. 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, including the Northern Cape, which is one of the best solar resource areas in the world. 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.*
- *Several interventions which could enhance the future solar energy landscape are recommended as follows: – Large scale CSP projects with proven thermal storage technologies and hybridisation / industrial steam application projects should be incentivised in the short to medium term. In the long term the existing incentives could be extended to promote locally developed CSP technology storage solutions and large scale solar fuel projects.*
- *A thorough solar resource assessment for South Africa should continue to be undertaken in the Northern Cape 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 IRP for Electricity 2010 – 2030 is a subset of the IEP, and constitutes South Africa's current gazetted energy plan[13]. 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 IRP 2010 - 2030 includes 9.6GW of nuclear, 6.25GW of coal, **17.8GW of renewables**, and approximately 8.9GW of other generation sources such as hydro, and gas in addition to all existing and committed power plants.

On 22 August 2018 the Draft IRP 2018 was released for comment. The latest update of the IRP includes estimates that **7.82GW of PV**, 9GW of wind, 10.94GW of gas (CCGT / CCGE / OCGT), and 0.025GW of landfill gas would be required by the end of 2030[14]. This demonstrates government's commitment to the ongoing development of renewable energy.

[13] Despite there having been numerous draft revisions proposed to it, the Integrated Resource Plan for Electricity 2010 – 2030 remains the current iteration of the IRP.

[14] These figures reflect capacities for the Least Cost Plan (IRP1) by year 2030 without Annual Build Limits on RE (IRP3).

In line with government policy to reduce GHG emissions, the IRP update uses the moderate decline constraint for GHG emissions. Although this is subject to change following recent correspondence received from DEA indicating that carbon budget methodology must be used instead of emissions decline constraints, the consideration of GHG emissions in the determination of the energy generation mix indicates government's commitment to international obligations under the Paris Agreement.

In response to the IRP, the DoE initiated a number of IPP Procurement Programmes to secure electricity generated by a range of resources from the private sector (i.e. from IPPs). Under these Programmes, IPPs are invited to submit proposals for the finance, construction, operation, and maintenance of electricity generation facilities for the purpose of entering into an Implementation Agreement with the DoE and a Power Purchase Agreement (PPA) with Eskom as the buyer. IPPP Programmes include the REIPPP, the Co-generation IPPP Programme, the Liquefied Natural Gas (LNG) to Power IPPP Programme, and the CBIPPPP (refer to **Table 5.1**).

Table 5.1: Overview of IPPP Programmes and their current allocation (MW).

IPP Procurement Programme	Technology	MW	Total
Renewables	Onshore Wind	6 360 MW	14 725MW
	Concentrated solar thermal	1 200 MW	
	Solar Photovoltaic	4 725 MW	
	Biomass	210 MW	
	Biogas	110 MW	
	Landfill Gas	25 MW	
	Small hydro	195 MW	
	Small Projects	400 MW	
	Solar Parks	1 500MW	
Coal Baseload	Coal	2 500MW	2 500MW
Cogeneration	Cogeneration	800MW	800MW
Gas	Gas	3 000MW	3 000MW

Renewable energy resources are valuable in contributing towards electricity generation and diversifying South Africa's electricity mix, while contributing towards South Africa's response to Climate Change. Under the REIPPPP the DoE intends to secure 14 725MW of electricity from renewable energy generation facilities utilising either Onshore Wind, Concentrated Solar Thermal, Solar PV, Biomass, Biogas, Landfill Gas, or Hydro across a number of bidding windows, while simultaneously contributing towards socio-economic development. A total of 2 291.83MW of PV generated electricity has been awarded to preferred bidders across four (4) rounds of bidding to date, with 2 433.17MW still remaining to be allocated in subsequent bidding rounds. Preferred bidders identified under any IPPP Programme, including the REIPPP Programme, are required to satisfy a number of economic development requirements, including amongst others, job creation, local content, skills development, enterprise and supplier development, and socio-economic development. In addition to electricity generation and supply, IPPP Programmes therefore also contribute positively towards socio-economic development of a region, over and above job creation.

The need for new power generation from PV has therefore been identified and assessed by government at a national scale considering the national energy requirements as well as international commitments under the Paris Agreement, and provision has been made for the inclusion of new PV power generation capacity in South Africa's' energy mix. The implementation of Allepad PV Three therefore 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 NDP.

Allepad PV Three 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 project would have reduced water requirements when compared with some other generation technologies in alignment with one of the vision 2030 themes of the DWS's National Water Resource Strategy 2 (2013) (i.e. transitioning to a low carbon economy through stimulating renewable energy and retrofitting buildings).

5.3. Need and Desirability of the project from a Regional Perspective

South Africa's electricity generation mix has historically been dominated by coal. This can be attributed to the fact that South Africa has abundant coal deposits, which are relatively shallow with thick seams, and are therefore easy and comparatively cost effective to mine. In 2016 South Africa had a total generation capacity of 237 006GWh. Approximately 85.7% (equivalent to 203 054GWh) of this figure was generated by coal, and only 0.9% (equivalent to 2 151GWh) was generated by solar (refer to **Figure 5.1**).

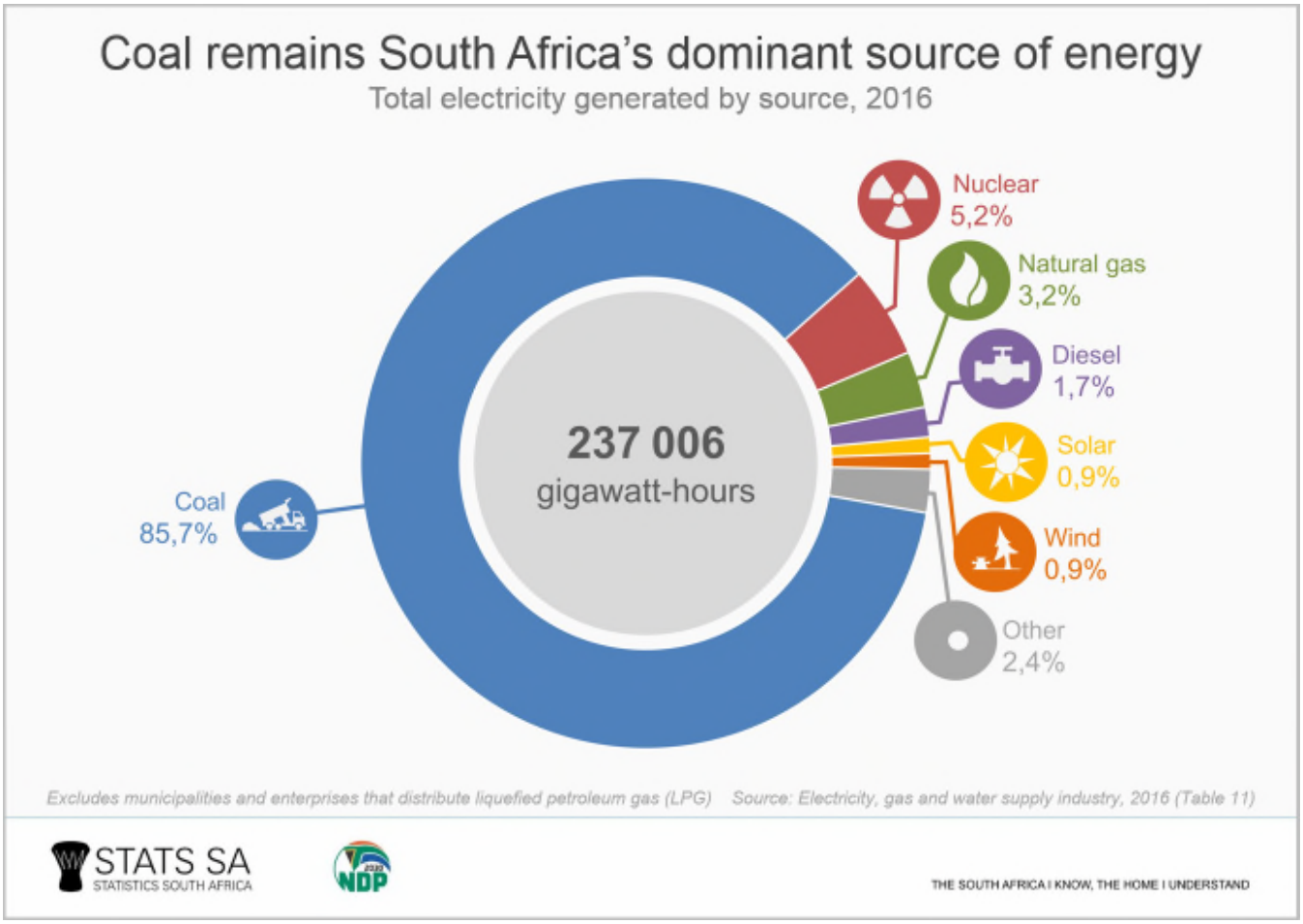

Figure 5.1: Overview of South Africa's electricity generation by source (Source: StatsSA 2016 Electricity, gas and water supply industry).

Whereas the majority of South Africa's electricity generation infrastructure is currently located within Mpumalanga Province due to the location of coal resources within this province, the Northern Cape Province has been identified as an area where the development of solar energy facilities is a feasible and

suitable option for electricity generation. The project site is therefore suitably located for the proposed development.

The Upington area has been ear-marked as a hub for the development of solar energy projects due to the viability of the solar resource for the area, and this area is included in the solar corridor which has been identified by the Northern Cape Spatial Development Framework (refer to Chapter 4 for more details). 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. The GHI for the area derived from the World Bank Group's Global Solar Atlas is approximately 2 264kWh/m^2/annum, equivalent to the highest GHI values in the country (refer to **Figure 5.2**).

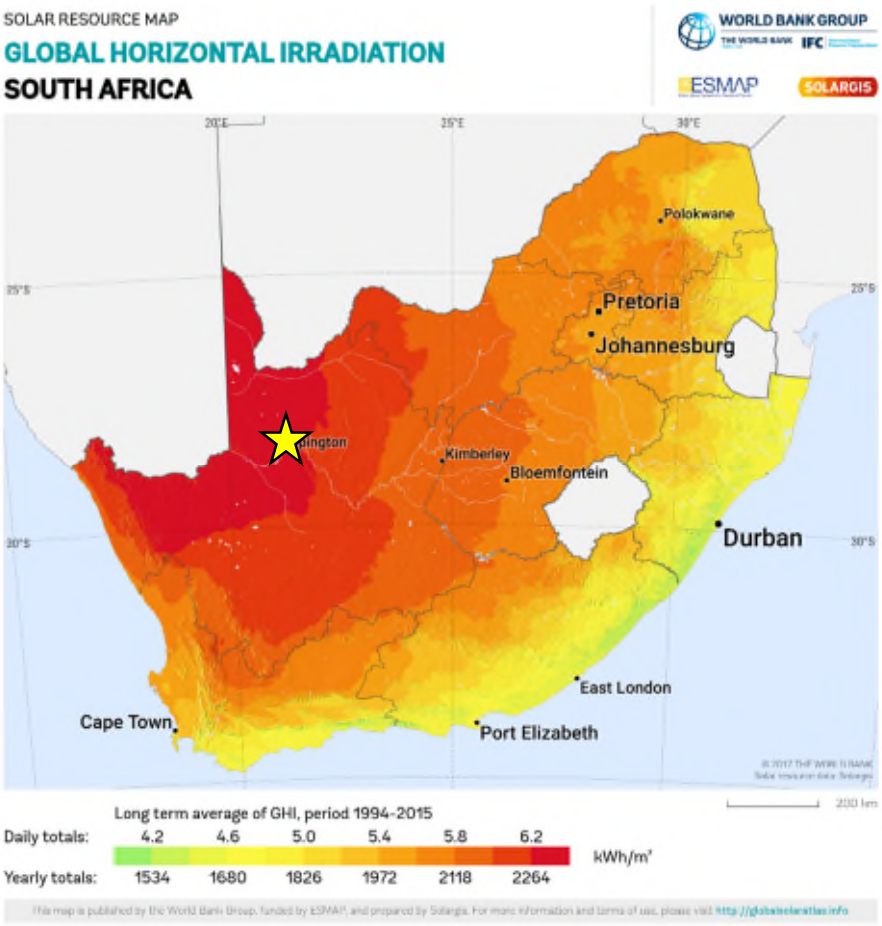

Figure 5.2: Solar irradiation map for South Africa, the proposed position of Allepad PV Three is shown by the yellow star on the map. (Source: World Bank Groups Global Solar Atlas).

5.4. Receptiveness of the proposed project site to development of Allepad PV Three

The placement of a solar PV facility is strongly dependent on several factors including climatic conditions (solar radiation levels), topography, the location of the site, and in particular the location in a planned 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 has specifically been identified by the

applicant as being highly desirable from a technical perspective for the development of a solar facility due to the following site characteristics:

» **Solar resource**: The economic viability of a solar facility is directly dependent on the annual direct solar irradiation values. The Upington region and other parts of the Northern Cape Province are characterised as having the highest solar irradiation values in South Africa (and which are comparable on a global scale). The actual Global Horizontal Irradiation (GHI) for the proposed project site is in the region of 2 282kWh/m^2/annum (as measured on the adjacent Solar Park site), which is ideally suited to the development of a commercial solar PV facility and of the highest levels in the country.

» **Topography**: A surface area with favourable topography facilitates the work involved in construction and maintenance of the PV facility. The proposed project site is characterised as having very flat topography with slopes of less than 0.5% across the site (i.e. 900m to 870m across 7km).

» **Site extent:** The project site is approximately 3 889ha in extent, which is sufficient for the installation of the facility allowing for avoidance of site sensitivities. The development footprint of the facility would occupy an area equivalent to approximately 6.4% of the full project site.

» **Site access**: Access to the project site is obtained via the existing and official farm entrance which is accessed off the N10 national road.

» **Grid access:** A key factor in the siting of any project is that the project must have a viable grid connection. The new Eskom Transmission Upington MTS is located approximately15km south of the project site with a future 400kV line servitude crossing the project site as well as a major 132kV (multi power line) corridor and proposed Solar Park Satellite substation approximately 6km away, all situated on surrounding Municipal land. Eskom's 2018-2027 Transmission Development Plan (TDP) currently stipulates the following roll out for this MTS substation:

- Upington Strengthening Phase 1a Nuwehoop-Upington 1st 400 kV line 2018 – installed.
- Upington 1st 500 MVA 400/132 kV transformation 2018 – installed.
- Upington 2nd 500 MVA 400/132 kV transformation by 2022.
- Upington Strengthening Phase 1b Aries-Upington 1st 400 kV lines 2024 and Aries-Upington 2nd 400kV lines 2024.
- Upington 3rd and 4th 500MVA 400/132kV transformation 2024.
- Upington Strengthening Phase 1c Ferrum-Upington 1st 400 kV line 2025.
- Upington 5th 500 MVA 400/132 kV Transformation 2025.
- Installed capacity 2500MVA by 2025.

Grid connection for Allepad PV Three is available by means of a new 132 kV double-circuit power line which will connect the on-site substation with Eskom's upgraded 132kV double-circuit power line running between the new Upington MTS and the Gordonia Distribution Substation (located in Upington town). The point of connection is located approximately 5km east of the project site and will make use of a loop-in and loop-out configuration utilising a double-circuit monopole construction. The presence of existing power lines within such close proximity of the proposed project site provides opportunity for the project to connect to the national grid with minimal linear transmission impact (i.e. of less than 10km). The principle to minimise associated infrastructure and the resulting impacts is also supported.

» **Land suitability:** The current land use of the site 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 cattle. Agricultural (i.e. grazing) land is preferred as the majority of farming practices can continue in tandem with the operation of the solar PV facility once construction and commissioning of the project is complete, without significantly impacting on the agricultural productivity of the site. In addition, sites that facilitate easy construction conditions (i.e. relatively flat topography, lack of major rock outcrops, limited watercourse crossing etc.) are also favoured during site selection.

» **Geographic location**: The proposed site is located within an area which has become a node for renewable energy projects, with the following solar energy facilities which are close proximity to the project site: Upington Solar Park (bordering), Sirius Solar PV Projects 1 (Preferred Bidder project under construction) and 2, Rooipunt CSP, S-Kol PV Plant, Bloemsmond Solar 1 and 2, Solis CSP I and II, Dyasonsklip (Preferred Bidder project under construction), Khi Solar One CSP (operating Preferred Bidder project) Khunab and Kai Garib CSP's, and Upington Airport Solar PV (operating Preferred Bidder project) (refer to **Figure 5.3**). The proposed project site is within very close proximity to an existing cluster or node for solar PV development and also borders a Renewable Energy Development Zone (REDZ 7) (refer to **Figure 5.4**). The site is in fact the first and closest commercially available land parcel to/in the REDZ that has the necessary techno-economic attributes for development. The site therefore compliments existing and planned future land use. It should also be noted that many of the projects in **Figure 5.3** are concentrating solar power (CSP) projects, that aim to provide power to the grid during peak power demand periods. The proposed solar PV facility is complementary to these as it will provide power to the grid during daytime periods when the CSP plants are storing up energy, especially during winter, and will assist in balancing and stabilising the supply to the local network.

» **Landowner support**: The selection of a site where the landowner is supportive of the development of renewable energy is essential for ensuring the success of the project. The landowner welcomes the project and does not view the development as a conflict with their current land use practices and future requirements.

» **Reduced water use**: Dust deposition measurements from neighbouring sites for CSP plants determined that the average daily soiling rate was less than 0.2% per day reflectivity. Considering that the project site is bordered by the tarred N10 national road and the site soil is stable due to established brush, it is expected that the panel soiling rates will be of industry standard or lower requiring less panel washing.

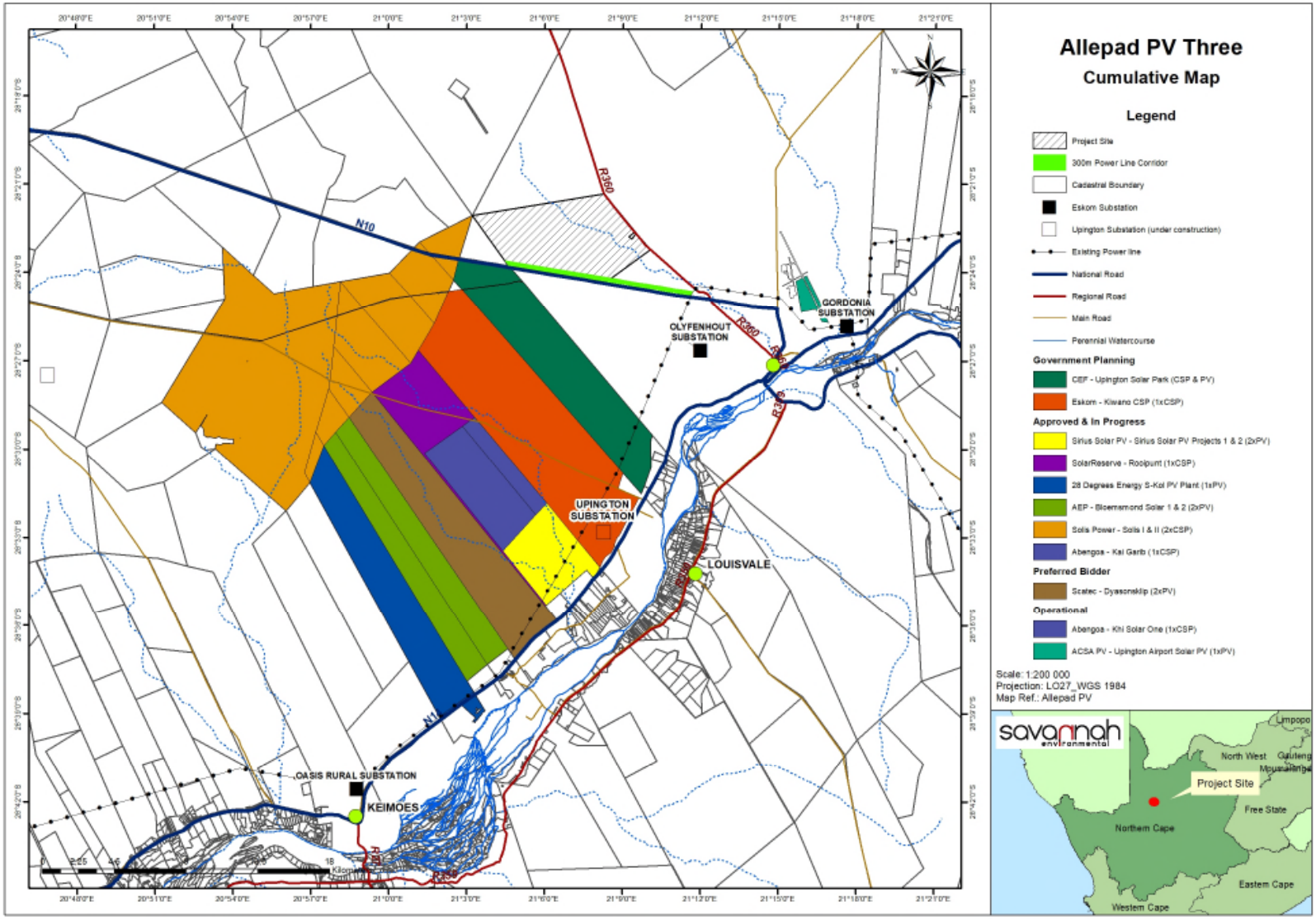

Figure 5.3: Map showing the location of solar energy facilities in relation to the proposed project site.

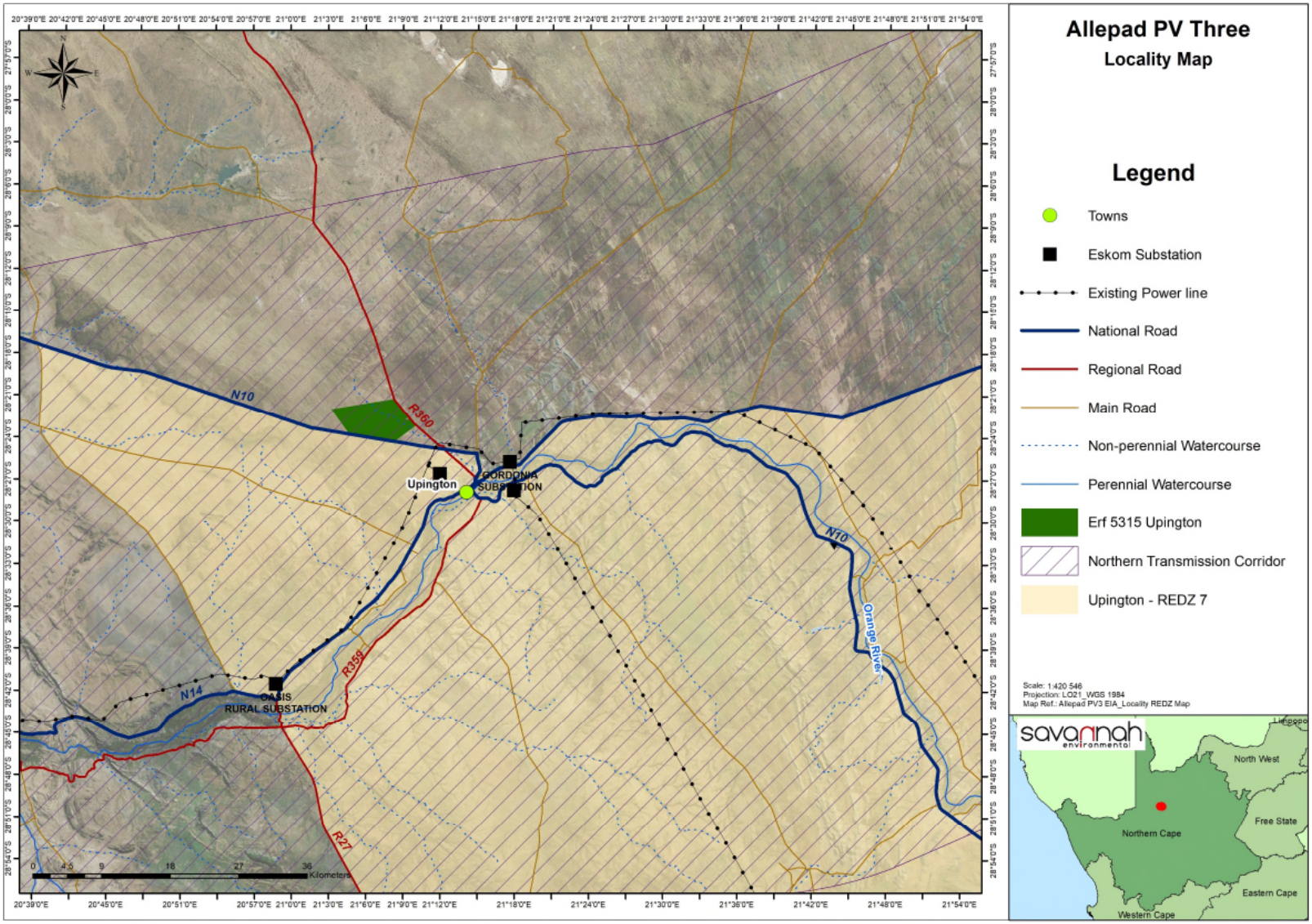

Figure 5.4: Map showing the location of the project site in relation to the REDZ 7 and Northern Transmission Corridor.

5.4.1. Benefits of Renewable Energy and the Need and Desirability thereof

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 proposed project has the potential to create much needed employment for unskilled locals during the construction phase. Opportunities will also be afforded to qualified local people having had employment at other developments in the area during their construction periods who can now be up-skilled to undertake certain roles during the construction and operation phases. In terms of the needs of the local community, the LM and DM IDPs identified the need to facilitate economic development by creating an environment which 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 Energy, National Treasury and DBSA (June 2017) found that employment opportunities created during the construction phase of the projects implemented to date had created 40% more job years 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 project 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 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.

Socio-economic sustainability: Several solar PV projects in the Upington area have either been completed or are currently under construction. As such, national and international resources have been utilised for the training and upskilling of local workers for the construction and operation of solar PV projects. While the operation of a solar PV facility provides employment over the 20 years of the plant's commercial life, the construction employment is finite, typically lasting one to two years in total, depending on the size of the plant. If approved and successful within the Department of Energy's IPP procurement programme, Allepad PV Three will provide an opportunity towards sustainable employment to those that have been skilled by previous projects; a key objective of the socio-economic development impact of the renewable energy programme.

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. 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 during 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]. During the first half of 2017, the average daily contribution of RE to the power system was about 3.6%"(NERSA, 2017). Maximum daily wind, solar PV and CSP energy of 47 GWh was available on 25 December 2017 (CSIR, 2018).

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. Results of a CSIR Energy Centre study for January – June 2015 (CSIR, August 2015) have quantified the contribution from renewable energy to the national power system and the economy over the first 6 months of 2015 compared to the 12 months of 2014:

2015 (6 months)	2014 (12 months)
R3.60 billion saving in diesel and coal fuel costs	R3.64 billion saving in diesel and coal fuel costs
200 hours of unserved energy avoided, saving at least an additional R1.20 billion–R4.60 billion for the economy	120 hours of unserved energy avoided, saving at least an additional R1.67 billion for the economy
Generated R4.0 billion more financial benefits than cost	Generated R0.8 billion more financial benefits than cost

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.

Economics: As a result of the excellent renewable energy resources and competitive procurement processes, both wind power and solar PV power have now been proven as cheaper forms of energy generation in South Africa than coal power. They offer excellent value for money to the economy and citizens of South Africa while benefitting society as a whole through the development of clean energy. This is supported by the Draft IRP 2018 released for comment which follows the least cost option.

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 radiation or wind for power generation is a non-consumptive use of a natural resource which produces zero emissions during its operation.

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

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 responsible) and is currently ranked 9th worldwide in terms of per capita carbon dioxide emissions. Since its inception the REIPPP Programme has achieved carbon emission reductions[16] of 25.3 million tonnes of CO_2 (IPP Office, March 2018). The development of Allepad PV Three, and the associated electricity generated as a result of the facility, will result in considerable savings on tons of CO_2 emissions.

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 the Kyoto Protocol, 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. By the end of March 2018 the REIPPP Programme had created 35 702 job years (equivalent of a full time employment opportunity for one person for one year) for South African citizens including people from communities local to IPP operations (IPP Office, March 2018).

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.

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.

[16] Carbon emission reduction is calculated based on a displacement of power, from largely coal-based to more environmentally friendly electrical energy generation, using a gross Eskom equivalent emissions factor of 1.015 tons CO_2/MWh.

CHAPTER 6 APPROACH TO UNDERTAKING THE EIA PROCESS

An EIA process refers to a process undertaken in accordance with the requirements of the relevant EIA Regulations (i.e. the 2014 EIA Regulations, as amended (GNR 326)), which involves the identification and assessment of direct, indirect, and cumulative environmental impacts associated with a proposed project or activity. The EIA process culminates in the preparation and submission of a Final EIA Report (including an EMPr) to the competent authority for decision-making.

The EIA process is illustrated in **Figure 6.1**.

Figure 6.1: The Phases of an EIA Process

The development of Allepad PV Three requires EA in accordance with the requirements of Section 24 of NEMA and the 2014 EIA Regulations (GNR 326). The applicant has appointed Savannah Environmental (Pty) Ltd, as the independent environmental consultants responsible for undertaking the EIA process required in support of the application for EA for Allepad PV Three. An application for EA was prepared and submitted to DEA, and the project was assigned Application Reference number: **14/12/16/3/3/2/1107**.

This Chapter provides a brief overview of NEMA and the 2014 EIA Regulations (GNR 326), as amended and their application to Allepad PV Three, as well as details of the EIA process followed for this project.

6.1. Relevant legislative permitting requirements

The legislative permitting requirements applicable to Allepad PV Three as identified at this stage in the process are described in more detail under the respective subheadings.

6.1.1. 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(1) 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 Allepad PV Three is a power generation project and therefore relates to the IRP 2010 – 2030, the National DEA has been determined as the Competent Authority in terms of GNR 779 of 01 July 2016. The Provincial Northern Cape DENC is a Commenting Authority on the project.

The need to comply with the requirements of the EIA Regulations published under NEMA ensures that developers 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.

The EIA process being conducted for Allepad PV Three is being undertaken in accordance with Section 24 (5) of NEMA. Section 24 (5) of NEMA pertains to EAs, 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 NEMA which are likely to have a detrimental effect on the environment, and which may not commence without EA from the competent authority subject to the completion of an environmental assessment process (either a Basic Assessment (BA) or full Scoping and EIA).

Table 6.1 contains all the listed activities identified in terms of NEMA, the 2014 EIA Regulations (GNR 326), and Listing Notice 1 (GNR 327), Listing Notice 2 (GNR 325), and Listing Notice 3 (GNR 324) which may be triggered by the proposed development of Allepad PV Three, and for which EA has been applied:

Table 6.1: Listed activities identified in terms of the Listing Notices (GNR 327, 325 and 324).

Notice Number	Activity Number	Description of listed activity
Listing Notice 1 (GNR 327) 08 December 2014	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 275kV or more. ***The project entails the construction of a new 132kV on-site substation up to 1ha in extent and a new 132kV double-circuit power line required to evacuate electricity generated by the project into the national electricity grid. The project site is located outside of the urban edge as identified in the Dawid Kruiper LM SDF (2017).***
Listing Notice 1 (GNR 327) 08 December 2014	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 1ha. ***The project comprises an industrial development, and will result in the transformation of approximately 250ha of land (equivalent to the size of the development footprint) which is currently utilised for agricultural (i.e. grazing) purposes.***
Listing Notice 2 (GNR 325) 08 December 2014	1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20MW or more.

Notice Number	Activity Number	Description of listed activity
		The project comprises a renewable energy generation facility, which will utilise ground-mounted PV technology and will have a generation capacity of up to 100MW. The project site is located outside of the urban edge as identified in the Dawid Kruiper LM SDF (2017).
Listing Notice 2 (GNR 325) 08 December 2014	15	The clearance of an area of 20ha or more of indigenous vegetation[17]. ***The project requires the clearance of an area up to 250ha (equivalent to the development footprint) of vegetation. The project is proposed on an agricultural property 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 indigenous vegetation greater than 20ha in extent.***

6.1.2. 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 the 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.

[17] "Indigenous vegetation" as defined by the 2014 EIA Regulations (GNR 326) refers to vegetation consisting of indigenous plant species occurring naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.

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 proposed development, 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 (GNR 668).

6.2. Overview of the Scoping and EIA Process being undertaken for the project.

In terms of NEMA, the 2014 EIA Regulations (GNR 326), and Listing Notices 1 (GNR 327), 2 (GNR 325), and 3 (GNR 324)), the development of Allepad PV Three requires EA from DEA subject to the completion of a full Scoping and EIA process, as prescribed in Regulations 21 to 24 of the 2014 EIA Regulations (GNR 326). The need for a full Scoping and EIA process to be conducted in support of the application for EA is due to the fact that listed activities contained within Listing Notice 2 (GNR 325) are triggered.

6.3. Scoping Phase

The Scoping Phase of the EIA process refers to the process of identifying potential issues associated with the proposed project, and defining the extent of studies required during the EIA Phase. This is achieved through an evaluation of the proposed project, involving the project proponent, specialists with relevant experience, and a public consultation process with key stakeholders (including government authorities) and Interested and Affected Parties (I&APs).

In accordance with Appendix 2 of the 2014 EIA Regulations (GNR 326), the objectives of the Scoping Phase are to, through a consultative process:

- Identify the relevant policies and legislation relevant to the activity.
- Motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location.
- Identify and confirm the preferred activity and technology alternative through an identification of impacts and risks, and a ranking process of such impacts and risks.
- Identify and confirm the preferred site, through a detailed site selection process. This includes an identification of impacts and risks inclusive of identification of cumulative impacts and a ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment.
- Identify the key issues to be addressed in the assessment phase.
- Agree on the level of assessment to be undertaken, including the methodology to be applied, the expertise required as well as the extent of further consultation to be undertaken to determine the impacts and risks which the activity may impose on the preferred site through the life of the activity (including the nature, significance, consequence, extent, duration and probability of the impacts), to inform the location of the development footprint within the preferred site.
- Identify suitable measures to avoid, manage or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

The Scoping Study for Allepad PV Three considered the broader project site in order to identify and delineate any environmental fatal flaws, "no-go", or sensitive areas which should be avoided. This was undertaken through specialist studies and a process of consultation. The preparation and release of a Scoping Report for a 30-day public review period provided stakeholders and I&APs with an opportunity to verify that the issues they had raised during the Scoping process had been captured and adequately considered, and provided a further opportunity for additional key issues to be raised for consideration. The Final Scoping Report incorporated all issues and responses raised during the Scoping Phase prior to submission to the DEA. The Final Scoping Report and Plan of Study for EIA was submitted to DEA on 16 November 2018, and acceptance was received on 05 December 2018, thus marking the start of the EIA Phase (refer to **Appendix B**). Additional information requested by the DEA in the Acceptance of the Scoping Report and the location of the requested information in this EIA Report is detailed in **Table 6.2**

Table 6.2: DEA requirements and reference to Section in the EIA Report.

DEA requirement for EIA	Response / Location in this EIA Report
Technical Details of the proposed facility and design alternative:	
i. The EIAr must provide the technical details for the proposed facility in a table format as well as their description and/or dimensions. A sample for the minimum information required is listed under point 2 of the EIA information required for PV facilities below.	**Chapter 2, Table 2.2** of this EIA Report provides the technical details for the Allepad PV Three solar energy facility, including their description and/or dimensions.
ii. Further, the EIAr must include the design alternatives for the proposed 100MW PV facility.	**Chapter 3** of this EIA Report provides a description of the various alternatives considered for Allepad PV Three. The design alternative proposed for Allepad PV Three is considered to be the most reasonable and feasible alternative for the development and therefore no design alternatives were identified or assessed.
Application for re-zoning i. The EIAr must include proof indicating that an application for the re-zoning has been lodged with the relevant authority as the proposed development will take place on land currently zoned for agricultural land uses.	An application for rezoning has been submitted to the Dawid Kruiper Local Municipality. The municipality informed the applicant that an application can only be processed once the project has received EA. Proof of correspondence with the municipality has been included in **Appendix L**. A rezoning application will be undertaken as a separate process by the developer once the project has been selected as a preferred bidder project in the Department of Energy's Renewable Energy Independent Power Producer Procurement (REIPPP) Programme.
The EIAr must also provide the following	
i. Provide a clear indication of the proposed development footprint of the PV solar facility as well as the all associated infrastructure; i.e. placement of photovoltaic (PV) panels.	The project footprint has been included in **Chapter 2, Section 2.1.1** of this EIA Report and consist of footprint of the facility and all associated infrastructure.
ii. Clear description of all associated infrastructure. This description must include, but not limited to the following: » Power lines; » Internal roads infrastructure;	The Allepad PV Three and all associated infrastructure has been described in **Chapter 2** of this EIA Report. Information on services required on the site, e.g. sewage, refuse removal, water and electricity, agreements with suppliers and confirmation of capacity have been requested from the municipality but not received as yet.

DEA requirement for EIA	Response / Location in this EIA Report
» All supporting onsite infrastructure such as laydown area, guard house and control room etc. » All necessary details regarding all possible locations and sizes of the proposed satellite substation and the main substation. » Information on services required on the site, e.g. sewage, refuse removal, water and electricity, agreements with suppliers and confirmation of capacity been obtained must be provided.	Proof of the requests for confirmation have been included in **Appendix L3** of this EIA Report.
Need and Desirability of the proposed development: The Department has noted that there are other projects of similar nature in the area, therefore; your EIAr must provide detailed description of the need and desirability taking into account cumulative impacts of the proposed development in the area.	The need and desirability of the project has been described in detail in **Chapter 5** of this EIA Report which considers other projects operating and under construction in the area. **Chapter 9** of this EIA Report assesses the potential for cumulative impacts associated with the project and other projects in the area.
A copy of the final site layout map and alternatives: All available biodiversity information must be used in the finalisation of the layout map. **The layout map must indicate the following:** » PV positions and its associated infrastructure; » Permanent laydown area footprint; » Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible); » Wetlands, drainage lines, rivers, stream (including buffer zones) and water crossing of roads and cables indicating the type of bridging structures that will be used; » The location of sensitive environmental features on site e.g. CBAs, heritage sites, wetlands, drainage lines etc. that will be affected by the facility and its associated infrastructure; » Substation(s) and/or transformer(s) sites including their entire footprint; » Connection routes (including pylon positions) to the distribution/transmission network; » All existing infrastructure on the site, especially roads; » Buffer areas; » Buildings, including accommodation; and » All "no-go" areas.	A copy of the final site layout map which indicates the information requested by DEA in its Acceptance of Scoping is provided in **Appendix M** of this EIA Report.
Topographical and Sensitive Maps	
i. An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process must be on an A3 page and must have a clear legend.	An A3 environmental sensitivity map is provided in **Appendix M** to this EIA Report.

DEA requirement for EIA	Response / Location in this EIA Report
ii. A topographical map combining the final layout map superimposed (overlain) on the environmental sensitivity map must be submitted with the final EIAr.	A layout map overlain by environmental sensitivities is provided in **Appendix M** to this EIA Report.
<u>Shapefile of the preferred Development layout:</u> A shapefile of the preferred development layout/footprint must be submitted to this Department. The shapefile must be created using the Hartebeesthoek 94 Datum and the data should be in Decimal Degree Format using the WGS 84 Spheroid. The shapefile must include at a minimum the following extensions i.e. .shp; .shx; .dbf; .prj; and, .xml (Metadata file). If specific symbology was assigned to the file, then the .avl and/or the .lyr file must also be included. Data must be mapped at a scale of 1:10 000 (please specify if an alternative scale was used). The metadata must include a description of the base data used for digitizing. The shapefile must be submitted in a zip file using the EIA application reference number as the title. The shape file must be submitted to: Postal Address: Department of Environmental Affairs Private Bag X447, Pretoria 0001 Physical address: Environment House, 73 Steve Biko Road, Pretoria For Attention: Muhammad Essop Integrated Environmental Authorisations Strategic Infrastructure Developments Telephone Number: (012) 399 9406 Email Address: MEssop@environment.gov.za	Shapefiles of the preferred development layout / footprint have been submitted to the DEA with a copy of this EIA Report for its review and comment.
The Environmental Management Programme (EMPr) to be submitted as part of the EIAr must include the following: i. All recommendations and mitigation measures recorded in the EIAr and the specialist studies conducted.	The EMPr prepared for the project is attached as **Appendix I** to this EIA Report, copies of which have been submitted to DEA for its review and comment. i. The EMPr contains all recommendations and mitigation measures recorded in the EIA Report and the specialist studies conducted (refer to **Appendix D to H** of this EIA Report).
ii. A good quality final site layout map with clear legend.	ii. A copy of the final site layout map is included in **Appendix A** of the EMPr prepared for the project and attached as **Appendix I** to this EIA Report.
iii. Measures as dictated by the final site layout map and micro-siting.	iii. Measures as dictated by the final site layout map are included in the EMPr, prepared for the project and attached as **Appendix I** to this EIA Report.
iv. An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.	iv. A copy of the environmental sensitivity map is included in **Appendix A** of the EMPr, prepared for the

DEA requirement for EIA	Response / Location in this EIA Report
	project and attached as **Appendix I** to this EIA Report.
v. A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.	v. A map which superimposes the final layout map over the environmental sensitivity map is included in **Appendix A** of the EMPr, prepared for the project and attached as **Appendix I** to this EIA Report.
vi. An alien invasive management plan to be implemented during construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken.	vi. An alien invasive management plan has been prepared for the project, and is included in **Appendix C** of the EMPr, prepared for the project and attached as **Appendix I** to this EIA Report.
vii. A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialist familiar with the site and be implemented prior to commencement of the construction phase.	vii. A plant rescue and protection plan has been prepared for the project, and is included in **Appendix D** of the EMPr, prepared for the project and attached as **Appendix I** to this EIA Report.
viii. A re-vegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.	viii. A re-vegetation and habitat rehabilitation plan has been prepared for the project, and is included in **Appendix E** of the EMPr, prepared for the project and attached as **Appendix I** to this EIA Report.
ix. A traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimize impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.	ix. A traffic management plan has been prepared for the project, and is included in **Appendix I** of the EMPr, prepared for the project and attached as **Appendix I** to this EIA Report.
x. A storm water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water run-off.	x. A storm water management plan has been prepared for the project, and is included in **Appendix G** of the EMPr, prepared for the project and attached as **Appendix I** to this EIA Report.
xi. A fire management plan to be implemented during the construction and operation of the facility.	xi. A fire management plan has been prepared for the project, and is included in **Appendix J** of the EMPr, prepared for the project and attached as **Appendix I** to this EIA Report.

DEA requirement for EIA	Response / Location in this EIA Report
xii. Measures to protect archaeological sites, artefacts, paleontological fossils or graves from construction and operational impacts.	xii. Measures to protect archaeological sites, artefacts, paleontological fossils or graves have been identified and are included in the EMPr prepared for the project, and attached as **Appendix I** to this EIA Report.
The EAP must provide detailed motivation if any of the above requirements is not required by the proposed development and not included in the EMPr.	Where there are deviation from DEA's requirements stipulated in the Acceptance of Scoping, a motivation has been provided.
You are hereby reminded that should the EIAr fail to comply with the requirements of this acceptance letter, the proposed 100MW Allepad Three PV Facility project will be refused in terms of the EIA Regulations 2014, as amended.	Savannah Environmental is cognisant of the requirements stipulated in the Acceptance of Scoping and have addressed these in this EIA Report (as detailed within this table).
Public Participation Ensure that all relevant stakeholders' comments (including original comments) are submitted to the Department with the final EIAr. This includes but is not limited to the Department of Environmental Affairs: Biodiversity and Conservation Directorate, the Department of Agriculture, Forestry and Fisheries (DAFF), Department of Environment and Nature Conservation, the South African Civil Aviation Authority (SACAA), the Department of Transport, The David Kruiper Local Municipality, Department of Water and Sanitation (DWS), the South African National Roads Agency Limited (SANRAL), the South African Heritage Resources Agency (SAHRA), the Endangered Wildlife Trust (EWT), Department of Mineral Resources, National Energy Regulator of South Africa (NERSA), National Department of Energy, Eskom, Cape Nature and Birdlife South Africa.	Comments received to date were included within the Final Scoping Report. No subsequent comments on the project have been received. All comments received from the relevant Departments during the review of the EIA Report will be included in the final EIA Report to be submitted to the DEA.
Proof of all correspondence must be included in the EIAr. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments.	Proof of correspondence with various stakeholders will be attached in **Appendix C4** (organs of state correspondence) and **Appendix C5** (stakeholder correspondence) of the final EIA Report. Proof of attempts to obtain comments will be attached in **Appendix C4** (organs of state correspondence) and **Appendix C5** (stakeholder correspondence) of the final EIA Report.
The applicant is hereby reminded to comply with the requirements of Regulation 45 with regard to the time period allowed for complying with the requirements of the Regulations, and Regulations 43 and 44 with regard to the allowance of a comment period for interested and affected parties on all reports submitted to the competent authority for decision-making. The reports referred to are listed in Regulation 43(1).	Savannah Environmental is cognisant of the need to comply with Regulations 43, 44 and 45 of the 2014 EIA Regulations (GNR 326). » **Regulation 43 (GNR 326):** This EIA Report has been made available for a 30-day public review period from **28 February 2019 to 01 April 2019**. The EIA Report has been distributed to relevant Organs of State and a copy has been made available at the Dawid Kruiper Public Library, corner of Mark and Mutual Streets, Upington. The EIA Report which has been submitted to the national DEA, the

DEA requirement for EIA	Response / Location in this EIA Report
	Northern Cape DENC, and relevant Organs of State is also available for download from www.savannahsa.com or on CD on request from Savannah Environmental (Pty) Ltd. » **Regulation 44 (GNR 326):** Comments from I&APs received to date are included in the Comments and Response (C&R) Report attached as **Appendix C8** to this EIA Report. » **Regulation 45 (GNR 326):** Acceptance of Scoping was received from DEA on **05 December 2018**. In accordance with Regulation 23(1)(a) (GNR 326) the applicant must within 106 days of the acceptance of the Scoping Report submit to the authority an EIA Report inclusive of any specialist reports, and an EMPr, which must have been subjected to a public participation process of at least 30-days and which includes the incorporation of comments received, including any comments of the competent authority. The EIA Report has been released for a 30-day public review period from **28 February 2019 to 01 April 2019**. Comments received during this 30-day public review period will be incorporated into the C&R Report to be attached as **Appendix C8** to the Final EIA Report. The Final EIA Report inclusive of specialist studies and an EMPr is due to be submitted by **13 April 2019**[18].
Furthermore, it must be reiterated that, should an application for Environmental Authorisation be subject to the provisions of Chapter II, Section 38 of the National Heritage Resources Act, Act 25 of 1999, then this Department will not be able to make nor issue a decision in terms of your application for Environmental Authorisation pending a letter from the pertinent heritage authority categorically stating that the application fulfils the requirements of the relevant heritage recourses authority as described in Chapter II, Section 38(8) of the National Heritage Resources Act, Act 25 of 1999. Comments from SAHRA and/or the provincial department of heritage must be provided in the EIAr.	Savannah Environmental acknowledges that should the application be subject to Section 38 of the National Heritage Resources Act, Act 25 of 1999, the Department will require a letter from the pertinent heritage authority categorically stating that the application fulfils the requirements of the relevant heritage resources authority. Comments from SAHRA and/or the provincial department of heritage have been requested.

[18] This date has been calculated excluding the period of 15 December to 05 January in accordance with the requirements of Regulation 3(2) of the 2014 EIA Regulations (GNR 326).

DEA requirement for EIA	Response / Location in this EIA Report
You are requested to submit two (2) electronic copies (CD/DVD) and one (1) hard copy of the EIAr to the Department as per Regulation 23(1) of the NEMA, EIA Regulations, 2014 as amended.	Two (02) electronic copies and one (01) hard copy of the EIA Report have been submitted to the DEA's EIA Administration Section as required.
You are hereby reminded that in terms of Section 24F(1)(a) of the National Environmental Management Act, Act No 107 of 1998, as amended, which stipulates that no activity may commence prior to an Environmental Authorisation being granted by this Department.	The applicant is cognisant of the need to comply with Section 24F(1)(a) of NEMA with regards to commencing with listed activities. No activities have or will commence on site prior to EA being granted by the DEA.
EIA INFORMATION REQUIRED FOR PHOTOVOLTAIC SOLAR POWER (PV) ENERGY FACILITIES **a. General site information** The following general site information is required: » Descriptions of all affected farm portions » 21 digit Surveyor General codes of all affected farm portions » Copies of deeds of all affected farm portions » Photos of areas that give a visual perspective of all parts of the site » Photographs from sensitive visual receptors (tourism routes, tourism facilities, etc.) » Solar plant design specifications including: * Type of technology * Structure height * Surface area to be covered (including associated infrastructure such as roads) * Structure orientation * Laydown area dimensions (construction period and thereafter) * Generation capacity » Generation capacity of the facility as a whole at delivery points This information must be indicated on the first page the EIAr. It is also advised that it be double checked as there are too many mistakes in the applications that have been received that take too much time from authorities to correct.	Refer to **Chapter 2**, **Table 2.1** and **Table 2.2** of this EIA Report for the general site information.
b. Sample of technical details for the proposed facility **Component** / **Description / dimensions** Height of PV panels Area of PV Number of inverters required	Refer to **Chapter 2**, **Table 2.2** of this EIA Report for the technical details of the proposed facility.

DEA requirement for EIA		Response / Location in this EIA Report
Area occupied by inverter / transformer stations / substations		
Capacity of on-site substation		
Area occupied by both permanent and construction laydown areas		
Area occupied by buildings		
Length of internal roads		
Width of internal roads		
Proximity to grid connection		
Height of fencing		
Type of fencing		

3. Site maps and GIS information

Site maps and GIS information should include at least the following:

- All maps / information layers must also be provided in ESRI Shapefile format
- All affected farm portions must be indicated
- The exact site of the application must be indicated (the areas that will be occupied by the application)
- A status quo map / layer must be provided that includes the following:
  - Current use of land on the site including:
    - Buildings and other structures
    - Agricultural fields
    - Grazing areas
    - Natural vegetation areas (natural veld not cultivated for the preceding 10 years) with an indication of the vegetation quality as well as fine scale mapping in respect of Critical Biodiversity Areas and Ecological Support Areas
    - Critically endangered and endangered vegetation areas that occur on the site
    - Bare areas which may be susceptible to soil erosion
    - Cultural historical sites and elements
  - Rivers, streams and water courses
  - Ridgelines and 20m continuous contours with height references in the GIS database
  - Fountains, boreholes, dams (in-stream as well as off-stream) and reservoirs
  - High potential agricultural areas as defined by the Department of Agriculture, Forestry and Fisheries
  - Buffer zones (also where it is dictated by elements outside the site):

Refer to **Appendix M** of this EIA Report for site maps and GIS information.

DEA requirement for EIA	Response / Location in this EIA Report
▪ 500m from any irrigated agricultural land ▪ 1km from residential areas * Indicate isolated residential, tourism facilities on or within 1km of the site » A slope analysis map / layer that include the following slope ranges: * Less than 8% slope (preferred areas for PV and infrastructure) * between 8% and 12% slope (potentially sensitive to PV and infrastructure) * between 12% and 14% slope (highly sensitive to PV and infrastructure) * steeper than 18 % slope (unsuitable for PV and infrastructure) » A site development proposal map(s) / layer(s) that indicate: * Foundation footprint * Permanent laydown area footprint * Construction period laydown footprint * Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible) * River, stream and water crossing of roads and cables indicating the type of bridging structures that will be used * Substation(s) and / or transformer(s) sites including their entire footprint. * Cable routes and trench dimensions (where they are not along internal roads) * Connection routes to the distribution / transmission network (the connection must form part of the EIA even if the construction and maintenance thereof will be done by another entity such as ESKOM) * Cut and fill areas at PV sites along roads and at substation / transformer sites indicating the expected volume of each cut and fill * Borrow pits * Spoil heaps (temporary for topsoil and subsoil and permanently for excess material) * Buildings including accommodation With the above information authorities will be able to assess the strategic and site impacts of the application.	
4. Regional map and GIS information The regional map and GIS information should include at least the following:	Refer to **Appendix M** of this EIA Report for regional maps and GIS information.

DEA requirement for EIA	Response / Location in this EIA Report
» All maps / information layers must also be provided in ESRI Shapefile format » The map / layer must cover an area of 20km around the site » Indicate the following: * Roads including their types (tarred or gravel) and category (national, provincial, local or private) * Railway lines and stations * Industrial areas * Harbours and airports * Electricity transmission and distribution lines and substations * Pipelines * Waters sources to be utilised during the construction and operational phases * A visibility assessment of the areas from where the facility will be visible * Critical Biodiversity Areas and Ecological Support Areas * Critically Endangered and Endangered vegetation areas * Agricultural fields * Irrigated areas * An indication of new road or changes and upgrades that must be done to existing roads in order to get equipment onto the site including cut and fill areas and crossings of rivers and streams	
5. Important stakeholders Amongst other important stakeholders, comments from the National Department of Agriculture, Forestry and Fisheries must be obtained and submitted to the Department. Any application, documentation, notification etc. should be forwarded to the following officials: Ms Mashudu Marubini Delegate of the Minister (Act 70 of 1970) E-mail: MashuduMa@daff.gov.za Tel 012- 319 7619 Ms Thoko Buthelezi AgriLand Liaison office E-mail: ThokoB@daff.gov.za Tel 012- 319 7634	Comments from the National Department of Agriculture, Forestry and Fisheries (DAFF) have been requested (refer to Appendix C4 for proof. No comments have been received to date. Should any comments be obtained, these will be included in **Appendix C4 and C6** to this EIA Report.
All hardcopy applications / documentation should be forwarded to the following address: <u>Physical address:</u>	Hard copies of documentation submitted to DAFF have been submitted to the Postal Address as provided. Refer to **Appendix C4** for a copy of the proof of delivery of hard copy documentation to DAFF.

DEA requirement for EIA	Response / Location in this EIA Report
Delpen Building Cnr Annie Botha and Union Street Office 270 Attention: Delegate of the Minister Act 70 of 1970 Postal Address: Department of Agriculture, Forestry and Fisheries Private Bag X120 Pretoria 0001 Attention: Delegate of the Minister Act 70 of 1970	
In addition, comments must be requested from Eskom regarding grid connectivity and capacity. Request for comment must be submitted to: Mr John Geeringh Eskom Transmission Megawatt Park D1Y38 PO Box 1091 **JOHANNESBURG** 2000 Tel: 011 516 7233 Fax: 086 661 4064 John.geeringh@eskom.co.za	Comments have been requested from Eskom. Refer to **Appendix C4** of this EIA Report for proof of correspondence submitted to Eskom, and to **Appendix C6** for copies of correspondence / comments received from Eskom.
B. AGRICULTURE STUDY REQUIREMENTS » Detailed soil assessment of the site in question, incorporating a radius of 50 m surrounding the site, on a scale of 1:10 000 or finer. The soil assessment should include the following: * Identification of the soil forms present on site * The size of the area where a particular soil form is found * GPS readings of soil survey points * The depth of the soil at each survey point * Soil colour * Limiting factors * Clay content * Slope of the site * A detailed map indicating the locality of the soil forms within the specified area, * Size of the site » Exact locality of the site » Current activities on the site, developments, buildings » Surrounding developments / land uses and activities in a radius of 500m of the site » Access routes and the condition thereof » Current status of the land (including erosion, vegetation and a degradation assessment)	Based on the conclusions of the scoping study for Allepad PV Three, no further detailed soil investigation will be required due mainly to the prevailing unfavourable climatic conditions for arable agriculture, as well as relatively homogeneous nature of the soils.

DEA requirement for EIA	Response / Location in this EIA Report
» Possible land use options for the site » Water availability, source and quality (if available) » Detailed descriptions of why agriculture should or should not be the land use of choice » Impact of the change of land use on the surrounding area » A shape file containing the soil forms and relevant attribute data as depicted on the map.	

6.4. EIA Phase

As per the EIA Regulations (GNR 326) the objectives of the EIA Phase are to, through a consultative process:

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

This EIA Report assesses potential positive and negative, direct, indirect, and cumulative impacts associated with all phases of the project life cycle including pre-construction, construction, operation and decommissioning. In this regard the EIA Report aims to provide the relevant authorities with sufficient information to make an informed decision regarding the proposed project.

6.4.1. Tasks completed during the EIA Phase

The EIA Phase for Allepad PV Three has been undertaken in accordance with the 2014 EIA Regulations (GNR 326) published in terms of Section 24(5) of NEMA.

Key tasks undertaken during the EIA Phase to date include:

- Consultation with relevant decision-making and regulating authorities (at national, provincial and local levels).
- Undertaking a public participation process throughout the EIA process in accordance with the requirements of Regulations 39 to 44 of the 2014 EIA Regulations (GNR 326) in order to identify any additional issues and concerns associated with the proposed project.
- Preparation of a Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process (in accordance with the requirements of Regulation 44 of the 2014 EIA Regulations (GNR 326).
- Undertaking independent specialist studies in accordance with the requirements of Regulation 23(5) and Appendix 6 of the 2014 EIA Regulations (GNR 326).
- Preparation of an EIA Report in accordance with the requirements of Regulation 23 and Appendix 3 of the 2014 EIA Regulations (GNR 326).

The following subsections outline the activities within the EIA process that have been undertaken to date.

6.4.2. Authority Consultation

The National DEA is the competent authority for this application. A record of all authority consultation undertaken is included in this EIA Report. Consultation with the regulating authorities (i.e. DEA and DENC) has continued throughout the EIA process.

The following steps are to be undertaken as part of this EIA process:

- Make the EIA Report available for a 30-day public and authority review period.
- Notification and consultation with stakeholders, I&APs and Organs of State that may have jurisdiction over the project, including provincial and local government departments, and State Owned Enterprises.
- Incorporating comments received during the 30-day public review period to prepare a Final EIA Report.
- Submission of the Final EIA Report to DEA for decision making.
- Provide an opportunity for DEA and DENC representatives to visit and inspect the proposed site and project area.

A record of the authority consultation during the EIA process to date is included in **Appendix C**.

6.4.3. Public Involvement and Consultation

The public participation process has been undertaken in accordance with the requirements of Regulations 39 to 44 of the 2014 EIA Regulations (GNR 326). The aim of the public participation process is primarily to ensure that:

- Information containing all relevant facts in respect of the proposed project is made available to potential stakeholders and I&APs.
- Participation by I&APs is facilitated in such a manner that all potential stakeholders and I&APs are provided with a reasonable opportunity to comment on the proposed project.
- Comments received from stakeholders and I&APs are recorded and incorporated into the EIA process.

In order to accommodate the varying needs of stakeholders and I&APs within the study area, as well as capture their inputs regarding the project, various opportunities for stakeholders and I&APs to be involved in the EIA Phase have been provided, as follows:

» Opportunity for review of the EIA Report for a 30-day period from **28 February 2019** to **01 April 2019.** Comments received from I&APs during this period will be captured within a Comments and Response Report, which will be included within the Final EIA Report, for submission to the DEA for decision-making.
» Focus Group Meetings to be held during the 30-day public review period.
» One-on-one consultation, where required.
» Telephonic consultation sessions (consultation with various parties from the EIA project team, including the Public Participation Consultant, and EIA Consultants).
» Written, faxed or e-mail correspondence.

Comments of from I&APs received to date are included in the Comments and Response (C&R) Report attached as Appendix C8 to this EIA Report. Comments raised by I&APs during the EIA process will be synthesised into this Comments and Responses (C&R) Report. The C&R Report will include responses from members of the EIA project team and / or project proponent.

Public participation documentation from the process to date is included in **Appendix C**.

6.4.4. Assessment of Issues Identified as part of the EIA Process

In accordance with the approved Plan of Study for EIA, issues which required investigation during the EIA Phase, as well as the specialists involved in the assessment of these impacts are indicated in **Table 6.3**.

Table 6.3: Specialist Studies undertaken as part of the EIA Phase.

Specialist Study	Specialist Company	Specialist Name	Appendix
Ecology (Flora and Fauna)	3Foxes Biodiversity Solutions	Simon Todd	**Appendix D**
Avifauna	3Foxes Biodiversity Solutions	Simon Todd and Eric Herrmann	**Appendix E**
Heritage (Archaeology and Palaeontology)	CTS Heritage	Jenna Lavin	**Appendix F**
Visual	LOGIS	Lourens du Plessis	**Appendix G**
Social	Dr Neville Bews and Associates[19]	Dr Neville Bews	**Appendix H**

Identified impacts are assessed in terms of the following:

» The **nature**, a description of what causes the effect, what will be affected, and how it will be affected

[19] Due to unavailability, the Social Impact Assessment was undertaken by Dr Neville Bews and not Sarah Watson of Savannah Environmental as per the Plan of Study included in the Scoping Report.

- 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)
  - 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)

As the developer has the responsibility to avoid or minimise impacts and plan for their management (in terms of the requirements of NEMA and the 2014 EIA Regulations (GNR 326)), the mitigation of significant impacts is discussed. Assessment of impacts with mitigation is made in order to demonstrate the effectiveness of the proposed mitigation measures. An EMPr has been prepared for the project and is attached as **Appendix I** to this EIA Report.

6.4.5. Assumptions and Limitations

The following assumptions and limitations are applicable to the studies undertaken within this EIA Phase:

» 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 site identified by the developer and their engineers represents a technically suitable site for the establishment of the proposed solar energy generation facility and associated infrastructure.
» It is assumed that the grid connection solution is both technically feasible and viable, and that the developer has consulted with Eskom in this regard.
» Conclusions of specialist studies undertaken and this overall Impact Assessment assume that any potential impacts on the environment associated with the proposed development will be avoided, mitigated, or offset.
» This EIA 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 provided in **Appendices D – H** for limitations specific to the independent specialist studies.

6.5. Legislation and Guidelines that have informed the preparation of this EIA Report

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

» NEMA
» The 2014 EIA Regulations (GNR 326), and Listing Notices published under Chapter 5 of NEMA (GNR 327, GNR 325, and GNR 324).
» International guidelines – the Equator Principles and the IFC Performance Standards and EHS Guidelines.

Several other Acts, standards or guidelines have also informed the project process and the scope of issues addressed and assessed in this EIA Report. A review of legislative requirements applicable to the proposed project is provided in **Table 6.4**.

Table 6.4: Relevant legislative permitting requirements applicable to Allepad PV Three

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. In terms of the Listing Notices (GNR 327, GNR 325 and GNR 324), a full Scoping and EIA Process is required to be undertaken for the proposed project.	DEA – Competent Authority Northern Cape DENC – Commenting Authority	The listed activities triggered by the proposed project have been identified and are being assessed as part of the EIA process currently underway for the project. The Scoping and EIA process will culminate in the submission of a Final EIA Report to the competent and commenting authority in support of the application for EA.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
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.	DEA Northern Cape DENC	While no permitting or licensing requirements arise directly by virtue of the proposed project, this section finds application during the EIA Phase 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).	DEA Northern Cape DENC Dawid Kruiper LM	Noise impacts are expected to be associated with the construction phase of the project. Provided that appropriate mitigation measures are implemented, construction noise is likely 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 DWS	The development footprint avoids all watercourses and therefore Allepad PV Three will not have an impact on watercourses. In the event that development activities impede or divert the flow of water in a watercourse, or alter the bed, banks, course or characteristics of watercourse, Section 21(c) and 21 (i) of the NWA would be triggered, and the project proponent would need to apply for a WUL or register a GA with the DWS.
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.	DMR	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 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		In terms of Section 53 of the MPRDA approval is required from the Minister of Mineral

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	may be contrary to any object of the Act, or which is likely to impede any such object must apply to the Minister for approval in the prescribed manner.		Resources to ensure 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 DENC / ZF Mgcawu DM	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 granted that appropriate mitigation measures are implemented, the proposed project 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.	SAHRA Ngwao Boswa Kapa Bokone (NBKB)	A full Heritage Impact Assessment (HIA) (with field work) has been undertaken as part of the EIA Phase (refer to **Appendix F** of this EIA Report). A possible burial site and a concentration of MSA, LSA including a large ESA flake have been identified within the project site. Both sites are of some heritage significance and applicable no-go buffer zones have been recommended by the specialist. Both sites and buffer zones are avoided by the development footprint 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.		Allepad PV Three and associated 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 the NHRA, and the SAHRA Permit Regulations (GNR 668). This will be determined once the final location of the project and its associated infrastructure within the project site 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	DEA Northern Cape DENC	Under NEM:BA, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed protected species. Although it was not observed, it is possible that Devils' Claw *Harpagophytum procumbens* is present at the project site, within the dune areas as this species is relatively common on Gordonia Duneveld in the Upington area.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	(NEM:BA: National list of ecosystems that are threatened 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).	DEA Northern Cape DENC	Restricted Activities and the respective requirements applicable to persons in control of different categories of listed invasive species are contained within the Alien and Invasive Species Regulations (GNR 598) published under NEM:BA, together with the requirements of the Risk Assessment to be undertaken.
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 GNR 1048 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 GNR 1048 published under CARA provides requirement and methods to implement control measures for different categories of alien and invasive plant species.	DAFF	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. The permission of DAFF will be required if the Project requires the draining of vleis, marshes or water sponges on land outside urban areas. However this is not anticipated to be required for the project. In terms of Regulation 15E (GNR 1048) 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.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			» 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. » 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".	DAFF	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 on the project site for the submission of relevant permits to authorities prior to the disturbance of these individuals. The ecological specialist study undertaken as part of the EIA Phase included a site visit which allowed for the identification of any protected

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			tree species which may require a license in terms of the NFA within the project site (refer to **Appendix D** of this EIA Report). Three NFA-protected tree species occur within the project site; *Acacia erioloba*, *Acacia haematoxylon* and *Boscia albitrunca*. All three of these species are associated with the dune field areas located within the eastern portion of the project site.
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.	DAFF	While no permitting or licensing requirements arise from this legislation, this Act will be applicable during the construction and operation of the project, in terms of the preparation and maintenance of firebreaks, and the need to provide appropriate equipment and personnel for firefighting purposes.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
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. » 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.	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).
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.	DEA – hazardous waste Northern Cape DENC – general waste	No listed activities are triggered by the project and 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
	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. » 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.	SANRAL – national roads Northern Cape DoT	An abnormal load / vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits will be 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 substation components may not meet specified dimensional limitations (height and width).

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	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.		
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 Department of Environment and Nature Conservation (DENC).	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. The Ecological Impact Assessment (**Appendix D**) did not identify any species protected under this Act within the development footprint. The provincially protected *Boscia foetida* subsp. *foetida* has been confirmed within the project site and is fairly widespread.

6.5.1. 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 6.5** 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 6.5: 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.

For the purposes of Allepad PV Three the project has been classified as **Regime 2 site**. Two sets of monitoring (i.e. a wet and a dry monitoring season) of 3 days each (i.e. 2 x 3 days) have been undertaken as part of the independent Avifauna Impact Assessment conducted as part of the EIA process (i.e. 15 to 17 July 2018 and 01 to 03 February 2019. The results from the monitoring have been used to inform both the development footprint and Avifauna Impact Assessment report, attached as **Appendix E** to this EIA Report.

6.5.2. 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 & Safety
  - Community Health & Safety

6.5.3. 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:

6.5.3.1. Construction Phase Impacts

Construction activities lead to temporary air emissions (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. In addition, Occupational Health and Safety (OHS) is an issue that needs to be properly managed during construction in order to minimise the risk of preventable accidents leading to injuries and / or fatalities. Proper OHS risk identification and management measures should be incorporated in every project's management plan and standard Engineering, Procurement and Construction (EPC) contractual clauses.

Response:
Impacts associated with the construction phase of development have been identified and assessed as part of the detailed independent specialist studies undertaken as part of the EIA process. Where applicable appropriate mitigation measures with which to minimise the significance of construction phase impacts have been identified and included in the EMPr prepared for the project and attached as **Appendix I** to this EIA Report.

6.5.3.2. Water Usage

Although water use requirements are typically low for solar PV plants, clusters of PV plants may have a high cumulative water use requirement in arid areas where local communities rely upon scarce groundwater resources. In such scenarios, water consumption should be estimated and compared to local water abstraction by communities (if any), to ensure no adverse impacts on local people. O&M methods in relation to water availability and use should be carefully reviewed where risks of adverse impacts to community usage are identified.

Response:
Allepad PV Three would require 2 800m³ of water during the 18 month construction period, and approximately 2 000m³ of water per year over the 20 year operational lifespan. Two water supply options are being considered for the project. These include (in order of preference):

- Sourcing potable water from the Dawid Kruiper LM.
- Sourcing raw water from the Dawid Kruiper LM (Upington water treatment works or nearest bulk water supply point).

The preferred water source will be determined through consultation with relevant authorities. The recommendation that measures with which to minimise the projects water requirements must be investigated by the project developer has been made in the overall conclusion of the EIA Report (refer to **Chapter 10** of this EIA Report) and is included in the EMPr prepared for the project, and attached as **Appendix I** to this EIA Report.

6.5.3.3. Land Matters

As solar power is one of the most land-intensive power generation technologies, land acquisition procedures and in particular the avoidance or proper mitigation of involuntary land acquisition / resettlement are critical to the success of the project. This includes land acquired either temporarily or permanently for the project site itself and any associated infrastructure – i.e., access roads, powerlines, construction camps (if any) and switchyards. If involuntary land acquisition is unavoidable, a Resettlement Action Plan (RAP) (dealing with physical displacement and any associated economic displacement) or Livelihood Restoration Plan (LRP) (dealing with economic displacement only) will be required. This is often a crucial issue with respect to local social license to operate, and needs to be handled with due care and attention by suitably qualified persons.

Response:
Allepad PV Three is proposed on Remaining Extent of Erf 5315 Upington. A long term lease agreement will be entered into between the project developer and landowner to provide for the utilisation of the land for the Allepad PV Three development. No involuntary land acquisition or resettlement is required or will take place as a result of the project.

6.5.3.4. Landscape and Visual Impacts

Key impacts can include the visibility of the solar panels within the wider landscape and associated impacts on landscape designations, character types and surrounding communities. Common mitigation measures to reduce impacts can include consideration of layout, size and scale during the design process and landscaping / planting in order to screen the modules from surrounding receptors. Note that it is important that the impact of shading on energy yield is considered for any new planting requirements. Solar panels are designed to absorb, not reflect, irradiation. However, glint and glare should be a consideration in the environmental assessment process to account for potential impacts on landscape / visual and aviation aspects.

Response:
Potential visual impacts associated with the development of Allepad PV Three have been assessed as part of the Visual Impact Assessment specialist study conducted as part of the EIA process. Measures with which to avoid, or if avoidance is not possible minimise, and mitigate any negative visual impacts have been identified, and are contained within the EMPr prepared for the project and attached as **Appendix I** to this EIA Report.

6.5.3.5. Ecology and Natural Resources

Potential impacts on ecology can include habitat loss / fragmentation, impacts on designated areas and disturbance or displacement of protected or vulnerable species. Receptors of key consideration are likely to include nationally and internationally important sites for wildlife and protected species such as bats, breeding birds and reptiles. Ecological baseline surveys should be carried out where potentially sensitive habitat, including undisturbed natural habitat, is to be impacted, to determine key receptors of relevance to each site. Mitigation measures can include careful site layout and design to avoid areas of high ecological value or translocation of valued ecological receptors. Habitat enhancement measures could be considered where appropriate to offset adverse impacts on sensitive habitat at a site, though avoidance of such habitats is a far more preferable option.

Response:
Potential ecological impacts associated with the development of Allepad PV Three have been assessed as part of the Ecology Impact Assessment (refer to **Appendix D**) and Avifauna Impact Assessment (refer to **Appendix E**) conducted as part of the EIA process. Measures with which to avoid, or if avoidance is not possible minimise, and mitigate any negative ecological impacts have been identified, and are contained within the EMPr prepared for the project and attached as **Appendix I** to this EIA Report. Areas of ecological sensitivity are reflected in an environmental sensitivity map prepared for the project (refer to **Chapter 10** and **Appendix M**) and have been utilised to inform the development footprint so that such areas are suitably avoided.

6.5.3.6. Cultural Heritage

Potential impacts on cultural heritage can include impacts on the setting of designated sites or direct impacts on below-ground archaeological deposits as a result of ground disturbance during construction. Where indicated as a potential issue by the initial environmental review / scoping study, field surveys should be carried out prior to construction to determine key heritage and archaeological features at, or in proximity to, the site. Mitigation measures can include careful site layout and design to avoid areas of cultural heritage or archaeological value and implementation of a 'chance find' procedure that addresses and protects cultural heritage finds made during a project's construction and/or operation phases.

Response:
Heritage impacts associated with the development of Allepad PV Three have been assessed as part of the Heritage Impact Assessment conducted as part of the EIA process, which includes consideration of heritage, archaeological, and palaeontological resources. Measures with which to avoid, or if avoidance is not possible minimise, and mitigate any negative heritage impacts (including those on heritage, archaeology, and palaeontology) have been identified, and are contained within the EMPr prepared for the project and attached as **Appendix I** to this EIA Report. Areas of heritage sensitivity are reflected in an environmental sensitivity map prepared for the project (refer to **Chapter 10** and **Appendix M**) and have been utilised to inform the development footprint so that such areas are suitably avoided.

6.5.3.7. Transport and Access

The impacts of transportation of materials and personnel should be assessed in order to identify the most appropriate transport route to the site while minimising the impacts on project-affected communities. The requirement for any oversized vehicles / abnormal loads should be considered to ensure access is appropriate. Onsite access tracks should be permeable and developed to minimise disturbance to agricultural land. Where project construction traffic has to traverse local communities, traffic management plans should be incorporated into the environmental and social management plan and EPC requirements for the project.

Response:
Access to the site is obtained via an existing farm entrance point, which is accessed directly from the N10 national road. Within the facility development footprint, access will be required from new / existing roads for construction purposes (and limited access for maintenance during operation). The final layout has been determined following the identification of site related sensitivities.

The national, regional, secondary and proposed internal access roads will be used to transport all components and equipment required during the construction phase of the solar facility. Some of the components (i.e. substation transformer) may be defined as abnormal loads in terms of the National Road Traffic Act (No. 93 of 1996) (NRTO) by virtue of the dimensional limitations. A permit will be required in accordance with Section 81 of the National Road

Traffic Act (No. 93 of 1996) (NRTA) which pertains to vehicles and loads which may be exempted from provisions of Act.

6.5.3.8. Drainage / Flooding

A review of flood risk should be undertaken to determine if there are any areas of high flood risk associated with the site. Existing and new drainage should also be considered to ensure run-off is controlled to minimise erosion.

Response:
A stormwater management plan has been prepared for the project, and is included in **Appendix G** of the EMPr, prepared for the project and attached as **Appendix I** to this EIA Report.

6.5.3.9. Consultation and Disclosure

It is recommended that early stage consultation is sought with key authorities, statutory bodies, affected communities and other relevant stakeholders. This is valuable in the assessment of project viability, and may guide and increase the efficiency of the development process. Early consultation can also inform the design process to minimise potential environmental impacts and maintain overall sustainability of the project. The authorities, statutory bodies and stakeholders that should be consulted vary from country to country but usually include the following organisation types:

- Local and / or regional consenting authority.
- Government energy department / ministry.
- Environmental agencies / departments.
- Archaeological agencies / departments.
- Civil aviation authorities / Ministry of Defence (if located near an airport).
- Roads authority.
- Health and safety agencies / departments.
- Electricity utilities.
- Military authorities.

Community engagement is an important part of project development and should be an on-going process involving the disclosure of information to project-affected communities. The purpose of community engagement is to build and maintain over time a constructive relationship with communities located in close proximity to the project and to identify and mitigate the key impacts on project-affected communities. The nature and frequency of community engagement should reflect the project's risks to, and adverse impacts on, the affected communities.

Response:
A Public Participation Process as prescribed by Chapter 6 of the 2014 EIA Regulations (GNR 326) is being conducted as part of the EIA process being undertaken for the project. This Public Participation Process includes consultation with key authorities, affected and surrounding landowners, local communities, and other relevant stakeholders. The following stakeholders have been identified and registered as I&APs as part of the EIA process to date:

- Local and / or regional consenting authority.
  - National DEA
  - Northern Cape DENC

- ZF Mgcawu DM
- Dawid Kruiper LM

» Government energy department / ministry.
- DoE
- NERSA

» Environmental agencies / departments.
- National DEA
- Northern Cape DENC
- DAFF
- DWS
- DMR
- BirdLife South Africa
- Wildlife and Environment Society of South Africa (WESSA)

» Archaeological agencies / departments.
- SAHRA
- Ngwao Boswa Kapa Bokone

» Civil aviation authorities / Ministry of Defence (if located near an airport).
- South African Civil Aviation Authority (CAA).

» Roads authority.
- South African National Roads Agency Limited (SANRAL)
- Northern Cape Department of Roads and Public Works (NCDRPW)

» Health and safety agencies / departments.
- DoH

» Electricity utilities.
- Eskom

» Military authorities.
- South African National Defence Force (SANDF)

6.5.3.10. Environmental and Social Management Plan (ESMP)

Whether or not an ESIA or equivalent has been completed for the site, an ESMP should be compiled to ensure that mitigation measures for relevant impacts of the type identified above (and any others) are identified and incorporated into project construction procedures and contracts. Mitigation measures may include, for example, dust suppression during construction, safety induction, training and monitoring programs for workers, traffic management measures where routes traverse local communities, implementation of proper waste management procedures, introduction of periodic community engagement activities, implementation of chance find procedures for cultural heritage, erosion control measures, fencing off of any vulnerable or threatened flora species, and so forth. The ESMP should indicate which party will be responsible for (a) funding, and (b) implementing each action, and how this will be monitored and reported on at the project level. The plan should be commensurate to the nature and type of impacts identified.

Response:
Impacts associated with the construction phase of development have been identified and assessed as part of the independent specialist studies undertaken as part of the EIA process. Appropriate mitigation measures with which to minimise the significance of negative impacts have been identified and are included in the EMPr prepared for the project and attached as **Appendix I** to this EIA Report.

CHAPTER 7 DESCRIPTION OF THE RECEIVING ENVIRONMENT

This Chapter provides a description of the environment that may be affected by Allepad PV Three. The information is provided in order to assist the reader in understanding the receiving environment within which the project is proposed, and features of the biophysical, social, and economic environment that could be directly or indirectly affected by, or alternatively could impact on, the proposed development. This information has been sourced from existing available information and the on-site specialist investigations conducted as part of the EIA, and aims to provide the context within which this EIA is being conducted. The full impact assessments undertaken by the independent specialists, including detailed descriptions of the affected environment, are attached as **Appendices D to H** of this EIA Report.

7.1 Regional Setting: Description of the Broader Study Area

The Northern Cape Province is located in the north-western extent of South Africa and constitutes South Africa's largest province, occupying an area of 372 889km² in extent, equivalent to nearly a third (30.5%) of the country's total land mass. It is also South Africa's most sparsely populated province with a population of 1 145 861, and a population density of 3.1/km². The capital city is Kimberley, and other important towns include Upington, Springbok, Kuruman, De Aar and Sutherland. It is bordered by the Western Cape, and Eastern Cape Provinces to the south, and south-east, Free State, and North West Provinces to the east, Botswana and Namibia, to the north, and the Atlantic Ocean to the west. The Northern Cape is the only South African province which borders Namibia, and therefore plays an important role in terms of providing linkages between Namibia and the rest of South Africa. The Orange River, which is South Africa's largest river, is a significant feature and is also the main source of water in the Province, while also constituting the international border between the Northern Cape and Namibia.

The Northern Cape is rich in minerals including alluvial diamonds, iron ore, and copper. The province is also rich in asbestos, manganese, fluorspar, and semi-precious stones and marble. The mining sector is the largest contributor to the provincial GDP. The Northern Cape's mining industry is of national and international importance, as it produces approximately 37% of South Africa's diamond output, 44% of its zinc, 70% of its silver, 84% of its iron-ore, 93% of its lead and 99% of its manganese.

The province has fertile agricultural land in the Orange River Valley, especially at Upington, Kakamas and Keimoes, where grapes and fruit are cultivated intensively. The interior Karoo relies on sheep farming, while the karakul-pelt industry is one of the most important in the Gordonia district of Upington. Wheat, fruit, peanuts, maize and cotton are produced at the Vaalharts Irrigation Scheme near Warrenton. The agricultural sector employs approximately 19.5% of the total formally employed individuals (LED Strategy). The sector is experiencing significant growth in value-added activities, including game-farming, while food production and processing for the local and export market is also growing significantly (PGDS, July 2011). Approximately 96% of the land is used for stock farming, including beef cattle and sheep or goats, as well as game farming, while approximately 2% of the province is used for crop farming, mainly under irrigation in the Orange River Valley and Vaalharts Irrigation Scheme (LED Strategy).

The Northern Cape offers unique tourism opportunities including wildlife conservation destinations, natural features, historic sites, festivals, cultural sites, star gazing, adventure tourism, agricultural tourism, ecotourism, game farms, and hunting areas, etc. The Province is home to the Richtersveld Botanical and Landscape World Heritage Site, which comprises a United Nations Educational, Scientific and Cultural Organisation

(UNESCO) World Heritage Site under the World Heritage Convention. The Northern Cape is also home to two (2) Transfrontier National Parks, namely the Kgalagadi Transfrontier Park, and the Richtersveld /Ai-Ais Transfrontier Park, as well as five (5) national parks, and six (6) provincial reserves. The Northern Cape also plays a significant role in South Africa's science and technology sector, as it is home to the Square Kilometre Array (SKA), the Southern African Large Telescope (SALT), and the Karoo Array Telescope (MeerKAT).

The Northern Cape comprises 5 Districts, namely Frances Baard, Johan Taolo Gaetsewe, Namakwa, Pixley Ka Seme, and ZF Mgcawu (refer to Error! Reference source not found.).

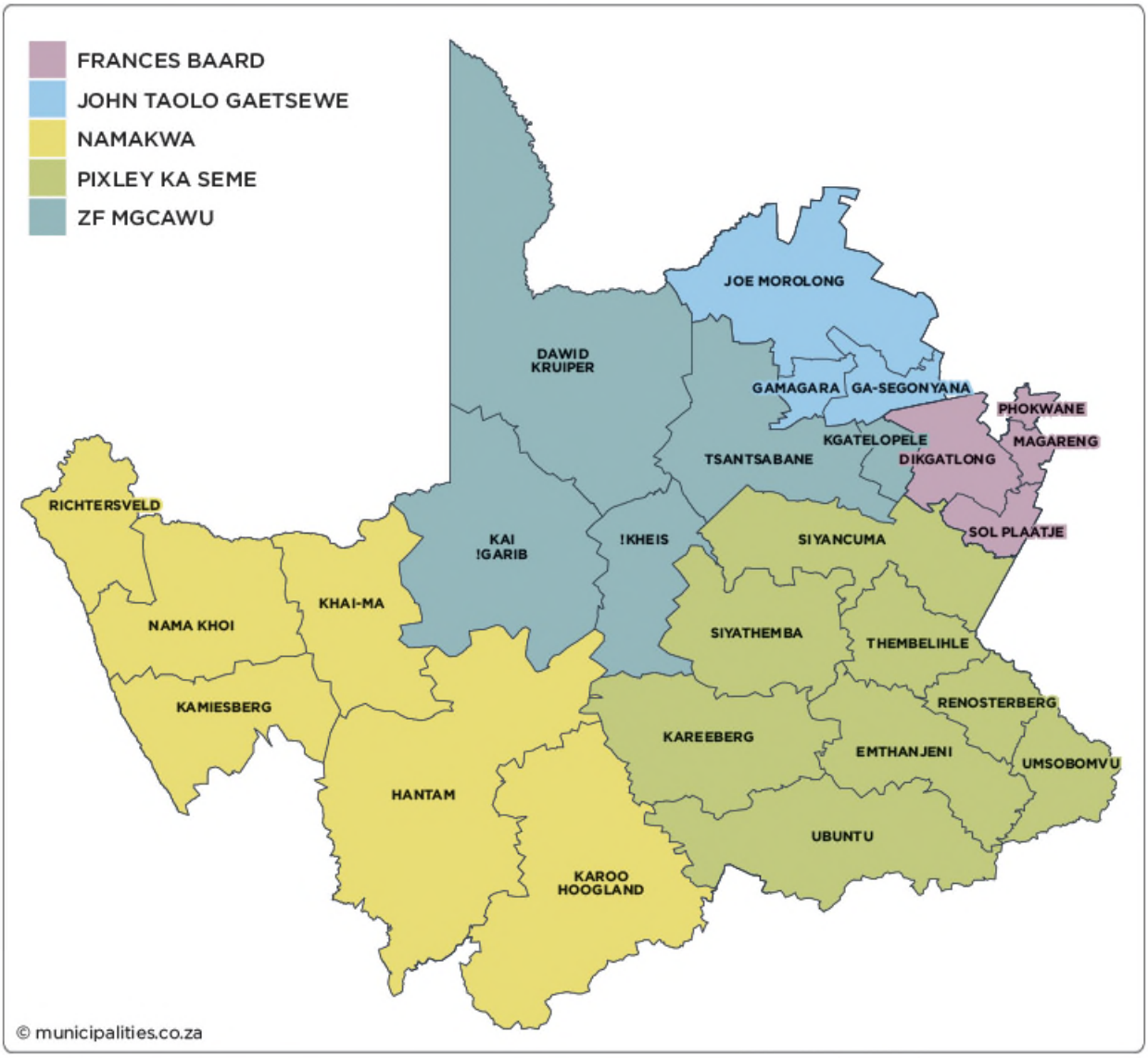

Figure 7.1: Districts of the Northern Cape Province (Source: Municipalities of South Africa).

The ZF Mgcawu DM (previously known as the Siyanda DM) is situated in the north-central extent of Northern Cape Province, and is bordered by the Namakwa DM to the south-west and south, the Pixley ka Seme DM to the south and south-east, the Frances Baard and John Taolo Gaetsewe DM to the east, Botswana to the north, and Namibia to the west. The ZF Mgcawu DM occupies an area of land approximately 102 484km² in extent which is equivalent to over one quarter (approximately 27%) of the Northern Cape Province.

Approximately 65 000km² of the DM's land mass comprises the Kalahari Desert, Kgalagadi Transfrontier Park, and the former Bushman Land.

The ZF Mgcawu DM includes the town of Upington, which is the capital of the DM, and is also where the DM's government is located. Other prominent cities and towns located within the DM include Beeshoek, Brandboom, Danielskuil, Eksteenskuil, Groblershoop, Kakamas, Keimoes, Kenhardt, Lime Acres, Mier, Postmasburg, and Rietfontein. The main economic sectors within the DM include agriculture, mining, and tourism.

The ZF Mgcawu DM comprises five (5) LMs, namely Dawid Kruiper, Kai! Garib, Tsantsabane, Kheis and Kgatelopele (refer to **Figure 7.2**).

Figure 7.2: Local Municipalities of the ZF Mgcawu DM (Source: Municipalities of South Africa).

The Dawid Kruiper LM was established by the amalgamation of the Mier LM and //Khara Hais LM on 3 August 2016, and is located in the northern extent of the ZF Mgcawu DM. The Dawid Kruiper LM is bordered by the Kai !Garib and !Kheis LMs to the south, the Tsantsabane LM to the south-east, Botswana to the north-east and north, and Namibia to the west. The LM occupies an area of land approximately 44 231km² in extent and is the largest of the five LMs which make up the ZF Mgcawu DM, occupying an area equivalent to approximately 43% of the ZF Mgcawu DM. The Dawid Kruiper LM is also formally the largest LM in South Africa, and makes up approximately 12% of the Northern Cape Province, and approximately 4% of the total

South African land mass. The LM is twice the size of Gauteng, one third the size of the Free State- and Limpopo Provinces, and almost half the size of KwaZulu-Natal Province.

The Kgalagadi Transfrontier Park is located in the northern extent of the LM. The LM is also home to the ‡Khomani San community, who are descended from several original San groups, and are indigenous people of Southern Africa.

The Dawid Kruiper LM is the commercial, educational, military, agricultural, medical, transport and tourism centre of the area. Upington comprises the administrative and economic centre of the LM, and is also the largest town within the LM. Other prominent cities and towns located within the LM include Mier and Rietfontein. The main economic sectors within the LM include agriculture, business services, game farming, tourism and hospitality, manufacturing, transport, community services, social and personal services.

7.2. Regional Setting: Location and description of the Project Site

The closest town to the proposed development is Upington, located approximately 11km south-east of the proposed project site. Upington is the administrative capital of the ZF Mgcawu DM and Dawid Kruiper LM, and is also the largest town within the LM and DM. The town of Upington is located on the banks of the Orange River, and is the centre of the karakul sheep and dried-fruit industries, and the most northerly winemaking region of South Africa.

Upington is characterised by some of the highest levels of solar irradiation within the country, and which are comparative on a global scale, making it the ideal location for solar energy production. In accordance with this the Upington area falls within the Northern Cape Solar Corridor and Renewable Energy Development Zone (REDZ) 7 (Upington) as identified by the DEA. REDZ 7 (Upington) has specifically been identified as an area where large scale solar PV energy facilities can be developed in terms of SIP 8 in a manner that limits significant negative impacts on the environment, while yielding the highest possible socio-economic benefits to the country. REDZ 7 stretches from south of the N10 national road and Upington in the north, to Kenhardt and Marydale in the south, and from Keimoes in the west, to Groblershoop in the east. The proposed project site is adjacent to / boundaries the Upington REDZ 7 along its northern boundary (N10).

The project is proposed on the Remaining Extent of Erf 5315 Upington. The area under investigation is approximately 3 889ha in extent, and comprises a single agricultural property which is currently utilised for livestock (i.e. cattle) grazing. A farm house and associated infrastructure is located in the centre of the project site, and a dry riverbed or seasonal wetland (pan) is located in the eastern half of the project site.

The site is located between the N10 national and the R360 regional road which form the southern and eastern boundaries of the project site. Both of these roads are considered part of the primary access road network within the Northern Cape Province. The N10 serves as the national route from the Eastern Cape past De Aar, Prieska and Upington up to Namibia, while the R360 serves as the regional route to the Kgalagadi Transfrontier Park via Upington. Access to the site is provided directly from the N10 national road via the existing farm entrance.

The Kalahari Monate Lodge is located adjacent to the project site (in a small “cut-out” area in the north-eastern extent of the property). The Kalahari Monate Lodge comprises 6 self-catering chalets (which sleep 3 persons each), and 43 camping / caravan sites.

The majority of the surrounding area is sparsely populated and consists of a landscape of wide-open expanses. The local population is primarily concentrated in the town of Upington and smaller towns / settlements along the Orange River. There are a very limited number of farm residences or homesteads within the remaining portion of the area under investigation. The area is characterised as a semi-arid desert region, and vegetation cover is predominantly restricted to low shrubland, described as Kalahari Karroid Shrubland and Gordonia Duneveld. Planted vegetation in the form of vineyards and cotton fields are found along the Orange River floodplain.

Major linear infrastructure, within the surrounding area includes the N10 national and R360 regional roads, a railway line, which traverses the area south of the N10 national road in an east-to-west direction and connects Karasburg in Namibia with Upington, and a number of 132kV overhead power lines. Some of these include:

» Gordonia to Upington 1 and 2
» Gordonia to Oranje
» Gordonia to Upington
» McTaggerts to Oranje
» Klipkraal to Upington

A map illustrating the regional setting of the Allepad PV Three project site within the broader study area is included as **Figure 7.3**.

Photographs of the Allepad PV Three project site are included in **Table 7.1**. These photographs provide a visual illustration of the project site and the environment which may be affected by the proposed development.

Figure 7.3: Map indicating the regional setting of the Allepad PV Three project site.

Table 7.1: Photographs of the Allepad PV Three project site

Grassland and low *shrubland* within the project site.

Linear dune crest of the Gordonia Duneveld located within the western half of the project site, with a *Boscia foetida* tree in the foreground.

Linear dune crest of the Gordonia Duneveld, within the western half of the project site.

Sandy plains of the Gordonia Duneveld along the southern boundary of the project site.

7.2 Climatic Conditions

The suitability of the site for the development of a solar energy facility is dependent on the prevailing climatic condition of the area. The viability of the solar energy facility is directly affected by the amount of solar irradiation received in the area. The GHI for the Northern Cape Province varies between 2 045 and 2 337kWh/m^2/annum, which relates to the higher end of the spectrum. The irradiation received in Upington and the location of the proposed site is approximately 2 337kWh/m^2/annum which is the highest in South Africa, and comparable on a global scale (refer to **Figure 7.4**).

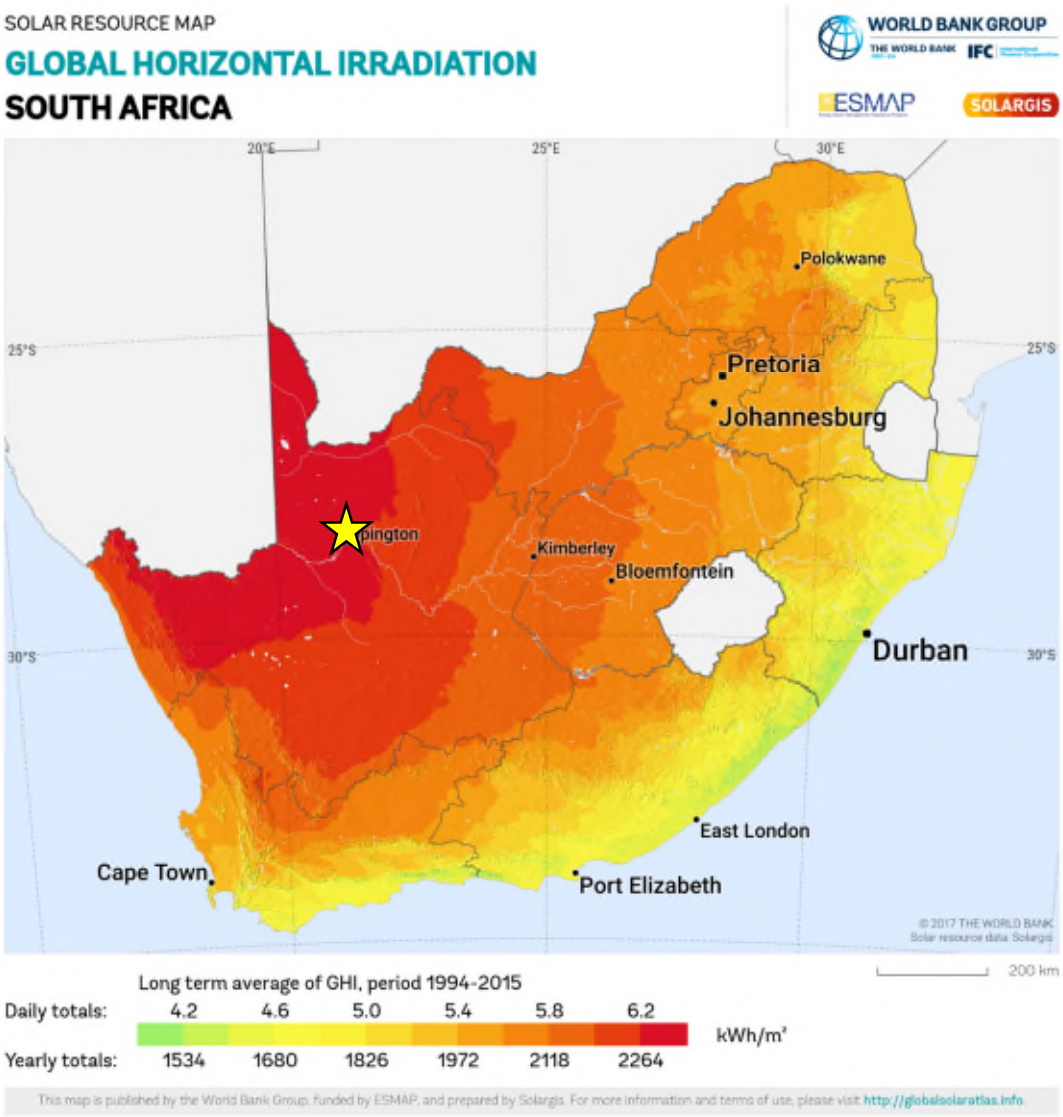

Figure7.4: GHI map for South Africa (Source: World Bank Group Solar Map). The proposed location of Allepad PV Three is shown by the yellow star on the map.

The Upington area is typically characterised as having a desert climate (BWh / hot desert climate). Very little rainfall occurs during the year, and the area is characterised by an average annual temperature of 19.3°C, and an average annual rainfall of 180mm.

Temperatures range from maximum highs of 34.6°C in January, to minimum lows of 2.5°C in July. January is the warmest month with average temperatures of 26.2°C, and July is the coldest month with average temperatures of 11.5°C. July is also typically the driest month, receiving an average of 2mm of rainfall, while March is the wettest month, receiving an average of 39mm of rainfall (refer to **Figure 7.5** and **Table 7.2**). Rainfall within the area is erratic, both locally and seasonally, and therefore cannot be relied on for agricultural practices. The average evaporation is 2 375mm per year, peaking at 11.2mm per day in December. Frost occurs most years on 6 days on average between mid-June and mid-August.

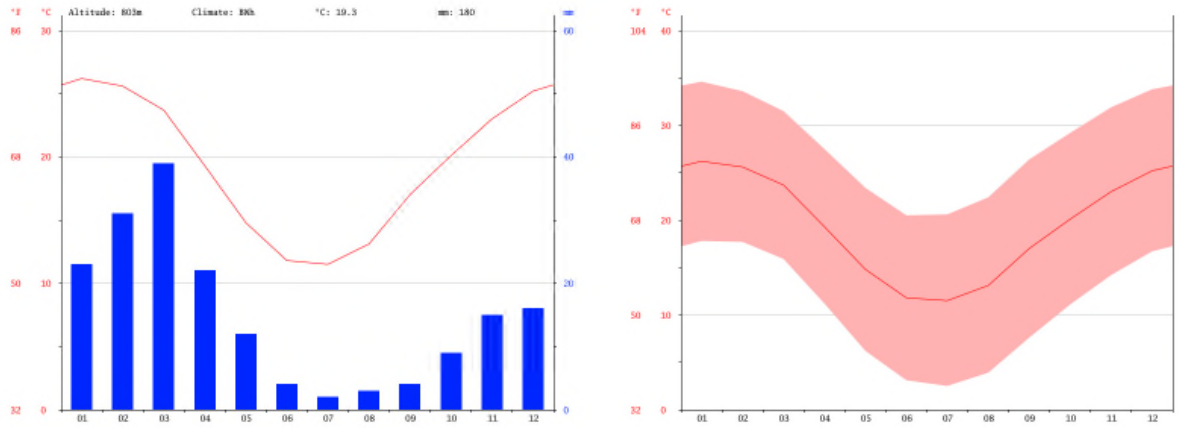

Figure 7.5: Climate and Temperature graphs for Upington, Northern Cape Province (Source: en.climate-data.org).

Table 7.2: Climate data for Upington, Northern Cape Province (Source: en.climate-data.org).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Temp. (˚C)	26.2	25.6	23.7	19.3	14.8	11.8	11.5	13.1	17	20.1	23	25.2
Minimum Temp. (˚C)	17.8	17.7	15.9	11.2	6.2	3.1	2.5	3.9	7.6	11.1	14.2	16.7
Maximum Temp. (˚C)	34.6	33.6	31.5	27.5	23.4	20.5	20.6	22.4	26.4	29.2	31.9	33.8
Precipitation (mm)	23	31	39	22	12	4	2	3	4	9	15	16

7.3 Biophysical Characteristics of the Study Area and Project Site

The following section provides an overview of the biophysical characteristics of the project site.

7.3.1. Landscape Features

The project site is generally flat to gently undulating and lies at a height of approximately 860m – 920m above mean sea level, sloping to the south. Dunes (trending in a north-west / south-east direction) occur in the western half of the project site, while there is a network of dry watercourses in the east. Although these stream beds will be dry in most years, they are a sign of possible water accumulation in the occasional years with above average rainfall.

7.3.2. Geology

The geology of the area comprises wind-blown sands with dunes of the Gordonia Formation, Kalahari Group (Geological Survey, 1988). The area is underlain by the Gordonia Formation, the Bethesda Formation, the Jannelsepan Formation, the Keimoes Formation and the Straussburg Granite (refer to **Figure 7.6**).

7.3.3. Soil and Land types

A land type is defined as an area with a uniform terrain type, macroclimate and broad soil pattern. The area under investigation is covered by the following land types (refer to **Table 7.3** and **Figure 7.7**):

» Ae10 (Deep, red, freely-drained soils, high base status)
» Af2, Af8 (Deep, red, freely-drained soils, high base status, with dunes)

Table 7.3: Land types occurring (with soils in order of dominance).

Land Type	Depth (mm)	Dominant soils	Percent of land type	Characteristics
Ae10	450 – 1 000	Hutton 33/34	42%	Red, sandy soils, occasionally on hardpan calcrete
	100 – 250	Mispah 22	40%	Red-brown, sandy topsoils on hard rock and calcrete
Af2	>1 200	Hutton 30/31	93%	Deep red, sandy dune soils on hard rock and calcrete
Af8	300 – 1 200	Hutton 30/31	64%	Deep red, sandy dune soils on hard rock and calcrete
	300 - 900	Hutton 33/34	35%	Red, sandy soils, occasionally on hardpan calcrete

Due to the fact that information contained in the land type survey is of a reconnaissance nature, only the general dominance of the soils in the landscape can be given, and not the actual areas of occurrence within a specific land type. Other soils that were not identified due to the scale of the survey may also occur.

7.3.4. Agricultural Potential

A significant portion of the western half of the project site comprises deep, red, sandy soils, with extensive areas of dunes. The eastern half has a mixture of deep, red, sands and shallow lithosols, often on calcrete (refer to **Table 7.3**). The very low rainfall in the area means that the only means of cultivation would be by irrigation, however remote sensing imagery of the area shows no signs of any agricultural infrastructure and none of irrigation, which is confined to a strip along the Orange River. The climatic restrictions indicate that this part of the Northern Cape Province is suited at best for grazing, and the grazing capacity is very low, around 40 – 50 ha/large stock unit (ARC-ISCW, 2004). The dominant class of agricultural potential is considered low.

7.3.5. Hydrology

The project is located within the Lower Orange Water Management Area (WMA). Major rivers within the Lower Orange WMA include the Ongers, Hartebeest, and Orange. The Lower Orange WMA includes the stretch of Orange River between the Orange-Vaal confluence and Alexander Bay. Other tributaries include the Ongers and Hartebeest Rivers from the south, and the Molopo River and Fish River (Namibia) from the north.

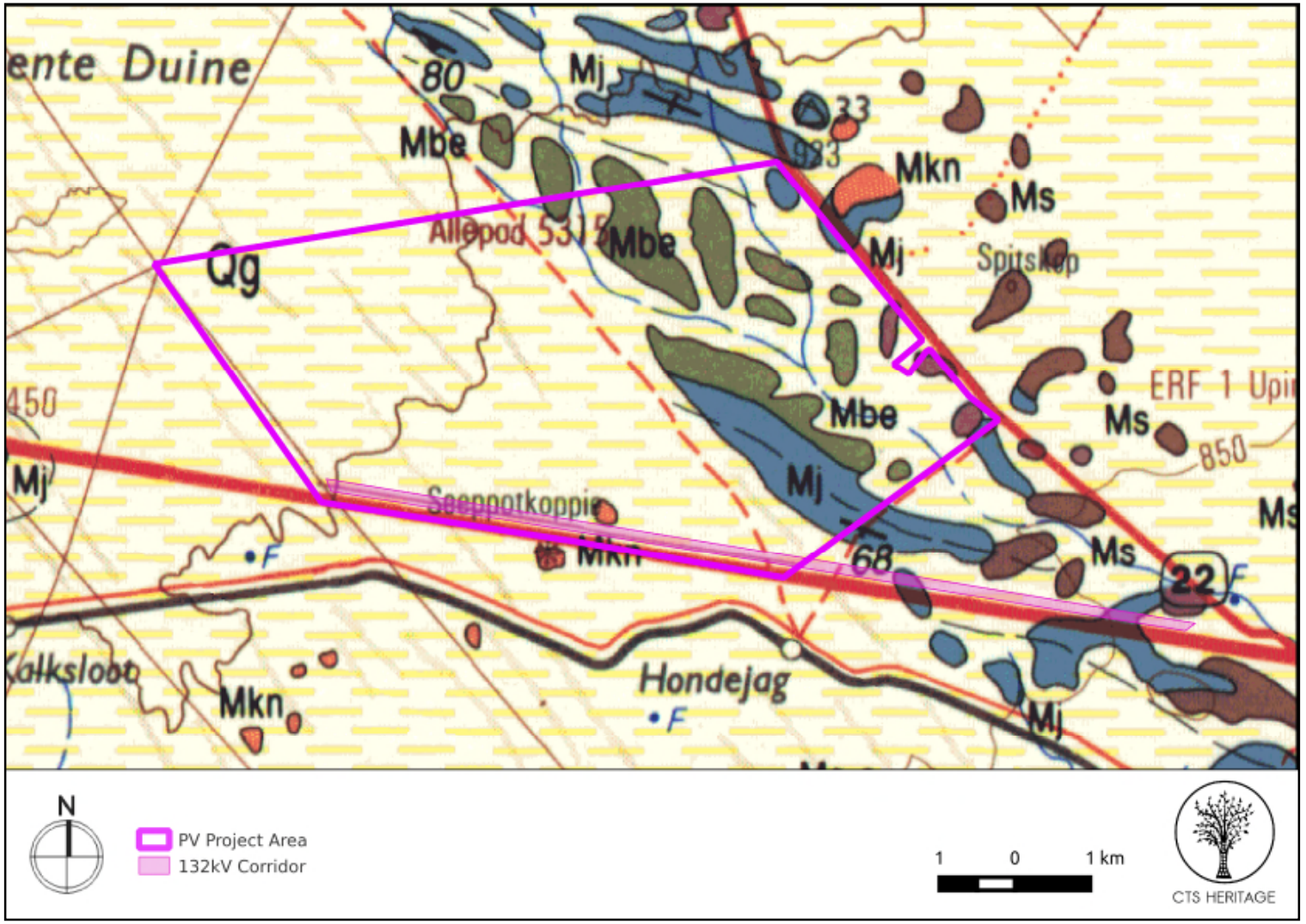

Figure 7.6: **Extract from the 1:50 000 Geological Map of South Africa: Council of GeoScience Map 2820 Zoomed in. [Qg: Gordonia Formation (Quaternary cover sands) Mbe: Bethesda Formation Mj: Jannelsepan Formation Mkn: Keimoes Formation Ms: Straussburg Granite].**

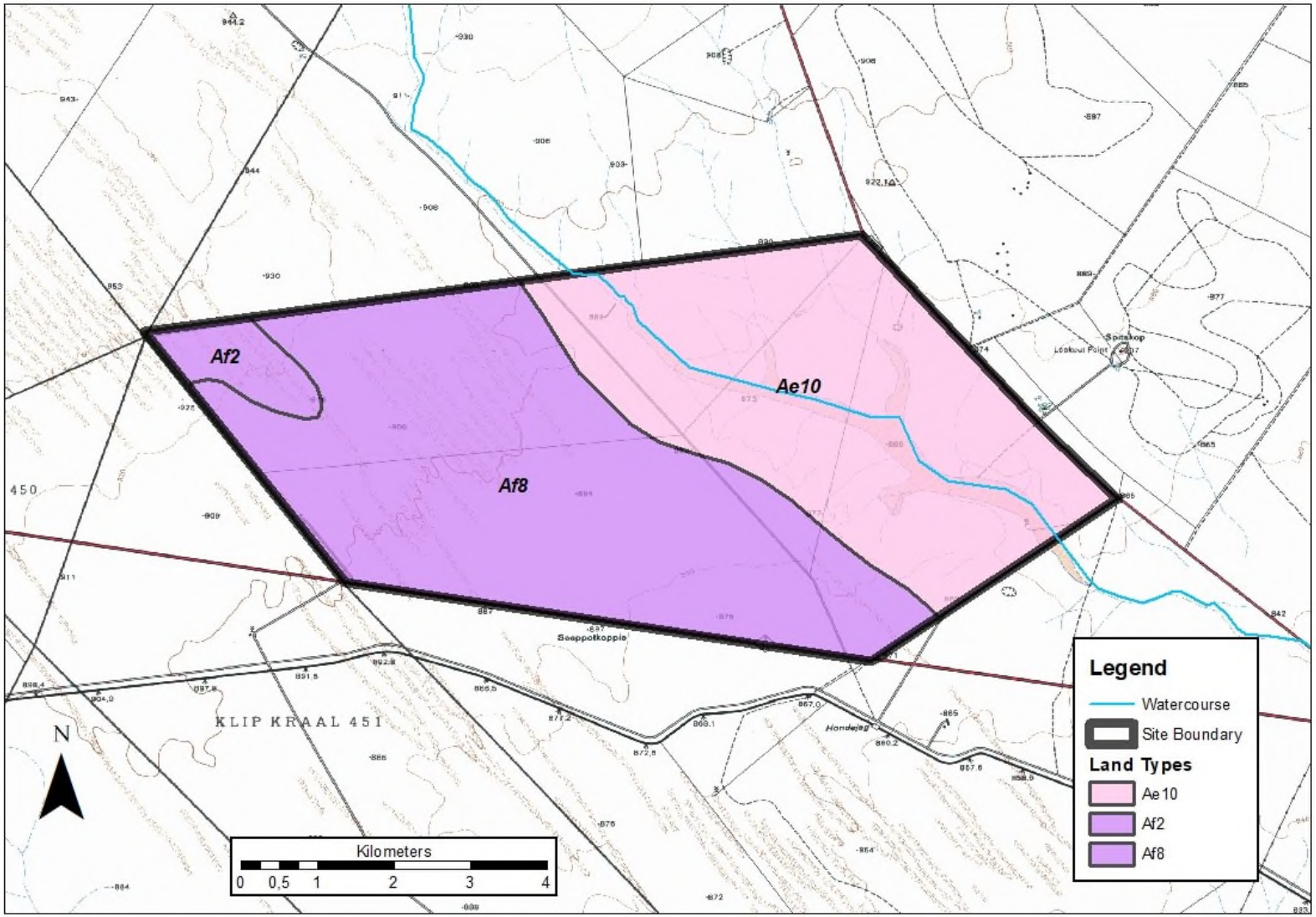

Figure 7.7: Land type map for the broader Allepad PV Three project site.

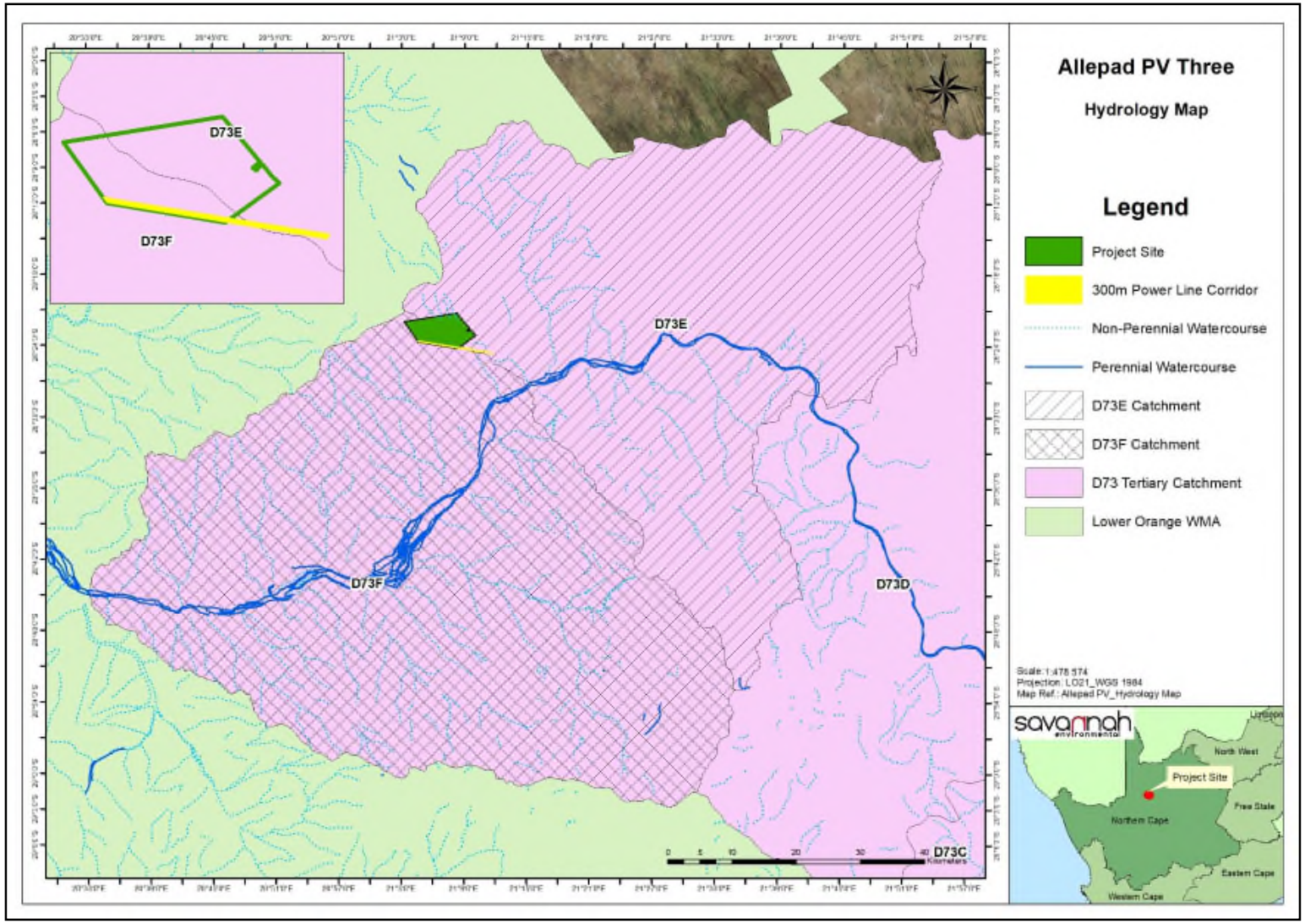

Figure 7.8: Hydrology Map showing the location of the project site in relation to the D73E and D73F Quaternary Catchments.

There are a number of highly intermittent watercourses along the coast which drain directly to the ocean. The Lower Orange catchment is the largest, but also the driest and most sparsely populated catchment in South Africa.

The project site is located within the D73 tertiary drainage region where is straddles the border of the D73E and D73F quaternary catchments (refer to **Figure 7.8**).

A non-perennial tributary which ultimately drains into the Orange River approximately 11.5km south-east of the project site, as well as numerous drainage lines and a few small pans occur in the eastern extent of the project site.

7.3.6. Ecological Profile of the Broader Study Area and the Project Site

i. Broad-Scale Vegetation Patterns

According to the national vegetation map (Mucina & Rutherford 2006), there are two vegetation types within the study area, namely Kalahari Karroid Shrubland in the eastern extent of the project site, and Gordonia Duneveld in the western extent of the project site (refer to **Figure 7.9**).

Both Kalahari Karroid Shrubland and Gordonia Duneveld are classified as Least Threatened and have been impacted little by transformation, with more than 99% of their original extent is still intact. Kalahari Karroid Shrubland is considered Hardly Protected within formal conservation areas, while Gordonia Duneveld is Moderately Protected. No vegetation-type endemic species are listed for either Kalahari Karroid Shrubland or Gordonia Duneveld (Mucina & Rutherford 2006). The biogeographically important and endemic species known from these vegetation types tend to be widespread within the vegetation type itself and local-level impacts are not likely to be of significance for any of these vegetation types or species concerned. Gordonia Duneveld is widely distributed and is among the most extensive vegetation types in South Africa while Kalahari Karroid Shrubland is less extensive, but represents a transitional vegetation type between the northern Nama Karoo and Kalahari (Savannah) vegetation types.

Species commonly observed within the areas of Kalahari Karroid Shrubland on nearby sites include shrubs such as *Leucosphaera bainesii*, *Hermannia spinosa*, *Monoechma genistifoilium*, *Salsola rabieana*, *Aptosimum albomarginatum*, *A.spinecens*, *Kleinia longiflora*, *Limeum argute-carinatum*, *Phyllanthus maderaspatensis*, *Zygophyllum dregeanum* and grasses such as *Stipagrostis anomala*, *S.ciliata*, *S.uniplumis*, *S.hochstetteriana* and *Schmidtia kalariensis*. The proportion of shrubs in this vegetation type is usually related to soil depth and texture, with the proportion of grass increasing as the soils become deeper or more sandy. Species of conservation concern that are often present include *Adenium oleifolium*, *Aloe claviflora* and *Hoodia gordonii*. None of these species were observed during the site surveys undertaken in November 2018 and February 2019.

The areas of Gordonia Duneveld consists of several different habitats. The most obvious of which are the dunes and the inter-dune areas. The dunes and areas of deep sand are usually dominated by species such as *Crotalaria orientalis*, *Stipagrostis amabilis*, *Centropodia glauca*, *Acacia haematoxylon* (*A. haematoxylon)* and various forbs. The interdune slacks are usually dominated by grasses or *Rhigozum trichotomum* depending on the substrate conditions as well as the history of land use. Other common species associated with the areas of Gordonia Duneveld include trees such as *Parkinsonia africana*, *Boscia foetida*, *Boscia albitrunca* and *Acacia erioloba*, shrubs such as *Phaeoptilum spinosum*, *Rhigozum trichotomum*, and *Lycium*

bosciifolium, grasses such as *Stipagrostis ciliata*, *S.uniplumis*, *S.amabilis*, *Schmidtia kalahariensis*, and forbs such as *Senna italica*, *Tribulis pterophorus*, *Hermannia tomentosa* and *Requienia sphaerosperma*. Species of conservation concern associated with this habitat include the nationally protected trees *Acacia erioloba* (*A. erioloba*), *A. haematoxylon* and *Boscia albitrunca*.

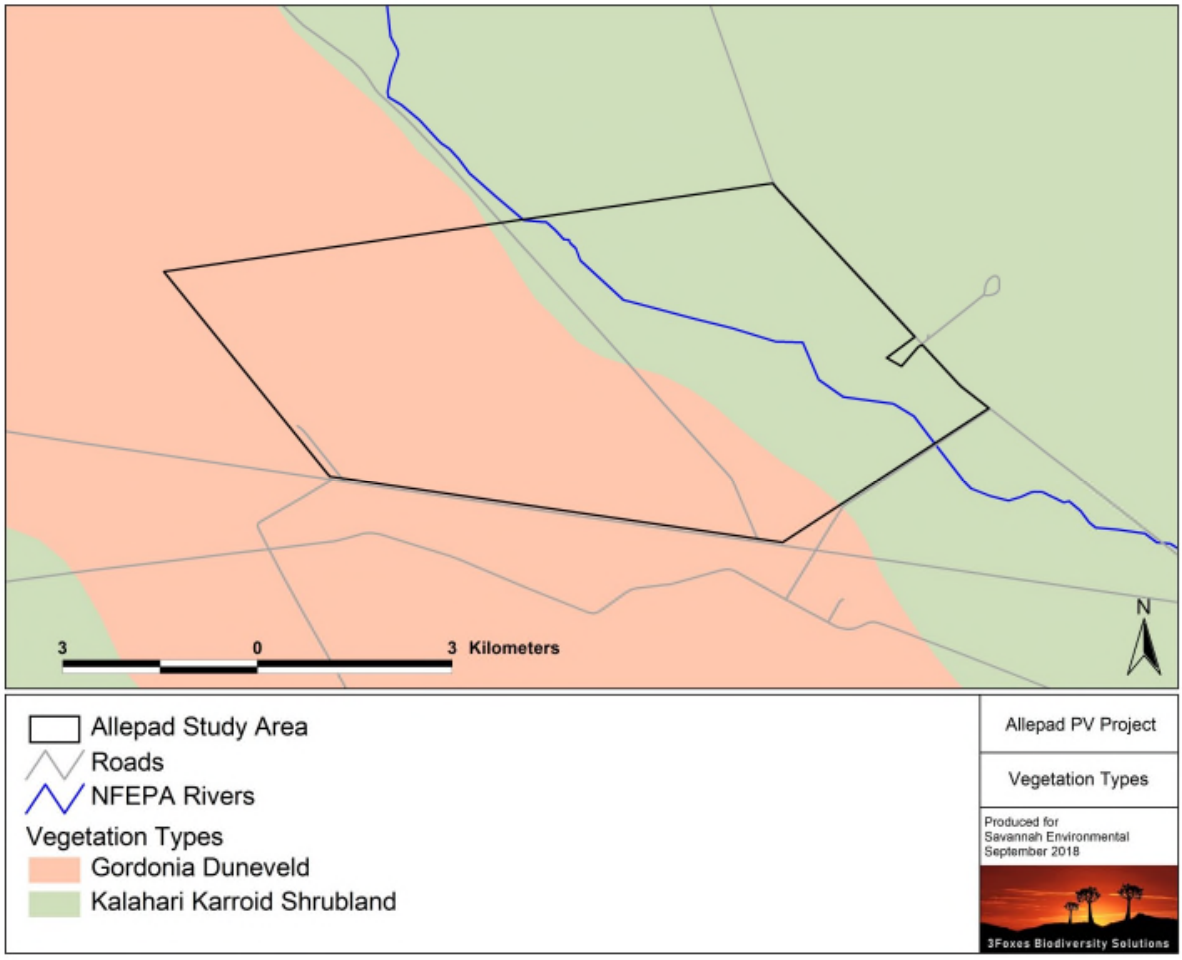

Figure 7.9: Broad-scale overview of the vegetation in and around the Allepad site. The vegetation map is an extract of the national vegetation map as produced by Mucina and Rutherford (2006/2012), and also includes drainage lines delineated by the NFEPA assessment (Nel et al. 2011).

ii. Listed Plant Species

Three NFA-protected tree species occur at the site *Vachellia* (*Acacia) erioloba, Vachellia haematoxylon* and *Boscia albitrunca*. All three of these species are associated with the with the dune field areas which are considered to be medium or medium high sensitivity. The provincially protected *Boscia foetida* subsp. *foetida* is also confirmed present at the site and is fairly widespread. Although it was not observed, it is possible that the provincially protected Devils' Claw *Harpagophytum procumbens* is present at the site, within the dune areas as this species is relatively common on Gordonia Duneveld in the Upington area.

iii. Alien Invasive Species

The current veld condition of the site can be considered to be fair and while there are some areas that have clearly suffered some degradation in the past, the vegetation cover and composition can be considered typical for the area. There are some localised areas of *Prosopis* invasion at the site, usually around watering points, but in general there are few alien species present across most of the site and it can be considered to be largely intact and in moderate condition.

iv. Critical Biodiversity Areas (CBA) and Broad-Scale Processes

An extract of the Northern Cape Critical Biodiversity Areas (CBAs) map for the study area is depicted in **Figure 7.10**. The majority of the site lies within an area classified as Other Natural Areas (ONA) and is not classified as a CBA or Ecological Support Area (ESA). The drainage line which traverses the site is however classified as an ESA. This area is avoided by the development. There are no CBAs in close proximity to the site.

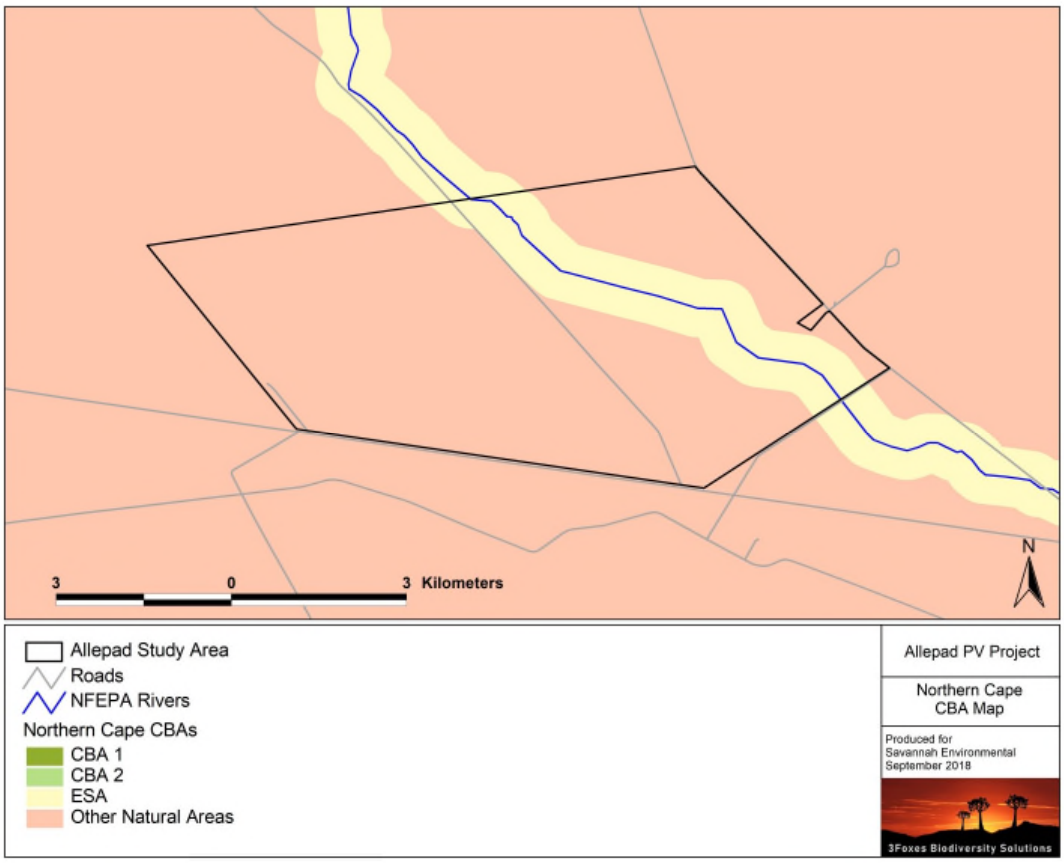

Figure 7.10. Extract of the Northern Cape CBA map for the study area, showing that there are no CBAs in close proximity to the site.

v. Faunal Communities

Mammals

The site falls within the distribution range of 46 terrestrial mammals, indicating that the mammalian diversity at the site is of moderate potential. The variety of habitats present at the site is however fairly low and the overall mammalian diversity at the site is likely to be lower than the richness of the broader area. The lack of rocky hills or outcrops at the site would preclude a variety of species from the site. The most common mammal species confirmed present at the site includes Duiker, Steenbok, Springbok, Springhare and Aardvark. Less common species also observed include Meerkat, Scrub Hare, Yellow Mongoose, Polecat and Gemsbok.

Two listed terrestrial mammals may occur at the site, the Brown Hyaena (Near Threatened) and Black-footed cat (Vulnerable). While it is possible that both species occur at the site, it is least likely that the Brown Hyaena is present as this species is often purposely or inadvertently persecuted within farming areas.

Reptiles

According to the SARCA database, 39 reptile species are known from the area suggesting that the reptile diversity within the site is likely to be moderate to low. As there are no significant rocky outcrops at the site, only species associated with sandy substrates or trees are likely to be present. Species observed in the vicinity include the Namaqua Mountain Gecko *Pachydactylus montanus*, Ground Agama *aculeata*, Spotted Sand Lizard *Pedioplanis lineoocellata* and Spotted Desert Lizard *Meroles suborbitalis*. No reptile species of conservation concern are known from the area and there do not appear to be any broad habitats at the site which would be of high significance for reptiles.

Amphibians

The site lies within the distribution range of 10 amphibian species. The only listed species which may occur at the site is the Giant Bullfrog *Pyxicephalus adspersus* which is listed as Near Threatened. Although there are several small pans at the site which are likely to be used by other frogs, they are rock pans or too shallow for the Giant Bullfrog and it is not likely that this species is present at the site. As there are no natural perennial water sources at the site, it is likely that amphibian abundance is generally low and restricted largely to those species which are relatively independent of water such as the Karoo Toad *Vandijkophrynus gariepensis*.

vi. Avifauna

The bird assemblage recorded within the project site is fairly typical of the Kalahari bioregion with elements of the Nama-Karoo bioregion. Based on information derived from the South African Bird Atlas Project (SABAP1) approximately 145 bird species are expected to occur within the project site and the surrounding area of which 54 species were recorded within the project site.

During a site survey undertaken in July 2018 (i.e. in the dry season), an average of 12.1 species were recorded per point count, with an average of 30.9 individual birds. The majority of the species detected (63%) consist of small passerines species, compared to non-passerines (37%). Five near-endemic species reported for the broader study area include Karoo Thrush, Black-eared Sparrowlark, Fiscal Flycatcher, Black-headed Canary

and Jackal Buzzard. None of these species were observed during the site survey, and can generally be considered uncommon in the area. Five biome-restricted species were recorded, namely Karoo Korhaan, Sociable Weaver and Kalahari Scrub Robin, Stark's Lark and Ludwig's Bustard.

The most abundant passerine species with the highest detection rates along the line transects were Fawn-coloured Lark (3.7 birds/km) and Namaqua Dove (3.5 birds/km). Other regularly encountered species, but with markedly lower encounter rates, included Scaly-feathered Finch (2.3 birds/km), Spike-heeled Lark (2.3 birds/km), and Northern Black Korhaan (1.5 birds/km). Grey-backed Sparrowlark and Pink-billed Lark also occurred with reasonable frequency (0.5 to 1.0 bird/km), considering their irregularity as nomadic species. Karoo Korhaan, Ludwig's Bustard and Double-banded Courser were exclusively found on the gravel plains in the eastern side of the project site, as were Sabota and Strark's Lark and Grey-backed Sparrowlark (in summer). The presence of several individuals of Karoo Korhaan and Ludwig's Bustard on the gravel plains clearly illustrate the importance of this habitat for these species. Red-crested Korhaan were only recorded within the sandy plains habitat in the western part of the project site, particularly where there were Parkinsonia trees. Pink-billed Lark were also only recorded on the sandy plains.

Nine species recorded in the broader area are red-listed, of which six species are listed as threatened, and three considered Near-Threatened. The most important of the red-listed species is the Critically Endangered White-backed Vulture, which has been recorded in the area during SABAP2, albeit only twice. The species is therefore probably only an occasional visitor to the area, with no breeding or roosting sites nearby, perhaps primarily due to the absence of suitably large *Acacia erioloba* trees.

Two Near-Threatened species were recorded including a number of pairs of Karoo Korhaan and Kori Bustard. The Karoo Korhaan were recorded within the gravel plains habitat in the eastern part of the project site, which represents the species' more preferred Karoo-like habitat type. The Kori Bustard were recorded within the sandy plains habitat adjoining the linear dunes in the northern part of the project site which represents more typical Kalahari habitat. Although not recorded during the field survey, the highly nomadic Ludwig's Bustard has a fairly high reporting rate, and it is predicted that this species would occupy the gravel plains in favourable years. No sensitive breeding or roosting sites (communal or individual) of any red-listed species were observed at the site during the field survey. There is a possibility that species such as Secretarybird may use solitary *Boscia* or other tree species for nesting, which may have been overlooked during the site survey. **Table 7.4** provides a list of Red listed species recorded in the broader study area during SABAP1.

In essence, much of the avifauna within the study area appears fairly similar to that found across the Kalahari bioregion of the Northern Cape. The apparent lack of red-listed species in the area could be attributed to their naturally low densities and large ranges (eagles and Secretarybird), the absence of suitable habitat (Abdim's Stork) and nesting/roosting trees (White-backed Vulture). However, certain species may use the study area on occasion as part of their large ranges, such as Martial Eagle, Tawny Eagle and Secretarybird. The study area appears to not directly support large and healthy populations of red-listed species.

Conservation Areas, Protected Areas and Important Bird Areas (IBA)

There are no Important Bird Areas (IBAs), Coordinated Avifaunal Roadcounts (CAR) routes, or Coordinated Waterbird Counts (CWAC) wetlands in the vicinity of the project site.

Table 7.4: Red-listed species recorded in the study area during SABAP1 (1987-1991), SABAP2 (2007 on-going) and the site visit in winter (15 to 17 July 2018) and summer (1 to 3 February 2019), ranked according to their red-list status. All species besides Abdim's Stork have been recorded during the SABAP2 period. Four species were observed during the two site visits (marked in bold), with the most of the other species having low reporting rates (<5%).

English Name	Taxonomix Name	Red-list status	Estimated importance of local population	Preferred habitat	Probability of occurrence	Threats
Vulture, White-backed	*Gyps africanus*	Critically Endangered	Low	Savanna	High	Habitat loss/Disturbance Collisions/Electrocution
Bustard, Ludwig's	***Neotis ludwigii***	**Endangered**	**Moderate**	**Shrubland plains**	**High**	**Habitat loss/Disturbance Collisions**
Eagle, Martial	*Polemaetus bellicosus*	Endangered	Moderate	Savanna and shrublands	High	Habitat loss/Disturbance Collisions/Electrocution
Eagle, Tawny	*Aquila rapax*	Endangered	Low	Savanna and Karoo plains	Low	Habitat loss/Disturbance Collisions/Electrocution
Falcon, Lanner	***Falco biarmicus***	**Vulnerable**	**Moderate**	**Widespread**	**High**	**Habitat loss/Disturbance Collisions/Electrocution**
Secretarybird	*Sagittarius serpentarius*	Vulnerable	Low	Open savanna and grassland	Moderate	Habitat loss/Disturbance Collisions
Bustard, Kori	***Ardeotis kori***	**Near-threatened**	**Moderate**	**Open savanna**	**Recorded**	**Habitat loss/Disturbance Collisions**
Korhaan, Karoo	***Eupodotis vigorsii***	**Near-threatened**	**Moderate**	**Shrubland plains**	**Recorded**	**Habitat loss/Disturbance Collisions**
Stork, Abdim's	*Ciconia abdimii*	Near-threatened	Low	Grassland and savanna	Low	Collisions

7.4. Visual Quality

The study area identified for the visual assessment encompasses a geographical area of 679km² and includes a 10km buffer zone (area of potential visual influence) from the boundary of the project site. The area includes the western portion of the town of Upington, sections of the N10 and N14 national roads, and a section of the R360 regional road.

The topography of the region is relatively homogenous and is described pre-dominantly as lowlands with hills, dune hills, and irregular or slightly irregular plains. Relatively prominent hills occur towards the north-east of the study area. The terrain surrounding the project site is predominantly flat with an even south-eastern slope towards the Orange River valley.

The scarcity of water and other natural resources has dictated the settlement patterns of this region. The Orange River has, to a large degree, dictated the settlement pattern in the region by providing a source of perennial water for the cultivation of grapes and other irrigated crops. Cattle and game farming practises also occur, although less intensively. An example of this is the Spitskop Farm located east and adjacent to the proposed project site. Spitskop Farm is indicated on Google Earth as a private game farm, however it is not a designated protected area in the South African Protected Areas Database (SAPAD), and is not accessible to the public. Spitskop Farm is currently in the property market and not operating as a tourist lodge / destination, but rather as a private cattle and game ranch. The farm has a rocky outcrop that appears to be (or have been) a viewpoint from which to look out over the generally flat expanse surrounding it. It is expected that this viewpoint would be quite exposed to Allepad PV Three, and other larger solar energy facilities such as the operational Khi Solar One project, as well as structures at the Upington International Airport located within the region. Other land-use activities include conservation and nature oriented tourism in the form of the Kalahari Monate Lodge located approximately 5km north-east of the proposed development footprint, which provides self-catering and camping facilities.

The majority of the study area is sparsely populated (i.e. less than 10 people per km²) and consists of a landscape of wide-open expanses and vast desolation. The population distribution is primarily concentrated in Upington and the smaller towns / settlements along the Orange River. There are a very limited number of farm residences or homesteads within the remaining part of the study area. Vegetation cover is predominantly restricted to low shrubland, described as Kalahari Karroid Shrubland and Gordonia Duneveld. Planted vegetation in the form of vineyards and cotton fields is found along the Orange River floodplain. A dry riverbed or seasonal wetland (pan) occurs on the eastern section of the larger development site (refer to **Figure 7.11**).

Allepad PV Three is expected to have a fairly contained core area of visual exposure, generally restricted to a 1km radius of the site. Receptors located within this zone include observers travelling along the N10 national road and residents of the settlement located west of the proposed solar energy facility and south of the N10. It must be noted that this informal settlement appears to be deserted at present. Visibility between 1km and 3km is more scattered and interrupted due to the undulating nature of the topography and the generally constrained height of the PV panel structures. Other than a section of the R360 regional road and a settlement north of the railway line, the exposure of the facility is largely restricted to vacant land and natural open space. The Kalahari Monate Lodge is not expected to be visually exposed to Allepad PV Three.

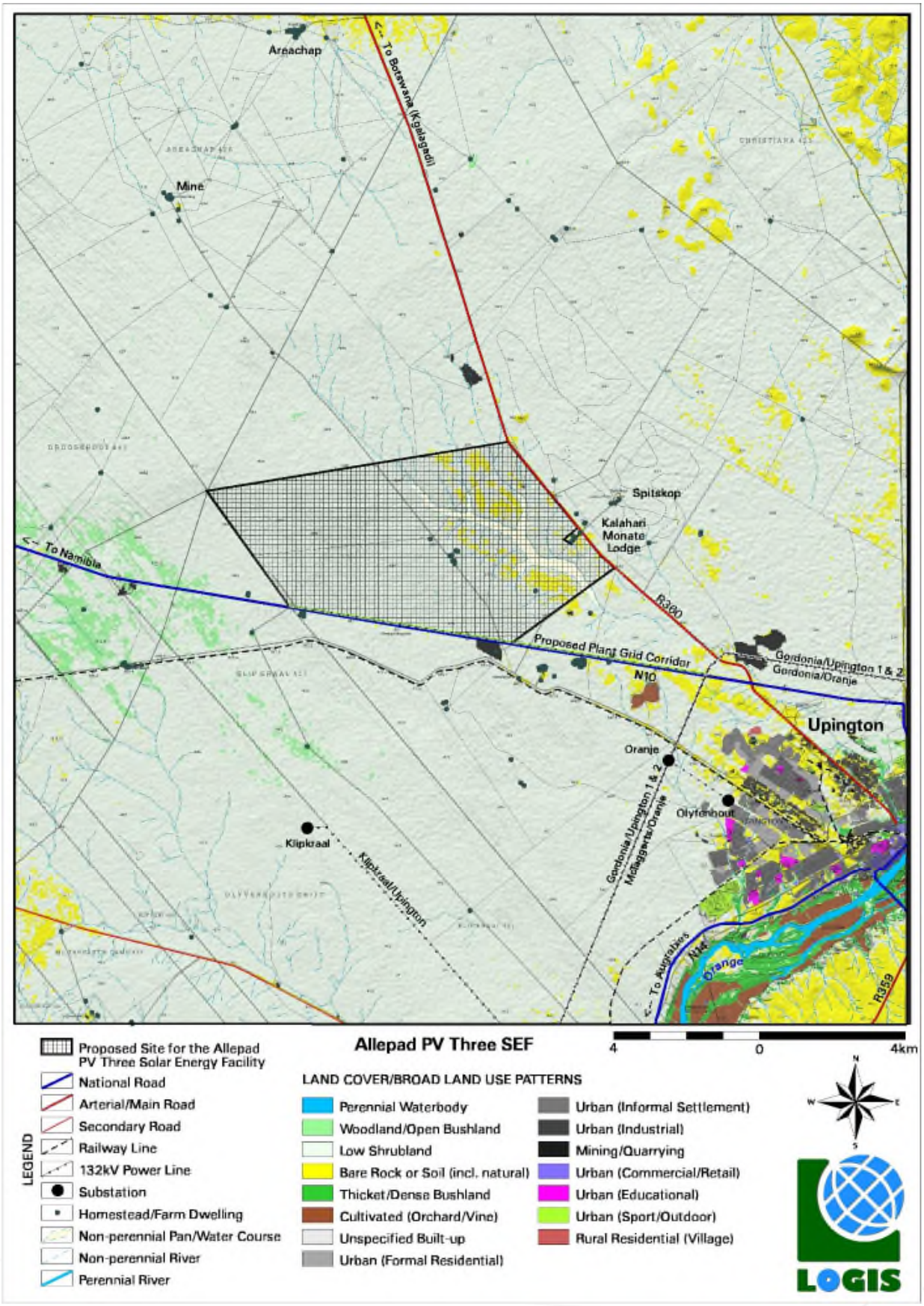

Figure 7.11: Land cover and broad land use patterns map of the study area.

7.5. Social Characteristics of the Broader Study Area and the Project Site

The following is a baseline summary of the social characteristics of the broader study area within which Allepad PV Three is proposed:

- The project is proposed within the Northern Cape Province, which is South Africa's largest, but least populated Province.
- The project is proposed within the Dawid Kruiper LM of the ZF Mgcawu DM.
- The Dawid Kruiper LM was established by the amalgamation of the Mier LM and //Khara Hais LM on 3 August 2016, and covers an area of land 44 231km² in extent, formally making it the largest LM in South Africa.
- Between 2001 and 2011 the Dawid Kruiper LM experienced a population growth rate of 1.8% per year.
- The Dawid Kruiper LM is female dominated, with females comprising approximately 50.6% of the LM population, while the ZF Mgcawu DM is male dominated, with males comprising approximately 50.8% of the DM population.
- Coloureds comprise the predominant population group within the Dawid Kruiper LM and ZF Mgcawu
- The Dawid Kruiper LM, ZF Mgcawu DM, and Northern Cape Provincial population age structures are youth dominated. A considerable proportion of the respective populations therefore comprise individuals of the economically active population between the ages of 15 – 64.
- The Dawid Kruiper LM has a dependency ratio of 35.6, which correlates closely with the ZF Mgcawu DM (34.4), Northern Cape Province (35.8), and South Africa (34.5).
- Education levels within the Dawid Kruiper LM are low with approximately 58.3% of the population over 20 years of age not having completed Grade 12 / Matric. This means that the majority of the population can be expected to have a relatively low-skill level and would either require employment in low-skill sectors, or skills development opportunities in order to improve the skills level of the area.
- The unemployment rate of the Dawid Kruiper LM is only fractionally lower than that of the ZF Mgcawu DM (i.e. 11.9% for the LM and 11.3% for the DM), and the percentage of economically inactive individuals within the Dawid Kruiper LM is higher than in the ZF Mgcawu DM (i.e. 43.3% in the LM and 38.3% in the DM). This could have a negative impact in terms of the local human capital available for employment.
- Household income levels are low within the area, with over half (54%) of falling within the poverty level (i.e. R0 – R38 400 per annum). The area can therefore be expected to have a high poverty level with associated social consequences such as not being able to pay for basic needs and services and poor living conditions.
- The primary economic activities within the Dawid Kruiper LM comprise trade and retail as a result of the strong tourism and agricultural sectors.
- The Dawid Kruiper LM is poorly serviced in terms of public sector health facilities with 2 hospitals (one public and one private hospital), 2 Community Healthcare Centres (CHC) and 6 Fixed Primary Healthcare Clinics (CHC), and 5 Satellite Healthcare Clinics.
- The majority of households within the Dawid Kruiper LM comprise formal brick dwellings, with only a very small proportion (0.8%) comprising traditional dwellings.
- The majority of households within the Dawid Kruiper LM are well serviced with regards to water, sanitation, electricity, and refuse removal, with the LM often exhibiting higher levels of service provision that the ZF Mgcawu, Northern Cape Province, and South Africa.

7.6. Heritage Resources

7.6.1. Cultural Landscape

According to Van Schalkwyk (2014 SAHRIS NID 170520), "The cultural landscape qualities of the region essentially consist of two components. The first is a rural area in which the human occupation is made up of a pre-colonial (Stone Age) component and a later colonial (farmer) component. This rural landscape has always been sparsely populated. The second component is an urban one, consisting of a number of smaller towns, most of which developed during the last 150 years or less." According to Von Vollenhoven (2012 SAHRIS NID 117902), "the environment of the area is mostly undisturbed although it is being used for sheep farming... The natural topography… is reasonably flat, but in the north-west a hill dominates the area resulting in an even slope up to the crest. This area also is very rocky. The stones here are dark in colour and may be of a basaltic origin. However in the flat areas adjacent to the hill the rocks are white coloured and most likely are soft calcrete, which would not have been suitable for the manufacture of stone tools. Different non-perennial streams run through the area…"

7.6.2. Archaeology and the Built Environment

The area surrounding Upington has a rich historical and archaeological past (Fourie, 2014 SAHRIS NID 174335). It is noted that most of the heritage resources identified are Stone Age artefact scatters of varying significance. In Fourie's assessment (2014), the field work identified numerous areas where low density scatters of Middle and Later Stone Age lithics were found. As no context and in situ preservation were identified these sites were graded as having low heritage significance. In addition, one possible herder site was identified during the survey. No other material or deposits were identified but does not exclude the possibility of subsurface material. The ruins of old mining infrastructure were also identified. In Von Vollenhoven's assessment (2012 SAHRIS NID 117902), a number of interesting and significant rock art engravings depicting various animals including giraffes and an aardvark were identified. In addition, a significant historical site known as the "Rebellion Tree" as well as graves associated with farmers in this area were identified.

Five sites of moderate local significance are located just beyond the border of the proposed project site. Namely Site 45523 (VRV01), Site 19977 (SPITZ1), Site 19978 (SPITZ2), Site 19979 (SPITZ3), and Site 24972 (Van Roois Vley) (refer to **Figure 7.12**). Site 24972 (Van Roois Vley) is linked to Von Vollenhoven's (2012) report and may well be the location of the rock art engravings described above. Site 45523 (VRV01) is described as consisting of ostrich egg shell fragments and stone flakes scattered around the base of a hill in low densities. Flakes are micro lithic supporting an ascription to the LSA utilising quartzite as raw material. A lead sealed bully beef can was also found here dated to the late 1800's or early 1900's. Site 19977 (SPITZ1), Site 19978 (SPITZ2), Site 19979 (SPITZ3) comprise Middle Stone Age artefact scatter sites. In addition, there is a historical structure located within the development area of unknown heritage significance.

7.6.3. Palaeontology

According to the SAHRIS Palaeosensitivity Map, the area is underlain by the Gordonia Formation (Quarternary cover sands of moderate palaeontological sensitivity), the Bethesda Formation, the Jannelsepan Formation, the Keimoes Formation and the Straussburg Granite, all of which have zero palaeontological sensitivity (refer to **Figure 7.13**).

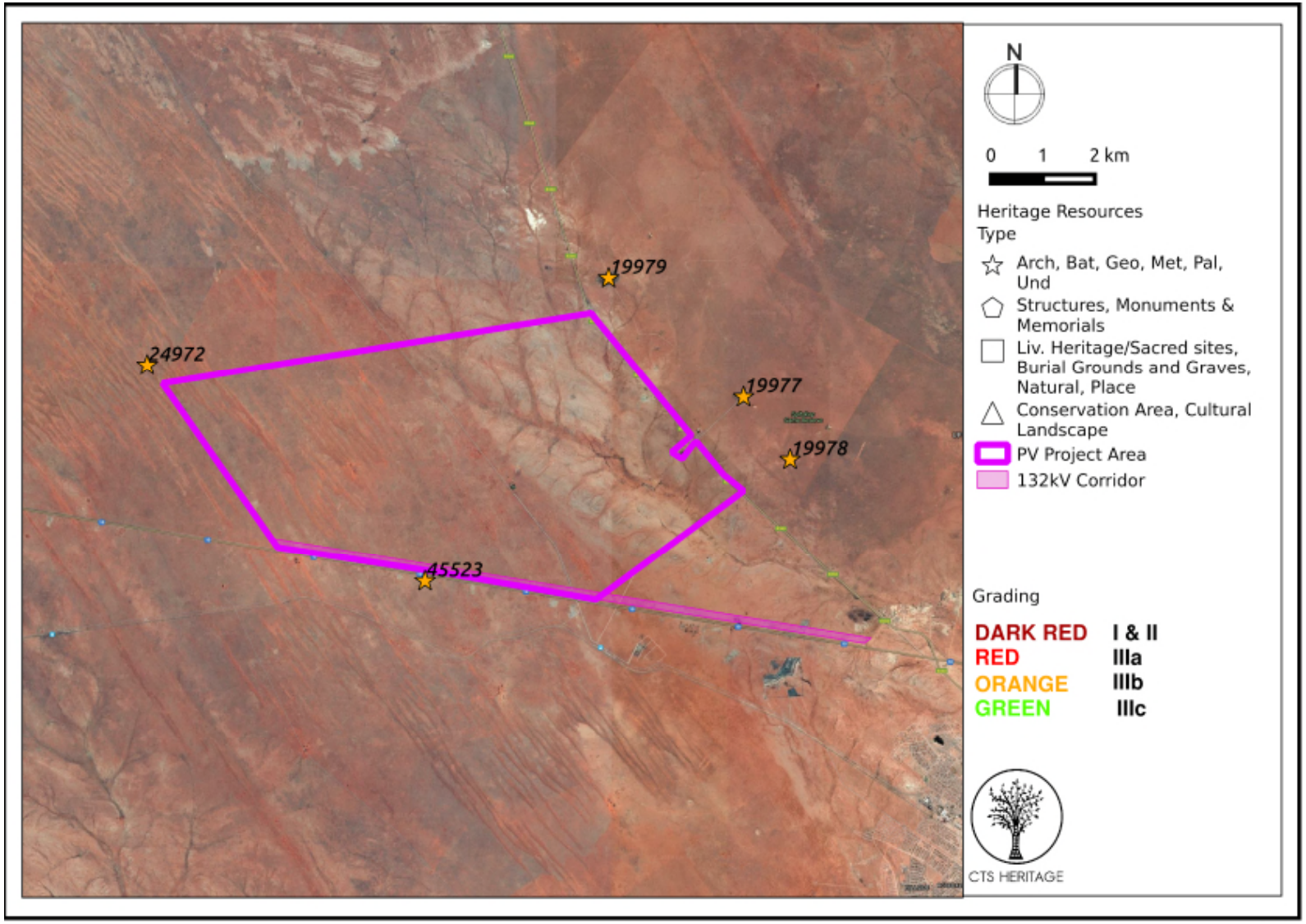

Figure 7.12: Heritage Resources Map showing heritage resources previously identified in and near the project site with SAHRIS Site IDs indicated.

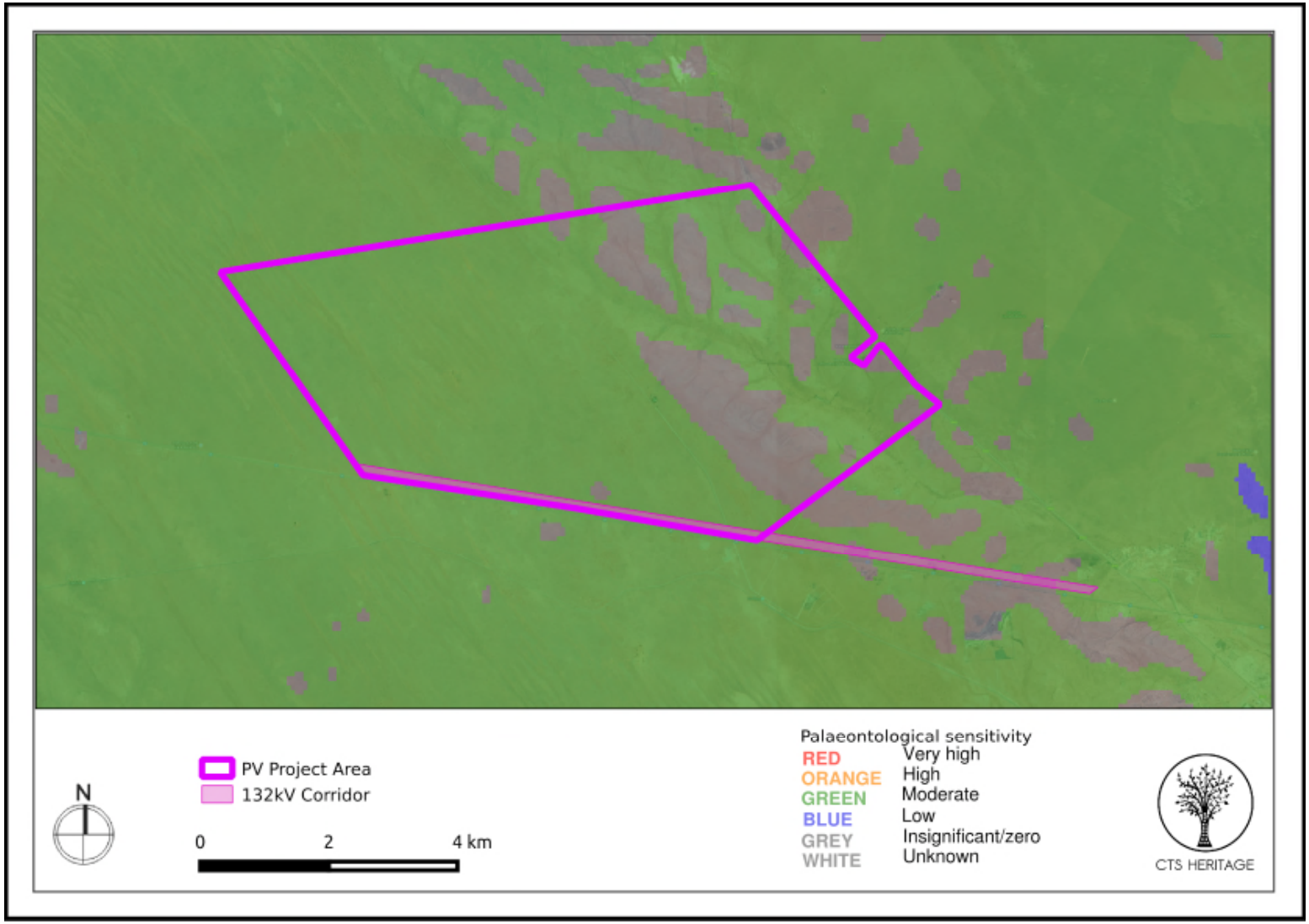

Figure 7.13: Palaeosensitivity Map indicating varied fossil sensitivity underlying the study area. The grey patches refers to areas that have a zero significance to palaeontology.

CHAPTER 8 ASSESSMENT OF IMPACTS

This chapter serves to assess the significance of the positive and negative environmental impacts (direct, indirect, and cumulative) expected to be associated with the development of Allepad PV Three and its associated infrastructure. This assessment has considered the construction of a PV facility with a contracted capacity of up to 100MW, within a development footprint of approximately 250ha in extent. The project will comprise the following key infrastructure and components:

- Arrays of PV panels with a generation capacity of up to 100MW.
- Mounting structures to support the PV panels (utilising either fixed-tilt / static, single-axis tracking, or double-axis tracking systems).
- Combiner boxes, on-site inverters (to convert the power from Direct Current (DC) to Alternating Current (AC)), and distribution power transformers.
- A 132kV on-site substation up to 1ha in extent to facilitate the connection between the solar energy facility and the Eskom electricity grid.
- A new 132kV double-circuit power line (which will make use of a loop-in and loop-out configuration utilising a double-circuit monopole construction), up to 9.5km in length. The power line will connect the on-site substation to the upgraded 132kV double-circuit power line running between the new Upington Main Transmission Substation (MTS) (currently under construction approximately 15km south of the project site), and the Gordonia Distribution Substation (located in Upington town). The point of connection is located approximately 5km east of the project site.
- Cabling between the project's components (to be laid underground where practical).
- Meteorological measurement station.
- An energy storage area up to 2ha in extent.
- Access road and internal access road network.
- On-site buildings and structures, including a control building and office, ablutions and guard house.
- Perimeter security fencing, access gates and lighting.
- Temporary construction camp up to 1ha in extent, including temporary site offices, parking and chemical ablution facilities.
- Temporary laydown area up to 1ha in extent, for the storage of materials during the construction and for a concrete batching plant.

The full extent of the project site was considered through the EIA phase 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 EIA process. A layout for Allepad PV Three was designed within this development footprint and avoids no-go areas identified in the scoping phase (refer to **Figure 8.1**). Therefore, the layout/development footprint of Allepad PV Three is considered as *least intrusive* on the environment and most suitable for further development.

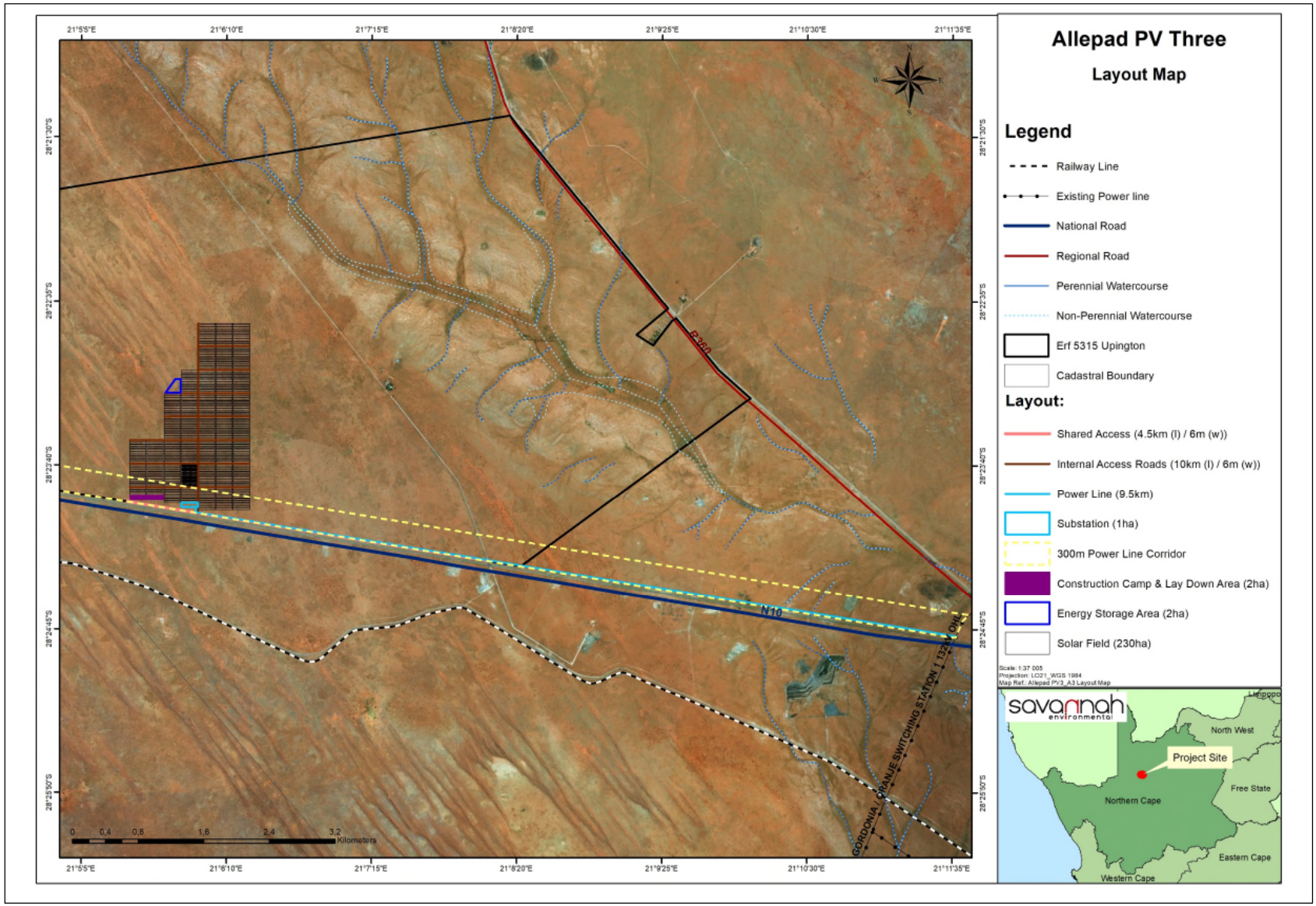

Figure 8.1: Map illustrating the project layout considered within the project site for Allepad PV Three.

The development of Allepad PV Three 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; construction of foundations involving excavations; the transportation of components/construction equipment to site, manoeuvring and operating vehicles for unloading and installation of equipment; laying cabling; and commissioning of new equipment and site rehabilitation. The construction phase for Allepad PV Three is estimated at 18 months.
- *Operation* – will include the operation of the solar PV energy 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 of Allepad PV Three is expected to be approximately 20 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-year period. At the end of the project's life, decommissioning will include site preparation, disassembling of the components of the solar energy 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 issues associated with construction and decommissioning activities may include, among others, threats to biodiversity and ecological processes, including habitat alteration and impacts to fauna, impacts to sites of heritage value, soil contamination and erosion, and nuisance from the movement of vehicles transporting equipment and materials during decommissioning.

Environmental impacts associated with the operation phase includes mismanagement of the facility which may result in an increase in alien invasive species and possibly result in erosion. Other impacts associated with the operation phase include visual impacts, night time lighting impacts, soil contamination and erosion and potential invasion by alien and invasive plant species.

8.1 Quantification of Areas of Disturbance on the Site

Site-specific impacts associated with the construction and operation of Allepad PV Three relate to the direct loss of vegetation and species of special concern, disturbance of animals and loss of habitat, and impacts on soils. In order to assess the impacts associated with Allepad PV Three, it is necessary to understand the extent of the affected area.

The project footprint being assessed for Allepad PV Three requires an area of approximately 250ha (equivalent to 6.5% of the project site), of which the PV structures / modules will occupy an area of approximately 230ha in extent, while supporting infrastructure such as internal roads (up to 9ha), on-site buildings and structures (up to 1ha), energy storage (up to 2ha) and an on-site substation (up to 1ha) will occupy the remaining extent. During construction, a temporary construction camp of up to 1ha in extent, including temporary site offices, parking and chemical ablution facilities will be required as well as a temporary laydown area (including a batching plant) of up to 1ha in extent.

A 300m wide power line corridor is being proposed for the development. It is within this corridor that a 132kV double-circuit power line will be located to connect Allepad PV Three to the national grid. The servitude of the power line will be up to 36m in width, with the towers required to support the power line 20m to 30m in height.

8.2. Potential Impacts on Ecology (Ecology, Flora and Fauna)

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. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix D** for more details).

8.2.1 Results of the Ecological Impact Assessment

An ecological sensitivity map (refer to **Figure 8.2**) of the larger site was produced by integrating the available ecological and biodiversity information available in the literature and various spatial databases with mapping based on the satellite imagery of the site as well as knowledge obtained from the site surveys undertaken in November 2018 and February 2019. This includes delineating different habitat units identified on the satellite imagery and assigning likely sensitivity values to the units based on their ecological properties, conservation value and the potential presence of species of conservation concern. The ecological sensitivity of the different units identified in the mapping procedure was rated accordingly:

» Areas of very high sensitivity:
The eastern half of the project site is associated with Kalahari Karroid Shrubland which occurs on shallow calcrete soils and has numerous drainage lines as well as a few small pans present. Due to the presence of the drainage system and the difficulty involved in avoiding impacts to this feature, these areas are considered to be of very high ecological sensitivity and largely unsuitable for development. These areas are avoided by the development footprint for Allepad PV Three and the 300m power line corridor.

» Areas of high sensitivity:
The areas of high sensitivity located within the western section of the project site consist of an extensive area of mobile dunes which are not suitable for development as the loose sands are very vulnerable to erosion. The development footprint of Allepad PV Three and the 300m power line corridor avoid these areas of high sensitivity. A small pan located within the power line corridor and can easily be avoided by the power line route.

» Areas of medium sensitivity:
The areas of Kalahari Karroid Shrubland in the east of the project site are considered to be of moderate sensitivity due to its higher species diversity, and the potential presence of several species of conservation concern. Some dunes located within the western half of the project site is considered to be of moderate sensitivity. The majority of these areas are avoided except for a small section of sandy habitat which is traversed by the development footprint of Allepad PV Three. Isolated dunes of medium ecological sensitivity is situated within the 300m power line corridor located adjacent to the main entrance road. The dunes are unlikely to fulfil the same ecological services as the contiguous dune fields located well beyond the development footprint and is considered acceptable.

» Areas of low sensitivity:

The western half of the project site on undulating sandy soils is considered to be low sensitivity and suitable for development. The sandy plains habitat represents the most widely distributed habitat in the region, and occurs primarily on shallower soils that do not support an extensive tree layer, besides scattered patches of *Parkinsonia africana*. The majority of Allepad PV Three development footprint is restricted to the low sensitivity shrubby plains habitat. The 300m power line corridor traverses the sandy plains and gravel plains which is considered to be of low ecological sensitivity.

8.2.2 Description of Ecological Impacts

Potential impacts on the ecology of the project site due to Allepad PV Three would stem from a variety of activities and risk factors associated with the construction and operation phases of the project. The potential impacts associated with the development are explored in context of the features and characteristics of the site and the likelihood that each impact would occur given the characteristics of the site and the extent and nature of the development.

» *Impacts on vegetation and protected plant species*
Several protected species occur at the project site which may be impacted by the development, most notably *Acacia erioloba, Acacia haematoxylon* and *Boscia albitrunca*. The density of these species within the development footprint is however low. Vegetation clearing during construction will lead to the loss of currently intact habitat within the development footprint and is an inevitable consequence of the development. As this impact is certain to occur it is assessed for the construction phase as this is when the impact will occur, although the consequences will persist for a long time after construction.

» *Direct faunal impacts*
Increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to fauna. Sensitive and shy fauna would move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed. Some impact on fauna is highly likely to occur during construction as well as operation and this impact is therefore assessed for the construction phase and operational phase.

» *Impact on broad-scale ecological processes*
Transformation of intact habitat would contribute to the fragmentation of the landscape and would potentially disrupt the connectivity of the landscape for fauna and flora and impair their ability to respond to environmental fluctuations during the operation phase of the project.

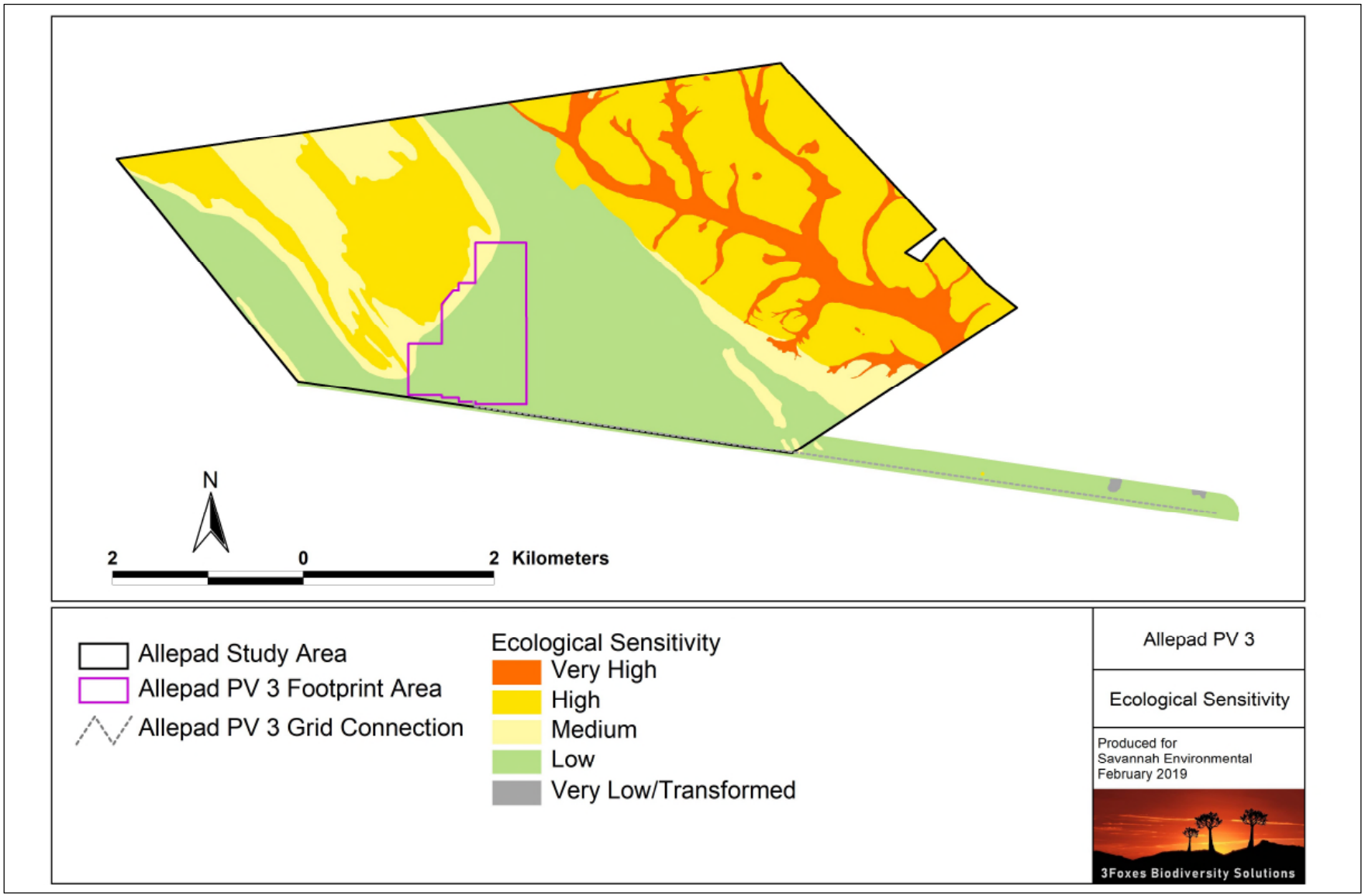

Figure 8.2: **Map illustrating the ecological sensitivity within the Allepad PV Three project site overlain with the proposed development footprint.**

8.2.3 Impact tables summarising the significance of impacts on ecology during construction and operation (with and without mitigation)

The impacts assessed below apply to the development area and the 300m power line corridor assessed for Allepad PV Three. Due to the current development footprint, which already avoids highly sensitive features, the significance of the impacts after mitigation is moderate to low.

Construction Phase Impacts

Nature: *Impacts on vegetation and listed or protected plant species resulting from construction activities of the facility* Impacts on vegetation will occur due to disturbance and vegetation clearing associated with the construction of the facility. In addition, it is likely that some loss of individuals of protected trees will occur.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low to Moderate (5)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**Medium (50)**	**Medium (45)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	This impact cannot be well mitigated because the loss of vegetation is unavoidable and is a certain outcome of the development.	

Mitigation:

- Pre-construction walk-through of the facility's final layout in order to locate species of conservation concern that can be translocated as well as comply with the Northern Cape Nature Conservation Act and DENC/DAFF permit conditions.
- Search and rescue for identified species of concern before construction.
- Vegetation clearing to commence only after walk-through has been conducted and necessary permits obtained.
- Pre-construction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within demarcated construction areas etc.
- Environmental Officer (EO) to provide supervision and oversight of vegetation clearing activities within sensitive areas such as near the pans.
- Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared.
- All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area.
- Temporary laydown areas should be located within previously transformed areas or areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.

Residual Impacts:

As the loss of currently intact vegetation is an unavoidable consequence of the development, the habitat loss associated with the development remains a moderate residual impact even after mitigation and avoidance of more sensitive areas.

Nature: *Direct Faunal Impacts Due to Construction Activities of the facility*

Disturbance, transformation and loss of habitat will have a negative effect on resident fauna during construction. Due to noise and operation of heavy machinery, faunal disturbance will extend well beyond the footprint and extend into adjacent areas. This will however be transient and restricted to the construction phase.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low to Medium (5)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (32)**	**Low (28)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Although the large amounts of noise and disturbance generated at the site during construction are largely unavoidable, impacts such as those resulting from the presence of construction personnel at the site can be easily mitigated.	

Mitigation:

- All personnel should undergo environmental induction with regards to fauna and, in particular, awareness about not harming or collecting species such as snakes, tortoises and owls, which are often persecuted out of superstition.
- Any fauna threatened by the construction activities should be removed to safety by an appropriately qualified person.
- All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.
- 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.
- If trenches need to be dug for electrical cabling, these should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are standing open should have places where there are soil ramps allowing fauna to escape the trench.

Residual Impacts:

It is probable that some individuals of susceptible species will be lost to construction-related activities despite mitigation. However, this is not likely to impact the viability of the local population of any fauna species.

Nature: *Impacts on vegetation and listed or protected plant species resulting from power line construction activities*

Impacts on vegetation will occur due to disturbance and vegetation clearing associated with the construction of the power line and associated infrastructure.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (3)	Long-term (3)
Magnitude	Minor to Low (3)	Minor (2)
Probability	Definite (5)	Highly Probable (4)
Significance	**Medium (35)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	This impact cannot be well mitigated because the loss of vegetation is unavoidable and is a certain outcome of the development.	

Mitigation:

- Pre-construction walk-through of the power line's final layout in order to locate species of conservation concern that can be translocated as well as comply with the Northern Cape Nature Conservation Act and DENC/DAFF permit conditions.

- » Search and rescue for identified species of concern before construction.
- » Vegetation clearing to commence only after walk-through has been conducted and necessary permits obtained.
- » Pre-construction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within demarcated construction areas etc.
- » Environmental Officer (EO) to provide supervision and oversight of vegetation clearing activities within sensitive areas such as near the pans.
- » Vegetation clearing along the power line route should be kept to a minimum.
- » All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area.
- » Temporary laydown areas should be located within previously transformed areas or areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.

Residual Impacts:
The loss of currently intact vegetation is an unavoidable consequence of the development and cannot be entirely mitigated. The residual impact would however be low.

Nature: *Direct Faunal Impacts Due to construction activities associated with the gird connection*
Disturbance, transformation and loss of habitat will have a negative effect on resident fauna during construction. This will however be transient and restricted to the construction phase.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor to Low (3)
Probability	Probable (3)	Probable (3)
Significance	**Low (21)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Partly, although noise and disturbance cannot be well mitigated, impacts on fauna due to human presence such as poaching can be mitigated.	

Mitigation:

- » All personnel should undergo environmental induction with regards to fauna and, in particular, awareness about not harming or collecting species such as snakes, tortoises and owls, which are often persecuted out of superstition.
- » Any fauna threatened by the construction activities should be removed to safety by an appropriately qualified person.
- » All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.
- » 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.
- » If holes or trenches need to be dug for pylons or electrical cabling, these should not be left open for extended periods of time as fauna may fall in and become trapped in them. Holes should only be dug when they are required and should be used and filled shortly thereafter.

Residual Impacts:
It is probable that some individuals of susceptible species will be lost to construction-related activities despite mitigation. However, this is not likely to impact the viability of the local population of any fauna species.

Operation Phase Impacts

Nature: *Faunal Impacts due to operation of the facility* The operation and presence of the facility may lead to disturbance or persecution of fauna within or adjacent to the facility.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To a large extent, but some low-level residual impact due to noise and human disturbance during maintenance is likely.	
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 the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract 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) to avoid collisions with susceptible species such as snakes and tortoises. » If the facility is to be 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 fence and not the outside as is the case on the majority of already constructed PV plants.		
Residual Impacts: Disturbance from maintenance activities will occur at a low level with the result that disturbance would be largely restricted to the site.		

Nature*: Habitat degradation due to erosion and Alien Plant Invasion* Disturbance created during construction of the facility will leave the site vulnerable to erosion and alien plant invasion for several years into the operational phase.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (3)
Magnitude	Low (4)	Minor to Low (3)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium (32)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	Moderate	Low
Can impacts be mitigated?	Yes, with proper management and avoidance, this impact can be mitigated to a low level.	
Mitigation:		

- » Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan.
- » The road should have runoff control features which redirects water flow and dissipate any energy in the water which may pose an erosion risk.
- » Regular monitoring for erosion during operation to ensure that no erosion problems have developed as result of the disturbance, as per the Erosion Management and Rehabilitation Plans for the project.
- » 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 revegetated of any remaining bare areas with indigenous perennial shrubs and succulents from the local area.
- » Alien management at the site should take place according to the Alien Invasive Management Plan.
- » Regular monitoring for alien plant during operation to ensure that no erosion 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 Impacts:
Some erosion and alien plant invasion is likely to occur even with the implementation of control measures, but would have a low impact.

Nature: *Faunal Impacts due to operation of grid connection*
The operation and maintenance of the grid connection may lead to disturbance or persecution of fauna in the vicinity of the development.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor to Low (3)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Low (24)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To a large extent, but some low-level residual impact due to noise and human disturbance during maintenance is likely.	

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 the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract 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) to avoid collisions with susceptible species such as snakes and tortoises.
- » If the substation perimeter is to be 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 fence and not the outside.

Residual Impacts:
Disturbance from maintenance activities will occur at a low and infrequent level with the result that no long-term impacts are expected to occur.

8.2.4 Implications for Project Implementation

With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of ecological impacts of Allepad PV Three can be reduced to moderate to low. From the outcomes of the ecological studies undertaken, it is concluded that the PV facility and associated infrastructure can be developed. On-site mitigation is viewed as the most practical and appropriate action, and viable options for reducing the overall impact of the development on these areas is detailed below:

- A pre-construction walk-through of the final development footprint for species of conservation concern that would be affected and that can be translocated must be undertaken prior to the commencement of the construction phase.
- Before construction commences individuals of listed species within the development footprint that would be affected, must be counted and marked and translocated, where deemed necessary by the ecologist conducting the pre-construction walk-through survey. Permits from the relevant provincial authorities, i.e. the Northern Cape West Department of Environment and Nature Conservation (DENC), must be obtained before the individuals are disturbed.
- 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 bushveld.
- 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 fence.

8.3. Potential Impacts on Avifauna

The significance of the impacts on avifauna expected with the development of the Allepad PV Three project has been assessed as medium to low, depending on the impact being considered, with the implementation of mitigation measures. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix E** for more details).

8.3.1 Results of the Avifauna Impact Assessment

Important avian microhabitats play an integral role within the landscape, providing nesting, foraging and reproductive benefits to the local avifauna. In order to ensure that the development does not have a long term negative impact on the local avifauna, it is important to delineate these avian microhabitats within the project site. **Figure 8.3** was generated by integrating avian microhabitats present on the project site and avifaunal information collected during the winter and summer field survey.

Habitat units comprising potential avifauna sensitive elements have been identified within the project site. These sensitive elements have been classified as being of a low, medium and high sensitivity due to the subtle differences in the avifaunal assemblages that they support, especially with respect to red-listed species. These sensitive elements are described below.

» Areas of very high sensitivity:
The drainage lines that intersect the gravel plains are considered to be of very high avifaunal sensitivity, due to presence of localised large trees that may serve as nesting habitat for raptors, while also providing alternative roosting and feeding areas within the area largely deprived of trees. The drainage lines also intersect the gravel plains throughout and therefore the ecological functioning of these two habitats are intertwined.

» Areas of high sensitivity:
The gravel plains are considered to be of high sensitivity, due firstly to the habitat diversity of the area and the fact that it supports several pairs of the Near-Threatened Karoo Korhaan (resident) and the Endangered Ludwig's Bustard (nomadic). This area is avoided by the development footprint of Allepad PV Three and the 300m power line corridor. The dune habitat is well represented within the bioregion, but due to the deeper soils, supports a number of protected tree species, such as the *Acacia erioloba, A. haematoxylon* and *Boscia albitrunca, B. foetida subsp. foetida.* These tree species, in turn, provide important nesting and roosting sites for birds, including large raptors. The dunes are therefore considered to be of high avifauna sensitivity due to their importance to a wide variety of avifaunal species.

» Areas of medium sensitivity:
The dune habitat supports a number of protected tree species, such as the *Acacia erioloba, A. haematoxylon* and *Boscia albitrunca, B. foetida subsp. foetida.* These tree species, in turn, provide important nesting and roosting sites for birds, including large raptors. The adjoining habitat which is not characterised by taller dunes are considered to be of medium sensitivity. A small section of sandy habitat is traversed by the development footprint of Allepad PV Three. Isolated dunes of medium ecological sensitivity is situated within the 300m power line corridor located adjacent to the main entrance road. The dunes are unlikely to fulfil the same ecological services as the contiguous dune fields located well beyond the development footprint and is considered acceptable.

» Areas of low sensitivity:
The sandy plains habitat represents the most widely distributed habitat in the region, and occurs primarily on shallower soils that do not support an extensive tree layer, besides scattered patches of *Parkinsonia africana*. This habitat is therefore regarded to be of low sensitivity. The majority of the development footprint and the 300m power line corridor is situated within this area. The placement of the solar energy facility within the lower sensitivity parts of the site, such as the sandy plains habitat, generate the lowest impacts on the avifauna, provided suitable mitigation measures are employed during construction and operation of the proposed facility.

The 300m power line corridor traverses the sandy plains and gravel plains. There are also a number of minor features along the power line corridor, including a small rocky outcrop, a stand of *Acacia mellifera* shrubs, a stand of alien *Prosopis* trees near human habitation, a very small ephemeral pan, as well as some small sewage ponds. These features lie directly adjacent the N10 road and may attract raptors and waterbirds on occasion, although no large red-listed species are expected to be supported by these features. In particular, the small pan is considered far too insignificant in size to support either waterbirds when inundated or coursers when dry.

As the study area appears not to directly support large and healthy populations of red-listed species, the sensitivity of the study area in general can be considered to be of medium sensitivity with respect to avifauna.

8.3.2 Description of Avifaunal Impacts

Negative avifauna impacts expected to occur with the development of Allepad PV Three includes a loss of habitat loss and displacement of birds, collision trauma caused by PV panels and interaction with the power line and electrocution.

» *Loss of habitat and disturbance of small passerines*
For the smaller passerine species the most important impacts will involve displacement from the area encompassed by the development footprint as a result of habitat destruction. While numerous species will be impacted, all of these species have large distribution ranges and will therefore only experience population declines on the project site, and not regionally or nationally. Some of the most abundant species which will be impacted, and which are also common in neighbouring habitats, include Yellow Canary, Rufous-eared Warbler, Black-chested Prinia, Spike-heeled Lark, Kalahari Scrub Robin, Sociable Weaver, Scaly-feathered Finch, and Fawn-coloured Lark. Less abundant species which will also be impacted, but are still common elsewhere, include Pink-billed Lark, Ant-eating Chat, and Chat Flycatcher.

The loss of habitat will be permanent while disturbance may be continuous during the operational phase of Allepad PV Three. Other impacts such as disturbances caused by reflective panels and grid connecting power lines are not likely to have any appreciable impact on these small species. The impacts in general can be expected to be minimal as these smaller species are far less susceptible to the associated impacts than larger species.

» *Habitat loss, disturbance and collision risk of medium terrestrial birds and raptors*
Small to medium-sized non-passerines that may be impacted to some extent due to habitat loss and displacement include resident raptors such as Pale Chanting Goshawk, and the ground-dwelling Namaqua Sandgrouse, Northern Black Korhaan, and Red-crested Korhaan. The latter three species are particularly common at the broader project site. These species may also be susceptible to collisions with associated infrastructure such as the PV panels and power lines, but this is not expected to have a major impact on most of these species. Northern Black Korhaan and Red-crested Korhaan, may, however, be at more risk based on the recent research (Visser, 2016).

» *Habitat loss, disturbance and collision risk of large terrestrial birds and raptors*
The group of primary concern is the medium to large non-passerines, which include the large terrestrial birds and diurnal raptors. Many of these are also red-listed, such as White-backed Vulture, Martial eagle, Secretarybird and Lanner Falcon. While most of these species are considered uncommon to scarce in the broader project site, they may occur on occasion (e.g. a Lanner Falcon was recorded on the project site during the summer survey, while none of the other species have yet been recorded).

Besides the loss of habitat that these species will experience, disturbances during construction and maintenance of the facility are also expected to have a negative impact. In addition, most of these species are also highly susceptible to collisions with power lines owing to reduced ability to see the power lines and reduced manoeuvrability in flight to avoid collisions (Martin & Shaw, 2010; Jenkins et al., 2010).

All large terrestrial birds, including the red-listed species, are killed in substantial numbers by existing and newly erected power lines in the country (Jenkins et al., 2010; Jenkin et al., 2011; Shaw, 2013). An additional threat faced by the large raptors is electrocution when perched or attempting to perch on power line structures (Lehman et al., 2007).

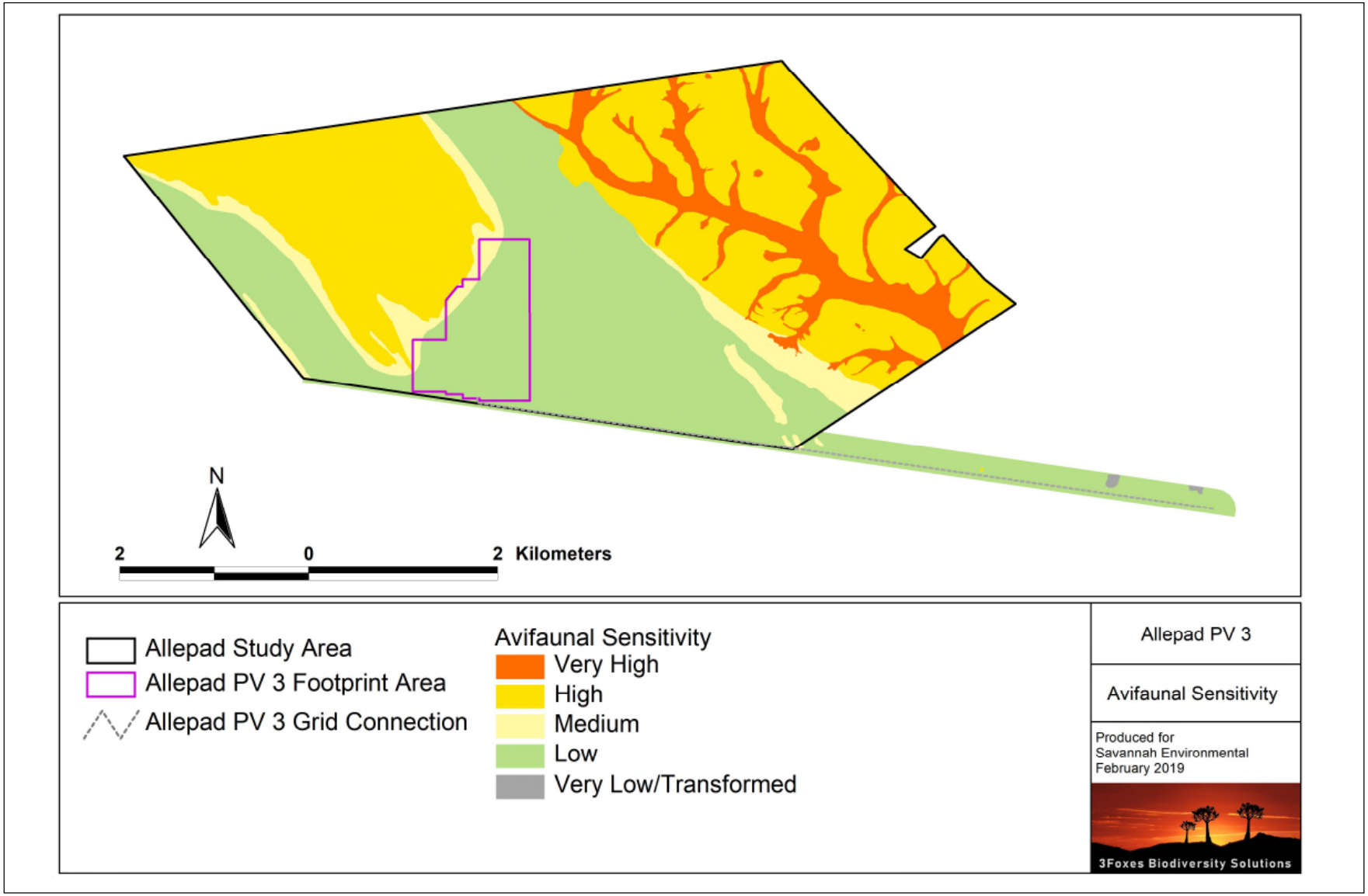

Figure 8.3: **Map illustrating the avifaunal sensitivity within the Allepad PV Three project site overlain with the proposed development footprint.**

8.3.3 Impact tables summarising the significance of impacts on avifauna during construction and operation (with and without mitigation)

Construction Phase Impacts

Nature: *Loss of habitat and disturbance due to the solar energy facility*
Loss of natural habitat and displacement of birds through physical transformation, modifications, removals and land clearance. The loss of habitat will be permanent while disturbance may be continuous during the operational phase of Allepad PV Three.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Low to Moderate (5)
Probability	Definite (5)	Definite (5)
Significance	**Medium (45)**	**Medium (40)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	This impact cannot be well mitigated because the loss of habitat is unavoidable and is a definite outcome of the development.	

Mitigation:

- The use of laydown areas within the footprint of the development should be used where feasible, to avoid habitat loss and disturbance to adjoining areas.
- All building waste produced during the construction phase should be removed from the development site and be disposed of at a designated waste management facility. Similarly, all liquid wastes should be contained in appropriately sealed vessels/ponds within the footprint of the development, and be disposed of at a designated waste management facility after use. Any liquid and chemical spills should be dealt with accordingly to avoid contamination of the environment.
- Pre-construction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to, and awareness about not harming or hunting ground-dwelling species (e.g. bustards, korhaans, thick-knees and coursers), and owls, which are often persecuted out of superstition.
- This induction should also include awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc.
- All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area.
- All construction vehicles should adhere to a low speed limit (40km/h on site) to avoid collisions with susceptible species such nocturnal and crepuscular species (e.g. nightjars, thick-knees and owls) which sometimes forage or rest along roads.
- Any avifauna threatened by the construction activities should be removed to safety by an appropriately qualified person.
- Reservoirs or ponds (evaporative or other) should be covered with fine mesh or other exclusion material in order to exclude and prevent birds from accessing potentially contaminated water contained therein.
- If holes or trenches need to be dug, these should not be left open for extended periods of time as ground-dwelling avifauna or their flightless young may fall in and become trapped in them. Holes should only be dug when they are required and should be used and filled shortly thereafter.
- No construction activity should occur near to active raptor nests should these be discovered prior to or during the construction phase. If there are active nests near construction areas, these should be reported to ECO and should be monitored until the birds have finished nesting and the fledglings left the nest.
- The fence around the facility should be designed with potential impacts on avifauna in mind, following recommendation by Visser (2016). This includes the location and positioning of the electrified strands in relation

to the fence as it has been shown that avifauna may become trapped in the gap between these two components of the fence (Visser, 2016).

Residual Impacts:

As the loss of currently intact habitat is an unavoidable consequence of the development, the habitat loss associated with the development remains a residual impact even after mitigation and avoidance of more sensitive areas. The sensitivity of the affected habitat is however low and the overall residual impact on avifaunal habitat loss remains low.

Nature: *Loss of habitat and disturbance due to the grid connection*

The power line is not likely to have any appreciable impact on small passerine species. Small to medium-sized non-passerines that may be impacted to some extent due to habitat loss and displacement include resident raptors such as Pale Chanting Goshawk, and the ground-dwelling Namaqua Sandgrouse, Northern Black Korhaan, and Red-crested Korhaan

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Low to Moderate (5)
Probability	High Likely (4)	Probable (3)
Significance	**Medium (36)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	Although there will be some habitat loss that cannot be well mitigated, impacts on avifauna will be transient and of low magnitude during construction.	

Mitigation:

- All personnel should undergo environmental induction with regards to avifauna and in particular awareness about not harming, collecting or hunting ground-dwelling species (e.g. bustards, korhaans, thick-knees and coursers), and owls, which are often persecuted out of superstition.
- Any avifauna threatened by the construction activities should be removed to safety by an appropriately qualified person.
- All vehicles (construction or other) accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such nocturnal and crepuscular species (e.g. nightjars, thick-knees and owls) which sometimes forage or rest on roads, especially at night.
- If holes or trenches need to be dug for pylons, these should not be left open for extended periods of time as ground-dwelling avifauna or their flightless young may fall in and become trapped in them. Holes should only be dug when they are required and should be used and filled shortly thereafter.
- Prior to construction, the design and layout of any proposed power lines must be endorsed by members of the Eskom-EWT Strategic Partnership, taking into account the mitigation guidelines recommended by Birdlife South Africa (Jenkins et al., 2017; Jenkins et al., 2016).
- Only power lines structures that are considered safe for birds should be erected to avoid the electrocutions of birds (particularly large raptors) perching or attempting to perch. Where necessary, deterrent devices such as bird guards should be mounted on relevant parts of the pylons to further reduce the possibility of electrocutions.
- The route that the power line will follow should be the shortest distance possible across an area where collisions are expected to be minimal, or follow existing power lines (as with this project), and be marked with bird diverters to make the lines as visible as possible to collision-susceptible species. Recommended bird diverters such as brightly coloured 'aviation' balls, thickened wire spirals, or flapping devices that increase the visibility of the lines should be fitted where considered necessary (collision hot-spots).
- The potential to 'stagger' the position of the power line pylons in relation to existing telephone or power line poles/pylons should be investigated, as this may assist in increasing the visibility of power lines to large flying birds such as bustards, which may regularly fly through the area.

Residual Impacts:
The loss of habitat associated with the grid connection corridor is an unavoidable consequence of the power line construction, and remains a residual impact even after mitigation and avoidance of more sensitive areas. The sensitivity of the affected habitat is however mostly low and the overall residual impact on avifaunal habitat loss remains low. Although the use of power line structures that are considered safe for large birds will contribute to reducing the potential impacts of the power line, future collisions with power line will remain a risk. This can be reduced further by 'staggering' the pylons in relation to existing pylons during construction, so that the profile of the power line will be more visible to flying birds.

Operation Phase Impacts

Nature: *Collisions with PV Panels*
Resident raptors such as Pale Chanting Goshawk, and the Red-crested Korhaan may also be susceptible to collisions with associated infrastructure such as the PV panels, entrapment along perimeter fencing, and disturbance due to traffic and night lighting.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low to Moderate (5)	Low (4)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium (40)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	Yes to a large degree, but it may be more difficult to prevent collisions and impacts related to the perimeter fence.	

Mitigation:

- If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects. The use of lighting at night should be kept to a minimum, so as not to unnecessarily attract invertebrates to the solar facility and possibly their avian predators, and to minimise disturbance to birds flying over the facility at night.
- All incidents of collision with panels should be recorded as meticulously as possible, including data related to the species involved, the exact location of collisions within the facility, and suspected cause of death. Post-construction monitoring with the aid of video surveillance should be considered, as this will contribute towards understanding bird interactions with solar panels.
- If birds nest on the infrastructure of the facility and cannot be tolerated due to operational risks of fire, electrical shorts, soiling of panels or other concerns, birds should be prevented from accessing nesting sites by using mesh or other manner of excluding them. Birds should not be shot, poisoned or harmed as this is not an effective control method and has negative ecological consequences. Birds with eggs or nestlings should be allowed to fledge their young before nests are removed.
- If there are any persistent problems with avifauna, then an avifaunal specialist should be consulted for advice on further mitigation.
- Any movements by vehicle and personnel should be limited to within the footprint of power lines and other associated infrastructure, especially during routine maintenance procedures.
- Reservoirs or ponds (evaporative or other) should be covered with fine mesh or other exclusion material in order to exclude and prevent birds from accessing potentially contaminated water contained therein.
- All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such nocturnal and crepuscular species (e.g. nightjars, thick-knees and owls) which sometimes forage or rest on roads at night.

» Maintenance of the perimeter fencing must ensure that it fulfils the guidelines suggested by Visser (2016), to minimise impacts to korhaans susceptible to entrapment between the fencing and electrical components of perimeter fencing.
Residual Impacts: Although high rates of mortality due to collisions has not been recorded in South Africa, there is some risk that this may occur in addition to some likely mortality associated with the perimeter fencing.

Nature: *Disturbance, electrocution and collision with power line infrastructure*

The group of primary concern relating to this impact is the medium to large non-passerines, which include the large terrestrial birds and diurnal raptors. Many of these are also red-listed, such as White-backed Vulture, Martial eagle, Secretarybird and Lanner Falcon. Most of these species are highly susceptible to collisions with power lines owing to reduced ability to see the power lines and reduced manoeuvrability in flight to avoid collisions (Martin & Shaw, 2010; Jenkins *et al.*, 2010). All large terrestrial birds, including the red-listed species, are killed in substantial numbers by existing and newly erected power lines in the country (Jenkins *et al.*, 2010; Jenkin *et al*., 2011; Shaw, 2013). An additional threat faced by the large raptors is electrocution when perched or attempting to perch on power line structures (Lehman *et al*., 2007).

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium (44)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	To a large extent although bird flappers and other bird diverters are not 100% effective and so there would still be some residual impact.	

Mitigation:

» Regular monitoring of power lines should be undertaken to detect bird carcasses, to enable the identification of any areas of high impact to be marked with bird diverters.
» Any movements by vehicle and personnel should be limited to within the footprint of the power line corridor and other associated infrastructure, especially during routine maintenance procedures.
» Any raptor nests that are discovered on the power line structures should be reported to the ECO, while utmost care should be taken to not disturb these nests during routine maintenance procedures.
» Minor features along the proposed route include the following, a stand of *Acacia mellifera* shrubs, a stand of alien *Prosopis* trees near human habitation, a small rocky outcrop and some small sewage ponds. These may attract raptors and waterbirds on occasion, although no large red-listed species are expected to be attracted to these features. Additional areas where the power line should be fitted with bird flight diverters to reduce collision risk should be identified post-construction through searches for bird carcasses along the power line, and particularly in the vicinity of the above mentioned features.

Residual Impacts:

Deterrent devices such as bird guards to reduce electrocutions, and flight diverters to reduce the risk of collisions with power lines are not 100% effective and some residual impact is likely to occur.

8.3.4 Implications for Project Implementation

With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of avifauna impacts associated with Allepad PV Three and the grid connection will be medium

to low. From the outcomes of the avifaunal studies undertaken, it is concluded that the PV facility can be developed and impacts on avifauna managed by taking the following into consideration:

» Prior to construction, the design and layout of any proposed power lines must be endorsed by members of the Eskom-EWT Strategic Partnership, taking into account the mitigation guidelines recommended by Birdlife South Africa (Jenkins et al., 2017; Jenkins et al., 2016).
» All construction vehicles should adhere to a low speed limit (40km/h on site) to avoid collisions with susceptible species such nocturnal and crepuscular species (e.g. nightjars, thick-knees and owls) which sometimes forage or rest along roads.
» Areas where the power line should be fitted with bird flight diverters to reduce collision risk should be identified post-construction through searches for bird carcasses along the power line, and particularly in the vicinity of the above mentioned features.
» Maintenance of the perimeter fencing must ensure that it fulfils the guidelines suggested by Visser (2016), to minimise impacts to korhaans susceptible to entrapment between the fencing and electrical components of perimeter fencing.

8.4. Assessment of Impacts on Heritage Resources

Negative impacts on heritage resources may occur due to loss of archaeological and palaeontological resources during construction activities of Allepad PV Three. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix F**).

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

The area surrounding Upington has a rich historical and archaeological past (Fourie, 2014 SAHRIS NID 174335) and several heritage sites have been identified in close proximity to the project site. During a field assessment undertaken by the heritage specialist in October 2018, a number of archaeological resources were identified. The majority of these resources were of low contextual significance (Grade IIIC), and were not *in situ*. While some features have been identified within the 300m wide power line corridor, none of these were considered to be of heritage significance (refer to **Figure 8.5**).

Two heritage sites of some significance were identified within the broader project site(refer to **Figure 8.4**). Both sites are, however, located outside of the development footprint for Allepad PV Three:

» A possible burial site (Grade IIIA) (Site 0506).
» By far the largest number of artefacts – mostly MSA, but also some LSA including a large ESA flake/large cutting tools (LCT). The majority of artefacts were flakes and chunks, but also a weathered core, among an extensive scatter of surface quartz, scraped top soils, large piles of stone and gravel, and large scale diggings. A small dry pan with many scattered tools lying around, in majority in quartzite, but also quartz, banded ironstone, chalcedony, hornfels/lydianite and 1-2 opaline were identified within the eastern section of the project site (Grade IIIB) (Site 0526).

Most of the project site is underlain by un-fossiliferous igneous and metamorphic basement rocks (granites, gneisses etc.) or mantled by superficial sediments (wind-blown sands, alluvium etc.) of low paleontological sensitivity. Extensive, deep excavations are unlikely to be required for the development of a solar energy facility. Significant negative impacts on local fossil heritage are therefore unlikely to result from the proposed development. The overall impact significance of the proposed development on paleontology is likely to be low.

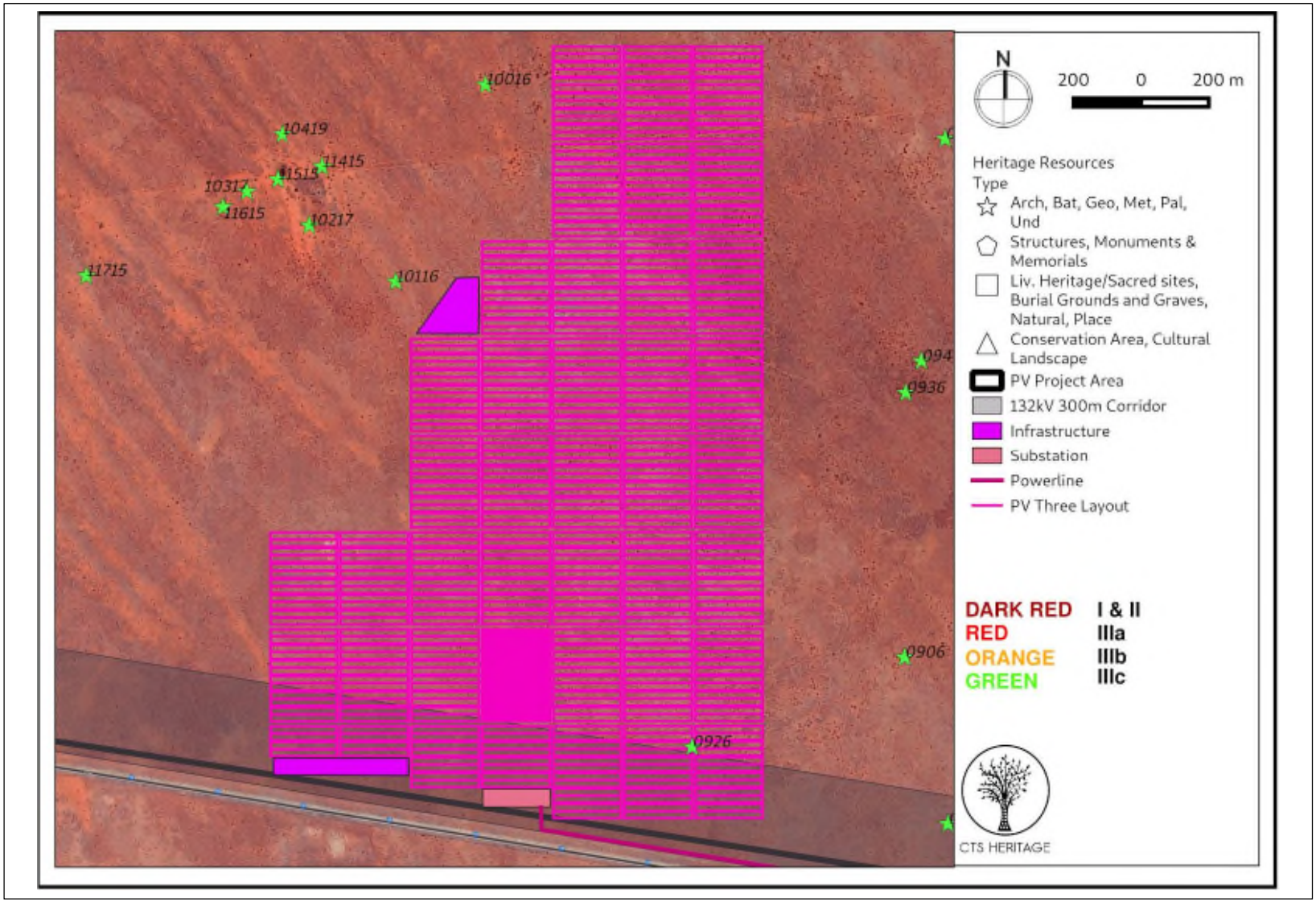

Figure 8.4: **Heritage resources within the vicinity of Allepad PV Three.**

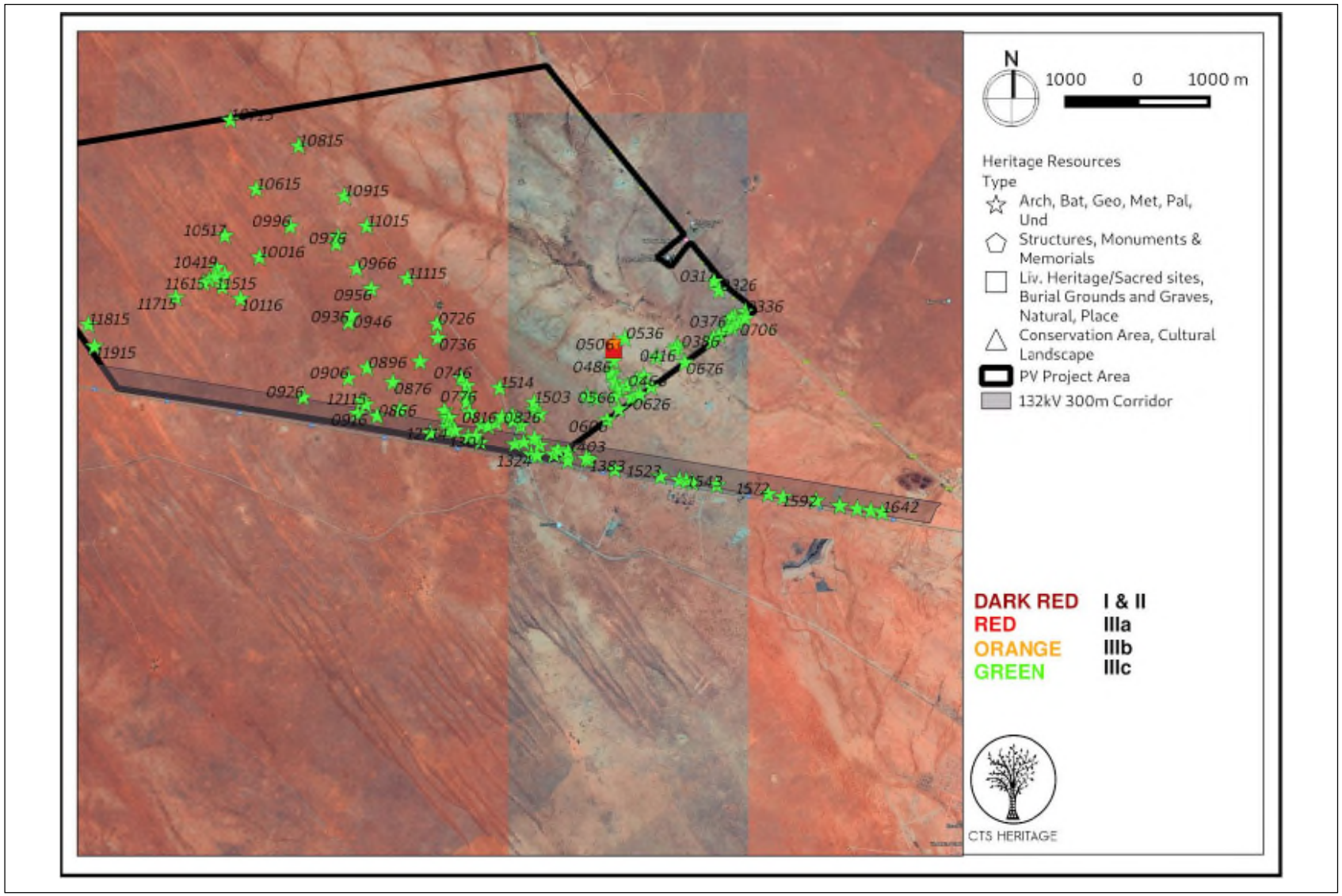

Figure 8.5: **Heritage resources identified within the vicinity of Allepad PV Three and the 300m wide power line corridor. Site 0506 is represented by the red square and Site 0526 is represented by the orange star located within the eastern section of the project site.**

8.4.2 Description of the Heritage Impacts

The development will require the clearing of vegetation and levelling of the site in order to construct the PV facility, and will involve earthmoving operations that may have a negative impact on potentially important archaeological resources. The impact of the proposed Allepad PV Three and associated infrastructure on significant archaeological resources is considered to be low. It is expected that neither Site 0506 or Site 0526 will be impacted by the proposed development.

It is possible that unmarked graves and ostrich eggshell water containers for example, may be exposed or uncovered during sub-subsurface excavations. However, the probability of this occurring is considered to be moderate to low.

Extensive, deep excavations are unlikely to be required for the development of a solar energy facility. Significant negative impacts on local fossil heritage are therefore unlikely to result from the proposed development.

8.4.3 Impact tables summarising the significance of impacts on heritage related to the PV facility and associated infrastructure during construction and operation (with and without mitigation)

Nature: *Impacts on archaeological resources* The construction phase of the project will require excavation, which may impact on heritage resources if present. No heritage resources of significance were identified within the development footprint for Allepad PV Three or the 300m wide power line corridor.		
	Without mitigation	**With mitigation**
Extent	Localised within the site boundary (1)	Not applicable as no impacts are anticipated
Duration	Where an impact to a resource occurs, the impact will be permanent (5)	
Magnitude	Low as the archaeological resources that were identified, are of low heritage significance (2)	
Probability	It is extremely unlikely that any significant archaeological resources will be impacted (1)	
Significance	**Low (8)**	
Status (positive or negative)	Neutral	
Reversibility	Any impacts to heritage resources that do occur are irreversible	
Irreplaceable loss of resources?	Unlikely	
Can impacts be mitigated?	Not applicable as no impacts are anticipated	
Mitigation: No impacts on archaeological resources are anticipated and therefore no mitigation is required. However, a chance find procedure must be developed and implemented for the project in the event that an archaeological resource is found.		
Residual Impacts: Should any significant recourses be impacted (however unlikely) residual impacts may occur, including a negative impact due to the loss of potentially scientific cultural resources.		

Nature: *Impacts on palaeontological resources* The construction phase of the project will require excavation, which may impact on fossil resources if present. No fossil resources of significance were identified within the development footprint or 300m wide power line corridor.		
	Without mitigation	**With mitigation**
Extent	Localised within the site boundary. (1)	Not applicable as no impacts are anticipated
Duration	Where an impact to a resource occurs, the impact will be permanent (5)	
Magnitude	Most of the project site is underlain by un-fossiliferous igneous and metamorphic basement rocks (granites, gneisses etc.) or mantled by superficial sediments (wind-blown sands, alluvium etc.) of low paleontological sensitivity. The impact would be very unlikely. (2)	
Probability	It is extremely unlikely that any fossils would be impacted (1)	
Significance	**Low (8)**	
Status (positive or negative)	Neutral	
Reversibility	Any impacts to heritage resources that do occur are irreversible	
Irreplaceable loss of resources?	Unlikely	
Can impacts be mitigated?	Not applicable as no impacts are anticipated	
Mitigation: No impacts on palaeontological resources are anticipated and therefore no mitigation is required. However, a chance find procedure must be developed and implemented for the project in the event that a palaeontological resource is found.		
Residual Impacts: Should any significant recourses be impacted (however unlikely) residual impacts may occur, including a negative impact due to the loss of potentially scientific cultural resources.		

8.4.4 Implications for Project Implementation

With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of impacts on heritage resources as a result of the development of Allepad PV Three will be low. From the outcomes of the studies undertaken, it is concluded that the PV facility can be developed and impacts on heritage managed by taking the following into consideration:

- The archaeological Site 0526 (graded IIIB) must not be impacted by the proposed development and a 100m no-go buffer must be implemented around this site.
- The possible burial site identified as Site 0506 must not be impacted by the proposed development and a 30m no-go buffer must be implemented.

» A chance find procedure must be developed and implemented in the event that archaeological or palaeontological resources are found. In the case where the proposed development activities bring these materials to the surface, work must cease and SAHRA must be contacted immediately.

8.5. Assessment of Visual Impacts

Negative impacts on visual receptors will occur during the undertaking of construction activities and the operation of Allepad PV Three. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix G**).

8.5.1 Results of the Visual Impact Assessment

The construction and operation of Allepad PV Three and its associated infrastructure may have a visual impact on the area surrounding the project site, especially within (but not restricted to) a 3km radius of the facility. The visual impact will differ amongst places, depending on the distance from the facility.

Five potentially sensitive visual receptors have been identified within a 6km radius from the Allepad PV Three development footprint. These include:

1. Informal settlements south of the N10 national road;
2. Observers travelling along the R360 regional road;
3. Residents of the house located on the project site (landowner);
4. Unknown residences south of the N10 national road; and
5. Observers travelling along the N10 national road.

The solar energy facility is expected to have a moderate visual impact on observers travelling along the R360 regional road and informal settlements located south of the N10 national road (Receptor 1). It is expected that the solar energy facility will have a moderate impact on observers travelling along the N10 national road.

Figure 8.6 indicates the combined results of the visual exposure, viewer incidence/perception and visual distance of Allepad PV Three.

The power line may be visible within the 3km visual corridor and potentially highly visible within a 500m radius of the power line structures. This is as a result of the generally flat terrain the power line is proposed to traverse. Potential observers (that may be visually impacted) include residents of the settlements south of the N10 national road and observers travelling along this road.

Overall, the significance of the visual impacts is expected to range from moderate to low as a result of the generally undeveloped character of the landscape. The facility would be visible within an area that incorporates certain sensitive visual receptors who would consider visual exposure to this type of infrastructure to be intrusive. Such visual receptors include people travelling along roads and residents of rural homesteads and settlements.

8.5.2 Visual Assessment

Visual impacts will occur during the construction and operation of Allepad PV Three.

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 traveling along the N10 national road and residents of homesteads within a 3km radius of the operational 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 to low. Observers located within a 3-6km radius of the PV facility structures could have a low visual impact, before and after the implementation of mitigation measures.

Visual impacts during the operation phase will also include lighting impacts relating to glare and sky glow[20]. The source of glare light is unshielded luminaries which emit light in all directions and which are visible over long distances. The sky glow intensifies with the increase in the amount of light sources. It is possible that Allepad PV Three may contribute to the effect of sky glow within the environment. The visual lighting impact is likely to be of a moderate significance and may be mitigated to low.

The visual impact of glint and glare relates to the potential it has to negatively affect sensitive visual receptors in relative close proximity to the source (e.g. residents of neighbouring properties), or aviation safety risk for pilots (especially where the source interferes with the approach angle to the runway). Allepad PV Three is not located near any airports or airfields and is relatively remote in terms of exposure to other potentially sensitive visual receptors and therefore this impact is considered to be of low significance. A visual impact relating to the ancillary infrastructure associated with Allepad PV Three is likely to result in a visual impact of low significance.

Visual impacts are also associated with the operation of the associated power line to connect Allepad PV Three to the national grid. The power line is expected to have a moderate visual impact on observers traveling along the N10 national road and residents of the informal settlements within a 0.5km radius of the power line structures. No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

[20] Sky glow is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog.

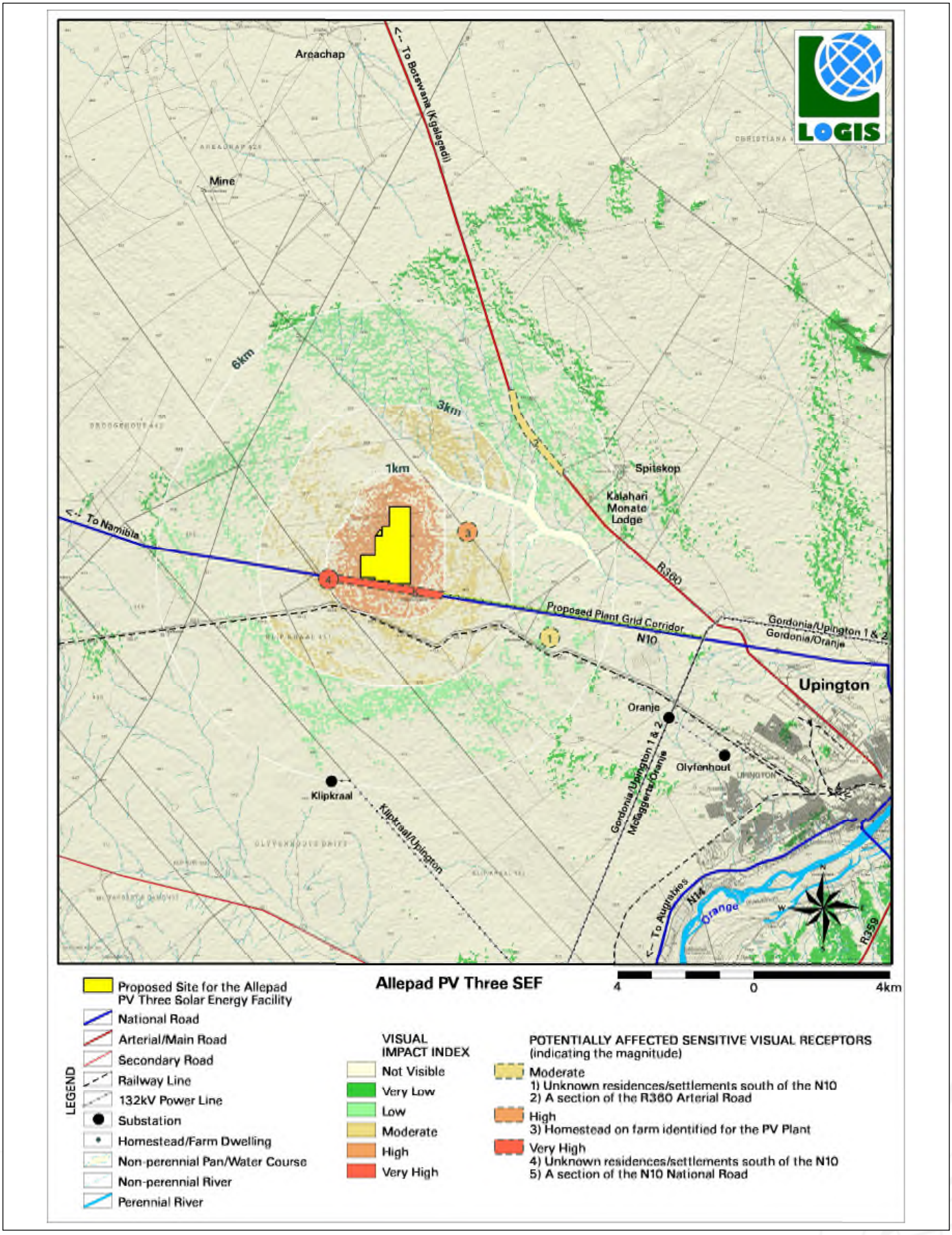

Figure 8.6: Potentially sensitive visual receptors in the area surrounding the site for Allepad PV Three

Secondary visual impacts are also expected with the operation of Allepad PV Three. These impacts include a visual impact on the sense of place of the region. An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light. These generally undeveloped landscapes are considered to have a high visual quality, except where urban development represents existing visual disturbances. The anticipated visual impact of Allepad PV Three on the regional visual quality, and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of low significance. This is due to the relatively low viewer incidence within close proximity to the project site as well as existing similar developments in the area.

8.5.3 Impact table summarising the significance of visual impacts during construction and operation (with and without mitigation)

Construction Phase Impacts

Nature: *Visual impacts of construction activities on sensitive visual receptors in close proximity to the PV facility and ancillary infrastructure* 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.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly Probable (4)	Probable (3)
Significance	**Moderate (40)**	**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: Planning: » Retain and maintain natural vegetation immediately adjacent to the development footprint. Construction: » Ensure that vegetation is not unnecessarily removed during the construction phase. » Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) 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 immediately after the completion of construction works.		
Residual Impacts: None, provided that rehabilitation work is carried out as specified.		

Operation Phase Impacts

Nature: *Visual impact on sensitive visual receptors located within a 3km radius to the proposed PV facility operational structures* Visual impacts on observers travelling along the roads and residents at homesteads within a 3km radius of the PV facility structures		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	**Moderate (42)**	**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: Planning: » Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. » Consult adjacent landowners in order to inform them of the development and to identify any (valid) visual impact concerns. Operation: » 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: *Visual impact of the PV facility structure within the region* Visual impact on observers travelling along the roads and residents at homesteads within a 3 – 6km radius of the PV facility structures.		
	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (26)**	**Low (26)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, however best practice measures are recommended.	
Mitigation: Planning: » Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. Operation: » 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: *Lighting impacts*		
Visual impact of lighting at night on sensitive visual receptors in close proximity to the PV facility.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	**Moderate (42)**	**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:

Planning and operation:

» Shield the sources of light by physical barriers (walls, vegetation, or the structure itself) where possible.
» 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 facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Nature: *Visual impact of ancillary infrastructure*		
Visual impact of the ancillary infrastructure during the operation phase on observers in close proximity to the structures.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (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 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.	

Mitigation:

Planning:

» Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/power line servitude.

Operation:

» 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: *Visual impact on sensitive visual receptors located within a 500m radius of the power line structures* Visual impact on sensitive visual receptors within a 500m radius of the power line associated with Allepad PV Three.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	High (8)
Probability	Probable (3)	Probable (3)
Significance	**Moderate (42)**	**Moderate (42)**
Status (positive 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.	
Mitigation: Planning: » Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/power line servitude. Operation: » 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: *Visual impact of the PV facility on the sense of place of the region* The greater environment has a rural, undeveloped character and a natural appearance. These generally undeveloped landscapes are considered to have a high visual quality, except where urban development represents existing visual disturbances. An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light.		
	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (26)**	**Low (26)**
Status (positive 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.	
Mitigation: Planning:		

» Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude. Operation: » 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: *Potential visual impact of solar glint and glare as a visual distraction and possible air travel hazard*

The visual impact of glint and glare relates to the potential it has to negatively affect sensitive visual receptors in relative close proximity to the source (e.g. residents of neighbouring properties), or aviation safety risk for pilots (especially where the source interferes with the approach angle to the runway). It is generally possible to mitigate the potential glint and glare impacts through the design and careful placement of the infrastructure. Allepad PV Three is not located near any airports or airfields and is relatively remote in terms of exposure to other potentially sensitive visual receptors. As such, the potential visual impact related to solar glint and glare is expected to be of low significance.

	Without mitigation	**With mitigation**
Extent	Local (2)	N/a
Duration	Long term (4)	
Magnitude	Low (4)	
Probability	Improbable (2)	
Significance	**Low (20)**	
Status (positive or negative)	Negative	
Reversibility	Reversible (1)	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Not applicable.	

Mitigation:

» No mitigation is required.

Residual Impacts:

Potential visual impact of solar glint and glare as a visual distraction and possible air travel hazard is not applicable as Allepad PV Three is not located near any airports or airfields.

8.5.4 Implications for Project Implementation

Overall, the significance of the visual impacts is expected to range from moderate to low, depending on the impact being considered, as a result of the generally undeveloped character of the landscape as well as the presence of existing similar developments in the area. The following mitigation is 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.
» Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude.
» Maintain the general appearance of the infrastructure.
» Remove infrastructure not required for the post-decommissioning use.
» Rehabilitate all affected areas.

8.6. Assessment of Social Impacts

Impacts on the social environment are expected during both the construction and operation phases. Potential social impacts and the relative significance of the impacts associated with the development of Allepad PV Three are summarised below (refer to **Appendix H**).

8.6.1 Results of the Social Impact Assessment

Traditionally, the construction phase of a PV solar development is associated with the majority of social impacts. Many of the social impacts are unavoidable and will take place to some extent, but can be managed through the careful planning and implementation of appropriate mitigation measures. A number of potential positive and negative social impacts have been identified for the project. An assessment of the potential social impacts indicated that there are no perceived negative impacts that are sufficiently significant to allow them to be classified as "fatal flaws".

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

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

8.6.2 Description of Social Impacts

The following positive and negative impacts have been identified and assessed for Allepad PV Three.

Positive social impacts associated with the construction phase of Allepad PV Three:

- Direct and indirect employment opportunities and skills development
- Socio-economic stimulation

Negative social impacts associated with the construction phase of Allepad PV Three:
» Influx of construction workers and change in population
» Increase in crime
» Increased risk of HIV infections
» Hazard exposure
» Impacts on daily living and movement patterns
» Disruption to social and community infrastructure
» Nuisance impacts (noise and dust)
» Transformation of the sense of place

Positive social impacts associated with the operation phase of Allepad PV Three:
» Direct and indirect employment opportunities and skills development
» Socio-economic stimulation

Negative social impacts associated with the operation phase of Allepad PV Three:
» Transformation of the sense of place impacts

8.6.3 Impact tables summarising the significance of social impacts during construction and operation (with and without mitigation measures)

Construction Phase Impacts

Nature: *Nuisance impacts (noise and dust)*
Site-specific activities such as site clearance and the deliveries of materials, equipment, plant and the transportation of the workforce along unsealed access roads will generate the most dust and noise. Dust that accumulates on foliage and grasses that is used for grazing may result in that foliage and those grasses becoming unpalatable for livestock and/or game. This may in turn have an effect on farming activities within the vicinity of the project site and along the access road over the construction period. This impact will negatively impact sensitive receptors situated within or in close proximity to the project site, and could also potentially impact surrounding land users. The impact of noise and dust on surrounding land users and local farmsteads can be reduced through the application of appropriate mitigation measures.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short term (1)	Short term (1)
Magnitude	Low (4)	Minor to Low (3)
Probability	Definite (5)	Definite (5)
Significance	**Medium (30)**	**Low (25)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:
» Where necessary apply the appropriate dust suppression methods;
» Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.
» Ensure all vehicles are road worthy, drivers are qualified and are made aware of the potential noise and dust issues.
» Appoint a community liaison officer to deal with complaints and grievances from the public.

Residual Impacts:
» This impact will not remain after the construction phase is completed.

Nature: *Increase in crime*
It is often opportunistic crimes such as stock theft, the abuse of alcohol and relationship related crimes that are associated with construction activities. With this in mind it would be pertinent for the developers to ensure that processes are put in place through which any suspected criminal activities associated with the project can be easily communicated and swiftly addressed.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short term (1)	Short term (1)
Magnitude	Low (4)	Minor to Low (3)
Probability	Highly probable (4)	Probable (3)
Significance	**Low (28)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:
» Ensure that construction workers are clearly identifiable. All workers should carry identification cards and wear identifiable clothing.
» Fence off construction site and control access to these sites.
» Appoint an independent security company to monitor the site.
» Appoint a community liaison officer.
» Encourage local people to report any suspicious activity associated with the construction site to the community liaison officer.
» A grievance mechanism must be prepared and communicated to surrounding landowners and local communities, to ensure that the project proponent, EPC Contractor, and sub-contractors remain responsible and accountable, and to facilitate the identification and implementation of additional mitigation measures if required.
» Prevent loitering within the vicinity of the construction camp as well as construction sites by recruiting off site in visa an offsite recruiting office/agent, whatever is most appropriate.

Residual Impacts:
» If crime levels are escalated it will probably take some time before they return to their pre-construction levels.

Nature: *Increased risk of HIV infections*
In 2013 the then Siyanda district, now the ZM Mgcawu District Municipality, had a relatively low HIV prevalence rate amongst antenatal women at 20.1%. This placed the district 11th lowest when compared to all districts across the country. The fact that sexually transmitted diseases tend to be spread by construction and transport workers, together with the high prevalence of HIV across the rest of South Africa, opens the area to a high risk of HIV infections (Singh & Malaviya, 1994; Ramjee & Gouws, 2002; Meintjes, Bowen, & Root, 2007; World Bank Group, 2016; Bowen, Dorrington, Distiller, Lake, & Besesar, 2008; Bowen P. , Govender, Edwards, & Cattell, 2016; Kikwasi & Lukwale, 2017; Bowen P. , Govender, Edwards, & Lake, 2018).

This risk is likely to be at its highest during the construction phase of the project as the construction workforce increases and material and equipment is delivered to site and is likely to subside during the operational phase.

	Without mitigation	**With mitigation**
Extent	Regional (4)	Regional (4)
Duration	Long-term (4)	Long-term (4)

Magnitude	High (8)	Moderate to High (7)
Probability	Highly probable (4)	Highly probable (4)
Significance	**High (64)**	**High (60)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:

» Ensure that an onsite HIV infections policy is in place and that construction workers have easy access to condoms.
» Expose workers to a health and HIV/AIDS awareness educational programme.
» Consider the viability of extending the HIV/AIDS programme into the community with specific focus on schools and youth clubs.

Residual Impacts:

» An increase in the HIV prevalence rate that will last beyond the construction period.

Nature: *Influx of construction workers and change in population*

During construction the workforce is likely to peak at approximately 300 workers who will commute to and from site on a daily basis. In-migration of labourers in search of employment opportunities, and a resultant change in population, and increase in pressure on local resources and social networks, or existing services and infrastructure.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short term (1)	Short term (1)
Magnitude	Low (4)	Low to Minor (3)
Probability	Definite (5)	Definite (5)
Significance	**Medium (35)**	**Low (30)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Communicate the limitation of opportunities created by the project through Community leaders and Ward Councillors to prevent an influx of job seekers.
» Develop and implement a local procurement policy which prioritises "locals first" to prevent the movement of people into the area in search of work.
» Draw up a recruitment policy in conjunction with the Community Leaders and Ward Councillors of the area and ensure compliance with this policy.

Residual Impacts:

» There is the risk that some workers remain in the area in the hope of finding employment with other projects planned for the region. This risk is, however, reduced as most workers will be recruited locally.

Nature: *Impacts associated with the exposure to hazards*

The use of heavy equipment and vehicles and an increase in vehicle traffic within the vicinity of all construction sites will result in an increased risk to the personal safety of people and animals. Of particular concern are increased hazards faced by pedestrians, cyclists and motorists with emphasis on vulnerable groups such as children and the elderly. Excavation work and trenches also pose a hazard to the safety of people, particularly children and animals, who may fall into these works and who may have difficulty in getting out.

There will also be an increased risk of fires brought about through construction workers lighting fires for cooking and for warmth during cold periods.

	Without mitigation	With mitigation
Extent	Regional (2)	Regional (2)
Duration	Short term (1)	Short term (1)
Magnitude	Low (4)	Low to Minor (3)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Low (28)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Ensure all construction equipment and vehicles are properly maintained at all times.
» Ensure that operators and drivers are properly trained and make them aware, through regular toolbox talks, of any risk they may pose to the community. Place specific emphasis on the vulnerable sector of the population such as children and the elderly.
» Ensure that fires lit by construction staff are only ignited in designated areas and that the appropriate safety precautions, such as not lighting fires in strong wilds and completely extinguishing fires before leaving them unattended, are strictly adhered to.
» Make staff aware of the dangers of fire during regular tool box talks.
» A grievance mechanism must be prepared and communicated to surrounding landowners and local communities, to ensure that the project proponent, EPC Contractor, and sub-contractors remain responsible and accountable, and to facilitate the identification and implementation of additional mitigation measures if required.
» Where necessary training should be provided on the implementation of the grievance mechanism to ensure that those who are most likely to be affected by the project are suitably knowledgeable on how to raise concerns and have these addressed.
» Compile and implement a Fire Management and Emergency Preparedness.
» Follow the recommendations in the Traffic Management Plan.

Residual Impacts:

» With an increased risk of hazard exposure there is the possibility that people may be injured or killed which will place a burden on their families.

Nature: *Impacts on daily living and movement patterns*
Disruptions to daily living patterns are likely to be minimal and restricted to the construction phase of the project. This impact will be mainly associated with the site and the main access roads. Project related activities such as the movement of construction vehicles on busy roads, an increase in the workforce in the area and the excavation of trenches amongst other activities could all disrupt the daily living patterns and routes of local residents.

	Without mitigation	With mitigation
Extent	Regional (2)	Regional (2)
Duration	Short term (1)	Short term (1)
Magnitude	Low (4)	Low to Minor (3)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Low (28)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Follow the recommendations in the Traffic Management Plan.
» Ensure that, at all times, people have access to their properties as well as to social facilities.

- » All vehicles must be road worthy and drivers must be qualified, obey traffic rules, follow speed limits and be made aware of the potential road safety issues.
- » Heavy vehicles should be inspected regularly to ensure their road safety worthiness.
- » Avoid heavy vehicle activity during "peak" hours (when children are taken to school, or people are driving to work).
- » The developer and EPC Contractor must ensure that the roads utilised for construction activities are either maintained in the present condition or upgraded if damaged due to construction activities.

Residual Impacts:

- » It is unlikely that any disruption of community patterns will persist after construction.

Nature: *Disruption to social and community infrastructure*

The increase in the workforce could result in a disruption to social and community infrastructure such as access to schools, health facilities and place strain on municipal services. With the workforce associated with the construction phase peaking at approximately 300 workers, of which approximately 60% will be locally recruited, it is unlikely that in isolation the project will have any significant effect on social and community infrastructure in the area.

	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Short term (1)	Short term (1)
Magnitude	Low (4)	Minor to Low (3)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Low (28)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- » Regularly monitor the effect that construction is having on infrastructure and immediately report any damage of infrastructure to the appropriate authority.
- » Ensure that where communities' access is obstructed that this access is swiftly restored to an acceptable state.

Residual Impacts:

- » If disrupted social and community infrastructure is not swiftly restored there is a risk that local communities may experience an extended loss in this respect.

Nature: *Direct and indirect employment opportunities and skills development*

The project will lead to the creation of both direct and indirect job which will have a positive economic benefit within the region. In this regard there are approximately 300 direct jobs associated with the construction phase of the project and approximately 25 over the operational phase. During the construction phase approximately 60% of these direct job opportunities will be for low and non-skilled workers with ~25% going to semi-skilled and ~15% to skilled workers. It is anticipates that the majority of the general labour force will as far as possible be sourced from the local labour pool. Where relevant skills are unavailable from the local labour pool, these would need to be sought elsewhere. The injection of income into the area in the form of wages will represent an opportunity for the local economy and businesses in the area.

	Without enhancement	**With enhancement**
Extent	Regional (3)	Regional (3)
Duration	Short term (1)	Short term (1)
Magnitude	Minor to Low (3)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**Medium (35)**	**Medium (40)**
Status (positive or negative)	Positive	Positive

Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Enhancement:

» Wherever feasible, local residents should be recruited to fill semi- and unskilled jobs.
» Women should be given equal employment opportunities and encouraged to apply for positions.
» A skills transfer plan should be put in place at an early stage and workers should be given the opportunity to develop skills which they can use to secure jobs elsewhere post-construction.
» A procurement policy promoting the use of local business should, where possible, be put in place and applied throughout the construction phase.
» As far as possible local contractors that are compliant with Broad-Based Black Economic Empowerment (B-BBEE) criteria should be used.

Residual Impacts:

» Job creation and skills development may help in addressing poverty and low living standards in the region and improve skills and experience in the local area.

Nature: *Socio-economic stimulation*

Apart from the increase in job creation, the project is also likely to stimulate the local economy and again this is likely to be most significant at a cumulative level. Socio-economic stimulation will be based on the use of local goods and services and will include, but not limited to, the provision of construction materials and equipment, and workforce essentials such as catering services, trade clothing, safety equipment, ablution, accommodation, transportation and other goods. At the project level there will be an economic contribution attached to Allepad PV Three. This contribution will be in the form of disposable salaries and the purchases of services and supplies from the local communities in and around the region.

In terms of business opportunities for local companies, expenditure during the construction phase will create business opportunities for the regional and local economy. The increase in demand for new materials and services in the nearby area may stimulate local business and local economic development. There is likely to be a direct increase in industry and indirect increase in secondary businesses.

	Without enhancement	**With enhancement**
Extent	Regional (2)	Regional (2)
Duration	Short term (1)	Short term (1)
Magnitude	Moderate (6)	Moderate (7)
Probability	Definite (5)	Definite (5)
Significance	**Medium (45)**	**Medium (50)**
Status (positive or negative)	Positive	Positive
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Enhancement:

» A procurement policy promoting the use of local business should, where possible, be put in place to be applied throughout the construction phase.
» A database of local companies, specifically Historically Disadvantaged Individuals (HDIs) which qualify as potential service providers (e.g. construction companies, security companies, catering companies, waste collection companies, transportation companies etc.) should be created and companies listed thereon should be invited to bid for project-related work where applicable.

Residual Impacts:

» The project could assist in upgrading the skills of local community members and growth in local business.

Operation Phase Impacts

Nature: *Transformation and the sense of place*

Photovoltaic facilities are highly visible due to their large size, highly reflective surfaces and geometry. Consequently, local communities perceive these facilities as having a negative impact on the landscape and as such limiting their quality of life (Chiabrando, Fabrizio, & Garnero, 2011) as a result of the transforming of the sense of place of the area. The construction and operation of Allepad PV Three and its associated infrastructure, may have a visual impact on the study area, especially within (but not restricted to) a 3km radius of the proposed facility. The visual impact will differ amongst places, depending on the distance from the facility. As the number of visual receptors within the area are low and there is existing similar existing infrastructure within the area, the impact is expected to be limited.

Apart from the visual criteria a sense of place, from a social perspective, also needs to consider a range of other criteria which may include smell, sound, community, heritage and a feeling of safety amongst others, all of which result in feelings and perceptions held amongst people tying them to a particular place or neighbourhood.

	Without mitigation	**With mitigation**
Extent	Regional (4)	Regional (4)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Low to Moderate (5)
Probability	Definite (5)	Definite (5)
Significance	**High (70)**	**High (65)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- Apply the mitigation measures recommended in the Visual Impact Assessment Report.
- Communicate the benefits associated with renewable energy to the broader community.
- Ensure that all affected land owners and tourist associations are regularly consulted.
- A Grievance Mechanism should be put in place and all grievances should be dealt with in a transparent manner.
- The mitigation measures recommended in the Visual and Heritage and Palaeontology Impact Assessments should be followed.

Residual Impacts:

- Once the project has been decommissioned it will take some time and effort to restore the area's original sense of place.

Nature: *Direct and indirect employment opportunities and skills development*

During the operational phase ~40% of the job opportunities will be for low and unskilled workers. Many of the beneficiaries are likely to be historically disadvantaged members of the community and the project will provide opportunities to develop skills amongst these people. Labour costs have been estimated to be tween R10 and R12 million per annum. Apart from this it is estimated that a further 250 indirect jobs will be created through the project. None of the employment opportunities will be permanently stationed onsite.

	Without enhancement	**With enhancement**
Extent	Regional (2)	Regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor to Low (3)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**Medium (45)**	**Medium (50)**
Status (positive or negative)	Positive	Positive
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No

Can impacts be mitigated?	Yes
Enhancement: » Implement a training and skills development programme for locals; » Work closely with the appropriate municipal structures in regard to establishing a social responsibility programme. » The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.	
Residual Impacts: » Job creation and skills development may help in addressing poverty and low living standards in the region.	

Nature: *Socio-economic stimulation*

Socio-economic stimulation will be based on the use of local goods and services will include, but is not limited to, the provision of construction materials and equipment, and workforce essentials such as catering services, trade clothing, safety equipment, ablution, accommodation, transportation and other goods. Projects which form part of the DoE's REIPPP Programme are required as part of their bidding requirements to contribute towards local economic development (LED) and social upliftment initiatives within the area in which they are proposed. In addition, they are required to spend a percentage of their revenue on socio-economic and enterprise development, as well as allocate ownership shares to local communities that benefit previously disadvantaged communities around the project. A portion of the dividends generated by each development also needs to be invested into LED projects and programmes. The proposed development therefore has the potential to contribute positively towards socio-economic development and improvements within the local area.

	Without enhancement	**With enhancement**
Extent	Regional (4)	Regional (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low to Moderate (5)	Moderate (6)
Probability	Definite (5)	Definite (5)
Significance	**High (65)**	**High (70)**
Status (positive or negative)	Positive	Positive
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Enhancement: » Ensure that the procurement policy supports local enterprises. » Establish a social responsibility programme either in line with the REIPPP BID guidelines or equivalent. » Work closely with the appropriate municipal structures with regard to establishing a social responsibility programme. » Ensure that any trusts or funds are strictly managed in respect of outcomes and funds.		
Residual Impacts: » The project could assist in upgrading the skills of local community members and in strengthening the national grid.		

8.6.4 Implications for Project Implementation

The significance of the positive impacts associated with the socio-economic aspects that will be affected by Allepad PV Three ranges from medium to high with the implementation of the enhancement measures recommended. These enhancement measures include:

» A local employment policy should be adopted to maximise opportunities made available to the local labour force.

- Labour should be sourced from the local labour pool, and only if the necessary skills are unavailable, should labour be sourced from (in order of preference) the Dawid Kruiper Local Municipality ZF Mgcawu District Municipality, Northern Cape Province, South Africa, or elsewhere.
- A database of local companies, specifically Historically Disadvantaged Individuals (HDIs) which qualify as potential service providers (e.g. construction companies, security companies, catering companies, waste collection companies, transportation companies etc.) should be created and companies listed thereon should be invited to bid for project-related work where applicable.
- Vocational training programmes should be established to promote the development of skills.
- A Community Needs Assessment (CAN) must be conducted to ensure that the LED and social upliftment programmes proposed by the project are meaningful.

The significance of the negative impacts associated with the social aspects that will be affected by Allepad PV Three ranges from low to medium to high with the implementation of the recommended mitigation measures. The mitigation measures include:

- Develop and implement a local procurement policy which prioritises "locals first" to prevent the movement of people into the area in search of work.
- Engage with local community representatives prior to construction to facilitate the adoption of the locals first procurement policy.
- Appoint a Community Liaison Officer (CLO) to assist with the procurement of local labour.
- Implement a method of communication whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process.
- The appointed EPC Contractor must appoint a security company to ensure appropriate security procedures and measures are implemented.
- All vehicles must be road worthy and drivers must be qualified, obey traffic rules, follow speed limits and be made aware of the potential road safety issues.
- Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.

8.7. Impacts Related to the Storage and Handling of Dangerous Goods

During the construction and operation phase, Allepad PV Three will store materials which may be considered to be a dangerous good.

"Dangerous goods" is defined under the Listing Notices of the EIA Regulations (2014) that deal with the storage, or storage and handling, of dangerous goods. "Dangerous goods" are defined as:

"Goods containing any of the substances as contemplated in South African National Standard No. 10234, supplement 2008 1.00: designated "List of classification and labelling of chemicals in accordance with the Globally Harmonized Systems (GHS)" published by Standards South Africa, and where the presence of such goods, regardless of quantity, in a blend or mixture, causes such blend or mixture to have one or more of the characteristics listed in the Hazard Statements in section 4.2.3, namely physical hazards, health hazards or environmental hazards".

The above definition makes specific reference to SANS 10234. South Africa has implemented the Globally Harmonized System of Classification and Labelling of Chemicals by issuing this national standard. The

dangerous goods likely to be stored or handled on site would mainly include grease, fuels and batteries (housed within fully self-contained specially adapted shipping type containers).

8.7.1. Description of the Impacts associated with the Storage and Handling of Dangerous Goods

The construction and operation of the Allepad PV Three requires the storage of dangerous goods, including fuels for everyday construction, operation and maintenance.

The facilities or infrastructure for storage and handling of a dangerous good will be located in containers with a combined capacity below 30m^3 (cubic metres). These dangerous goods will be stored on-site in appropriate storage vessels within bunded areas/ on impervious surfaces. The storage and handling of dangerous goods has the potential to result in soil and/or water contamination should any spillages/leakages occur. This is considered to be the most significant risk, other than a direct risk to personnel on site, which is an occupational health and safety issue and is considered in line with the Occupational Health and Safety Act. While not all materials to be stored on site are considered to be hazardous (or have a hazard rating), materials such as fuel and oils are flammable and also have the potential to cause fires, explosions, damage to infrastructure, as well as injuries of staff.

The proposed project will require the construction of facilities or infrastructures for the storage of the dangerous goods. The construction phase will require the handling and storage of materials including hydraulic oil, fuel, cement below 30m³.

8.7.2. Impact tables summarising the significance of the storage and handling of dangerous goods (with and without mitigation measures)

Nature of impact: Soil and water contamination due to the handling and storage of dangerous goods during the construction and operation phases.		
	Without mitigation	**With mitigation**
Extent	Local (5)	Local (5)
Duration	Short-term (2)	Short-term (1)
Magnitude	High (8)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (45)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	
Mitigation » Any spillages of dangerous substances must be contained as soon as possible, and remedial and clean-up actions initiated immediately. » Regular inspections of the permanent bunded areas for storage of dangerous goods must be undertaken throughout the life cycle of the project. » Appropriate spill kits must be available on site. » Maintenance vehicles must have access to spill kits. » An emergency spill response plan must be developed for implementation during the construction and the operational phase. Personnel should be suitably trained to attend to any spills that may occur. » A fire management plan must be developed for implementation during the construction and the operational phase Personnel must be suitably trained to manage any fires which may occur on site.		

» Flammable substances must be stored in enclosed containers away from heat, sparks, open flames, or oxidizing materials. » Develop a monitoring and leak detection procedure for monitoring of the chemical spillages.
Residual Impacts If spillages occur and are not cleaned up, contamination can result in impacts which remain after decommissioning of the project

8.8. Assessment of the 'Do Nothing' Alternative

The 'do-nothing' alternative (i.e. no-go alternative) is the option of not constructing Allepad PV Three. 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 agriculture

The potential of the project site for dryland agriculture is very limited as a result of the combination of deep, red, sandy soils and erratic rainfall patterns. The very low rainfall in the area indicates that the only means of cultivation would be by irrigation; however remote sensing imagery of the area shows no signs of any agricultural infrastructure and none of irrigation. Cattle grazing is considered to be a viable long-term land use for the project site. The grazing capacity of the veld in the project site is 40 to 50 ha per large animal unit or large stock unit (LSU) (ARC-ISCW, 2004) and is considered to be very low.

The proposed development of Allepad PV Three would allow the on-going current grazing activities to continue on areas of the project site that will not house PV facility infrastructure. The development footprint of Allepad PV Three is ~6.5% of the total extent of the project site and is located within areas of low agricultural potential. Therefore the current land-use will be retained, while also generating renewable energy from the solar resource available for the area. The impact on agricultural activities as a result of the project is, therefore, expected to be low.

The implementation of the 'do-nothing' alternative would leave the land-use restricted to the current grazing activities, losing out on the opportunity to generate renewable energy from solar energy as additive thereto (i.e. current grazing activities would continue). Therefore, from a land-use perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of a viable and compatible land use for the project site which allows the current land-use activities to continue.

In addition, the landowner would obtain an income from the facility (as the project owner will pay an amount to the landowner in accordance with the lease agreement for the use of the land). This would contribute towards the financial stability of the landowner which could in turn contribute to the financial viability of the farming practices on the project site. The implementation of the 'do nothing' alternative would retain the current land-use, fore-going the opportunity to generate renewable energy from the solar resource and supplementing of the income of the landowner.

The 'do nothing' alternative would result in a lost opportunity for the landowner (in terms of implementing a compatible alternative land use option, while still retaining the current land use, as well as a loss in long-term revenue) and the country (in terms of renewable energy). From this perspective the no-go alternative is not preferred when considering land use and agricultural potential of the project site.

b) Socio-economic impact

Social: The impacts of pursuing the no-go alternative are both positive and negative as follows:

- The benefits would be that there is no disruption from an influx of additional jobseekers into the Upington area, nuisance impacts (noise and dust during construction), visual impacts and safety and security impacts. The impact is therefore neutral.
- Negative impacts would be associated with an opportunity lost in terms of job creation, skills development and associated economic business opportunities for the local economy, as well as a loss of the opportunity to generate energy from a renewable resource without creating detrimental effects on the environment.

Foregoing the proposed development would not necessarily compromise the development of renewable energy facilities in South Africa. However, the socio-economic benefits for local communities at this location and within the surrounding area would be forfeited.

Therefore, from a socio-economic perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of socio-economic benefits, when considering the current socio-economic conditions of the area.

New Business: Some of the positive spin off effects that are to ensue from the project expenditure will be localised in the communities located near the site, such as the town of Upington. The local services sector and specifically the trade, transportation, catering and accommodation, renting services, personal services and business services are expected to benefit the most from the project activities during the construction phase. New business sales that will be stimulated as a result of the establishment of the PV facility, albeit for a temporary period, will be lost with the implementation of the 'do nothing' alternative. Therefore from a business perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of new business opportunities.

Employment: Approximately 300 full time equivalent jobs will be created during the construction phase. Of those employment opportunities likely to be generated, approximately 60% (i.e. 180) will accrue to low skilled workers, 25% (i.e. 75) to semi-skilled workers, and 15% (i.e. 45) to skilled workers. The development of Allepad PV Three within the Dawid Kruiper Local Municipality will aid in a reduction of the unemployment rate, however if the facility is not developed then the unemployment rate will not be positively influenced by the proposed development. The upliftment and socio-economic benefits for individuals within local communities would be forfeited with the implementation of the 'do nothing' alternative. Therefore, from an employment perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of employment opportunities.

Skills development: The establishment of Allepad PV Three will offer numerous opportunities for skills transfer and development. This is relevant for both on-site activities and manufacturing activities. Various PV facilities are proposed to be developed in the area and in the Northern Cape Province, which means that the transfer of skills from foreign experts to the local engineers and construction workers will take place, similar to what has taken place where PV facilities have been constructed and operated within the Province and the rest of the country. The skills training and transfer benefits for individuals within local communities would be forfeited with the implementation of the 'do nothing' alternative.

Municipal goals: The implementation of Allepad PV Three would contribute towards addressing the Dawid Kruiper Local Municipality's key issue regarding high levels of poverty and unemployment, skills shortage, and inequalities, through the creation of employment opportunities, the provision of skills training opportunities, and local economic growth, including growth in personal income levels of those community members who would be employed on the project.

The no-go alternative will therefore result in the above economic benefits not being realised and a subsequent loss of income and opportunities to local people. From this perspective the no-go alternative is not preferred.

c) Regional scale impact

At a broader scale, the benefits of additional capacity to the electricity grid and those associated with the introduction of renewable energy would not be realised. The Northern Cape has an ample solar resource. Although Allepad PV Three is only proposed to contribute a contracted capacity of up to100MW to the grid capacity, this would assist in meeting the electricity demand throughout the country and would also assist in meeting the government's goal for renewable energy and the energy mix. The generation of electricity from renewable energy resources offers a range of potential socio-economic and environmental benefits for South Africa. These benefits include:

» Increased energy security;
» Resource saving (i.e. fossil fuels and water);
» Exploitation of South Africa's significant renewable energy resource;
» Pollution reduction;
» Climate friendly development;
» Support for international agreements;
» Employment creation;
» Acceptability to society; and
» Support to a new industry sector.

At present, South Africa is some way off from fully exploiting the diverse gains from renewable energy and from achieving a considerable market share in the renewable energy industry. South Africa's electricity supply remains heavily dominated by coal-based power generation.

The current promulgated Integrated Resource Plan (IRP) 2010 includes 17.8GW of renewables, 9.6GW of nuclear, 6.25GW of coal, and approximately 8.9GW of other generation sources such as hydro, and gas. Based on the Draft IRP 2018 there is currently 1 474MW of installed PV capacity, while an additional 814MW has been committed between 2020 and 2022, and an additional 5 670MW capacity has been allocated between 2025 and 2030. This plan is however yet to be finalised and promulgated but it is unlikely that the contribution of renewable energy to the electricity generation mix will be reduced in the final plan. The IRP essentially drives the assortment of energy to be implemented for South Africa which is known as the energy mix of the country, considering various generation technologies.

d) Conclusion

The 'do-nothing' alternative will do little to influence the renewable energy targets set by government due to competition in the sector, and the number of renewable energy projects being bid to the Department of

Energy. However, as the project site experiences ample solar resource and optimal grid connection opportunities are available, not developing Allepad PV Three 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 (~6.5% of the larger project site) is not considered significant. In addition, the Northern Cape Province will not directly benefit from additional generated power being evacuated into the National grid. 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 Allepad PV Three. 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 for the development of Allepad PV Three.

CHAPTER 9 ASSESSMENT OF POTENTIAL CUMULATIVE IMPACTS

As identified and assessed in Chapter 8, a PV facility may have effects (positive and negative) on natural resources, the social environment and on the people living in a project area. The preceding impact assessment chapter has reported on the assessment of the impacts associated with Allepad PV Three largely in isolation (from other similar developments).

The DoE, 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 7 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, as well as socio-economic development contributions by the project and the 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 and 45 PV facilities currently operational (Energyblog, 2018[21]). It is, therefore, important to follow a precautionary approach in accordance with NEMA to ensure that the potential for cumulative impacts[22] 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.

9.1. Approach taken to Assess Cumulative Impacts

The cumulative impacts that have the potential to be compounded through the development of the 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 Allepad PV Three within the project site being considered for the development:

- 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 hydrological features through disturbance associated with construction activities and increased runoff and erosion during the operation phase;

[21] https://www.energy.org.za/data-and-tools

[22] 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 risk to avifauna through habitat loss, displacement, collision and interaction with power infrastructure;
- Unacceptable loss of high agricultural potential areas presenting a risk to food security 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; and
- 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 20km has been selected for this cumulative impact evaluation.

Figure 9.1 indicates the location of Allepad PV Three in relation to all other known and viable (i.e. projects with a valid Environmental Authorisation) PV facilities located within a radius of 20km from the project site. These projects were identified using the Department of Environmental Affairs Renewable Energy Database and current knowledge of projects being proposed in the area. In the case of Allepad PV Three, there are seventeen (17) solar energy facilities (PV and CSP) located within a 20km radius of the project site (refer to **Figure 9.1** and **Table 9.1**), all at various stages of approval. At the time of writing this EIA Report two facilities are operational, three facilities are under construction, nine facilities had been authorised, and three facilities are still in process of obtaining Environmental Authorisation[23]. The potential for cumulative impacts is summarised in the sections which follow and has been considered within the specialist studies (refer to **Appendices D – H**).

Table 9.1: Solar energy facilities located within the broader area (within a 20km radius) of the Allepad PV Three project site

Project Name	DEA Reference Number(s)	Location	Approximate distance from Allepad PV Three	Project Status
Allepad PV One (1 x 100MW PV)	14/12/1/3/3/2/1105	Remaining Extent of Erf 5315 Upington	Within the project site	EIA in process
Allepad PV Two (1 x 100MW PV)	14/12/1/3/3/2/1106	Remaining Extent of Erf 5315 Upington	Within the project site	EIA in process
Allepad PV Four (1 x 100MW PV)	14/12/1/3/3/2/1108	Remaining Extent of Erf 5315 Upington	Within the project site	EIA in process

[23] Applications for Environmental authorisation for numerous PV facilities have been undertaken within the area, however some of these applications have lapsed and are no longer considered to be valid and are therefore not considered as part of the cumulative impact assessment.

Project Name	DEA Reference Number(s)	Location	Approximate distance from Allepad PV Three	Project Status
Upington Solar Park (1 x 1 000MW CSP and PV)	12/12/20/2146	Farm Klip Kraal No. 451	Immediately adjacent (south-west)	Approved
Sirius One Solar PV Project (1 x 75MW PV)	14/12/16/3/3/2/469	Remaining Extent of the Farm Tungsten Lodge No. 638	~14km south	Preferred Bidder project under construction
Sirius Two Solar PV Project (1 x 75MW PV)	14/12/16/3/3/2/470	Remaining Extent of the Farm Tungsten Lodge No. 638	~14km south	Approved
Rooipunt (1 x 150MW CSP)	14/12/16/3/3/1/427	Farm McTaggarts Camp No. 435	~8.5km south-west	Approved
S-Kol PV Plant (1 x 100MW PV)	12/12/20/2230	Farm Geelkop No. 456	~18km south-south-west	Approved
Bloemsmond Solar 1 and 2 (1 x 75MW PV)	14/12/16/3/3/2/815	Portions 5 and 14 of the Farm Bloems Mond No. 455.	~17km south-south-west	Approved
Bloemsmond Solar 2 (1 x 75MW)	14/12/16/3/3/2/816	Portions 5 and 14 of the Farm Bloems Mond No. 455.	~17km south-south-west	Approved
Solis Power I Project (1 x 150MW CSP)	14/12/20/16/3/3/3/82	Portion 443 to 450 of the Farm Van Rooys Vlei	Immediately adjacent (west)	Approved
Solis Power II Project (1 x 125MW CSP)	14/12/16/3/3/2/621	Portion 443 to 450 of the Farm Van Rooys Vlei	Immediately adjacent (west)	Approved
Dyason's Klip 1 and 2 (2 x 75MW)	14/12/16/3/3/2/538/1 14/12/16/3/3/2/538/2	Portion 12 of the Farm Dyasonklip No. 454	~12.5km south-south-west	Preferred Bidder projects under construction
Kai Garib (1 x 125MW CSP)	14/12/16/3/3/2/656	Portion 03 of the Farm McTaggarts Camp No. 435	~11.5km south-south-west	Approved
Khi Solar One (1 x 50MW CSP)	12/12/20/1831	Portion 03 of the Farm McTaggarts Camp No. 435	~11.5km south-south-west	Operational
Upington Airport Solar PV (1 x 8.9MW PV)	12/12/20/2146	Erf 6013 Upington	~8.5km east	Operational

In addition to the above projects, the site is located adjacent to a designated Renewable Energy Development Zone (REDZ 7 – Upington). This area is designated for solar development. Therefore, it is reasonable to assume that additional projects will be developed in this area in the future.

It should be noted that not all the PV facilities presently under consideration by various solar energy developers will be built for operation. Not all proposed developments will be granted the relevant permits by the relevant authorities (DEA, DOE, 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 PV 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 Allepad PV Three are therefore qualitatively assessed in this Chapter. This assessment is based on information which is currently available. The following potential impacts are considered:

- Cumulative Impacts on Ecological Processes
- Cumulative Impacts on Avifauna
- Cumulative Impacts on Heritage Resources
- Cumulative Visual Impacts
- Cumulative Socio-economic Impacts

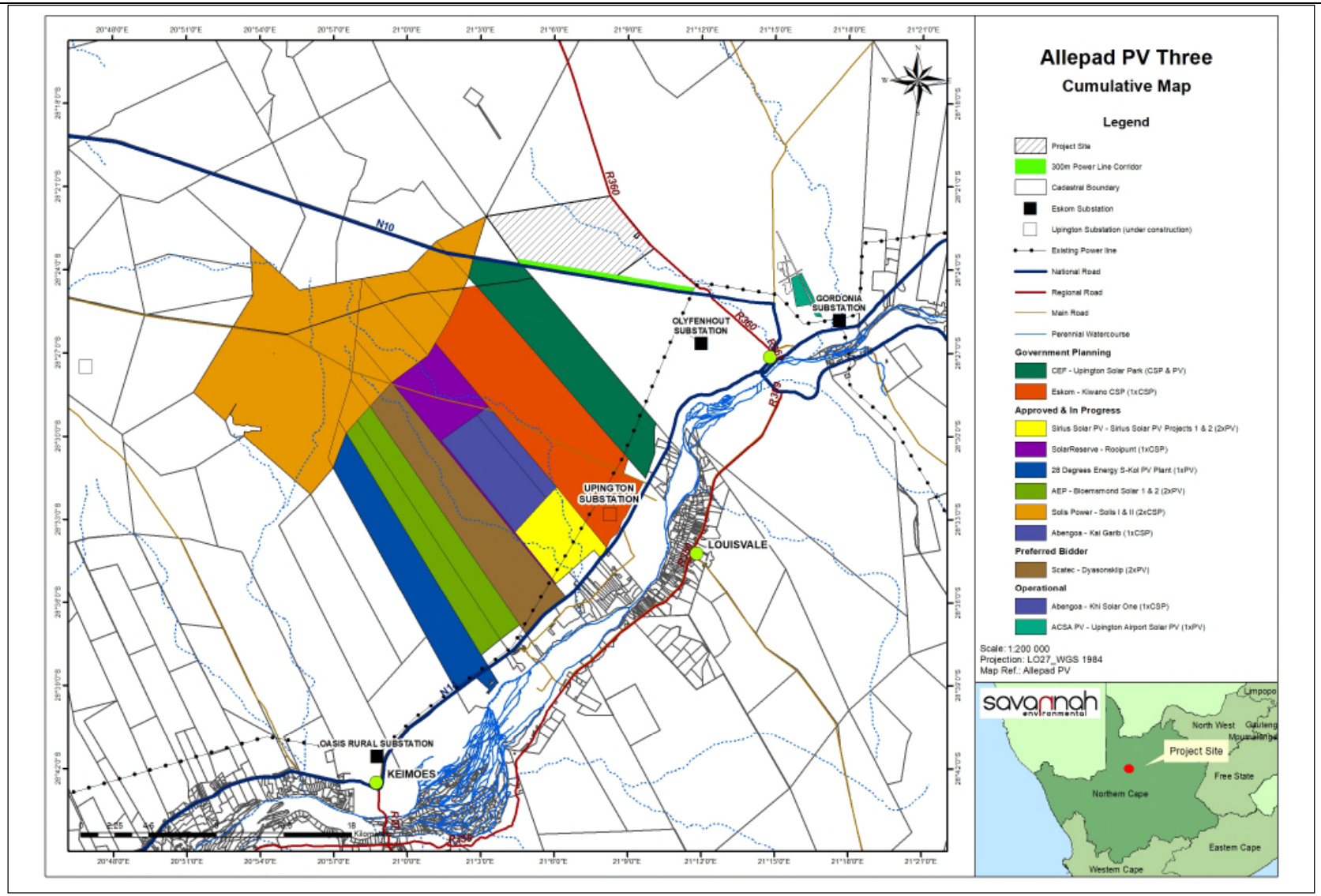

Figure 9.1: Identified solar energy projects located within a 20km radius of the Allepad PV Three project site that are considered as part of the cumulative impact assessment for the Allepad PV Three project.

9.2. Cumulative Impacts on Ecological Processes

Cumulative impacts associated with Allepad PV Three and the proposed associated infrastructure have been identified by the ecological specialist (refer to **Appendix D**). Cumulative impacts in the area are a potential concern due to the proliferation of proposed solar energy development in the wider Upington area. In terms of habitat loss, the affected vegetation and habitat types are widespread in the area and have not experienced significant levels of transformation to date. As a result, the loss of approximately 250ha of currently intact habitat within the low and moderate sensitivity areas of the site are likely to result from the development and is not considered highly significant. Cumulative impacts associated with the development are therefore considered acceptable.

The loss of unprotected vegetation types on a cumulative basis from the broad area may impact the country's ability to meet its conservation targets. Although the receiving vegetation types in the study area are classified as Least Threatened and are still more than 99% intact, Kalahari Karroid Shrubland is a relatively restricted vegetation type for an arid area and is therefore vulnerable to cumulative impact.

The ecological cumulative impact associated with Allepad PV Three and other solar energy projects in the area will be of a medium significance

Nature: *Reduced ability to meet conservation obligations & targets due to cumulative habitat loss*
The development of Allepad PV Three will potentially contribute to cumulative habitat loss and other cumulative impacts in the wider Upington 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 (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Probable (3)
Significance	**Low (18)**	**Medium (30)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	To some degree, but the majority of the impact results from the presence of the facility which cannot be mitigated.	

Mitigation:

- Ensure that sensitive habitats such as drainage features, pans and quartz patches are not within the development footprint.
- Ensure that the fencing around each facility is designed to have a low impact on fauna and avifauna. This includes not having any electrified strands within 30cm of the ground as well as implementing a design that prevents fauna and avifauna from becoming trapped between the inner and out layer of the fence as this has been demonstrated to be a common impact associated with existing PV plants.
- Ensure that an alien management plan and erosion management plan compiled for each project are effectively implemented at the site.

Nature*: Negative impact on broad-scale ecological processes*
Development of the PV plant may impact on broad-scale ecological processes such as the ability of fauna to disperse.

	Without mitigation	With mitigation
Extent	Local (1)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor to Low (3)	Low (4)
Probability	Improbable (2)	Probable (3)
Significance	**Low (16)**	**Medium (30)**
Status (positive or negative)	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 known faunal movement corridors such as drainage lines and ridge systems are not developed.
» 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 bushveld.

Residual Impacts:

The presence of the facility will represent an obstacle for some fauna which would contribute to fragmentation in the area.

Nature: *Impacts on fauna and flora from power line and other development sources in the wider Upington area*

The development of the Allepad PV Three Grid Connection will potentially contribute to cumulative habitat loss and other cumulative impacts in the wider Upington area.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Minor to Low (3)
Probability	Improbable (2)	Probable (3)
Significance	**Low (14)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	To some degree, but the majority of the impact results from the presence of the facility which cannot be mitigated.	

Mitigation:

» Ensure that the mitigation hierarchy is followed with a particular emphasis on reducing the development footprint, rehabilitating disturbed areas and reversing degradation where it occurs.
» Ensure that an alien management plan and erosion management plan is compiled for the project and is effectively implemented at the site.

Residual Impacts:

The loss of currently intact vegetation is an unavoidable consequence of the development and cannot be entirely mitigated. The residual impact would however be low.

9.3. Cumulative Impacts on Avifauna

Cumulative impacts from an avifauna perspective include exacerbated displacement and loss of habitat. Allepad PV Three would potentially contribute approximately 250ha of additional habitat loss and

fragmentation in the area. The significance of this impact is likely to be of a local nature only. The cumulative impact is assessed in context of the extent of the current project site, other developments in the area as well as general habitat loss and transformation resulting from agriculture and other activities in the area. In terms of potential losses to landscape connectivity, the site is not considered to lie within an area that is a likely avifaunal movement corridor or along an important avifaunal habitat gradient.

Increased probability of bird collisions and electrocutions with new power lines may contribute to the cumulative impacts of the proposed development. However, considering that the proposed power line corridor follows an existing telephone line and small power line (132kV), on opposite sides of the N10 national road, the potential impacts are not considered significantly accumulative (refer to assessment of grid connection impacts).

The cumulative avifauna impacts, considering the development of Allepad PV Three and the PV facilities within the surrounding area will be of a medium significance.

Nature: *Cumulative habitat loss and fragmentation* Impact on avifaunal habitats, migration routes and nesting areas due to cumulative loss and fragmentation of habitat, as well collisions and electrocutions along the grid connection.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low to Moderate (5)
Probability	Improbable (2)	Probable (3)
Significance	**Low (18)**	**Medium (33)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	To some degree, but the majority of the long-term impact results from the presence of the facility and other developments in the area which cannot be well mitigated.	

Mitigation:

» Minimise the development footprint as far as possible. A cover of indigenous grasses should be encouraged and maintained within the facility. This prevents the invasion of weeds and is the easiest to manage in the long-term. Furthermore, the grasses can be maintained low through livestock (sheep) grazing which is being successfully used at existing PV facilities. This will assist in maintaining natural vegetative cover which may support avifaunal population, as opposed to complete clearing of all vegetation.

» The facilities should be fenced off in a manner which allows small fauna to pass through, but that does not result in ground-dwelling avifauna (e.g. bustards, korhaan, thick-knees, coursers) being trapped and electrocuted along the boundary fences (Venter, 2016). In practical terms this means that the facility should be fenced-off to include only the developed areas and should include as little undeveloped ground or natural veld as possible. In addition, there should not be electrified ground-strands present within 30cm of the ground and the electrified strands should be located on the inside of the fence and not the outside. Furthermore, the fence should be a single layer fence and not a double fence with a large gap between. Images of suitable fencing types from existing PV facilities are available on request.

9.4. Cumulative Impacts on Heritage (including archaeology and palaeontology)

From twenty-nine (29) heritage assessments undertaken within 20km of the proposed project site, eight (8) are for solar PV facilities and three (3) are for electrical infrastructure. The remaining heritage assessments relate to mining infrastructure and residential township developments. There is the potential for the cumulative impact of Allepad PV Three to negatively impact the cultural landscape of the area due to a change in the landscape character from natural wilderness to semi-industrial. However, due to the remoteness of the area as well as the existing similar developments in the area, the impact on the experience of the cultural landscape is not foreseen to be significant. It is unlikely that the proposed Allepad PV Three project will result in unacceptable risk, unacceptable loss, whole-scale changes to the sense of place or unacceptable increase in impact.

The heritage cumulative impacts associated with Allepad PV Three will be of a low significance.

Nature: *Cumulative heritage impacts* Cumulative impact to the sense of place due to the development of the PV facility which will intensify industrial development within the area.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low (1)	Low (1)
Duration	Medium-term (3)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Probable (3)
Significance	**Low (16)**	**Low (27)**
Status (positive or negative)	Neutral	Neutral
Reversibility	High	Low
Irreplaceable loss of resources?	Unlikely	Unlikely
Can impacts be mitigated?	N/A	
Mitigation: No mitigation required.		

9.5. Cumulative Visual Impacts

A visibility analysis of the PV facilities (i.e. Allepad PV One, Allepad PV Two, Allepad PV Three and Allepad PV Four) was undertaken individually from each of the proposed sites from a representative number of vantage points per development footprint at 4m above ground level (assuming height of the PV panels). The results of these analyses were merged in order to calculate the combined visual exposure. Red areas indicate higher levels of cumulative exposure (where all four facilities may potentially be visible) whilst green areas represent areas where only one facility may be visible. (**Figure 9.2**). There is a good correlation between the visual exposure of the four facilities due to their close proximity to each other and the generally flat topography within the region. The combined visual exposure of these four facilities is generally contained or restricted to the same areas.

The more exposed areas are generally located on terrain that is slightly more elevated than its surrounds, or closer to the theoretical centre point of the PV facility footprints. Cumulative visual exposure from the formerly mentioned elevated areas occurs at varying distances from the sites, with some sites appearing in the foreground, whilst others further away in the distance. It is also possible that solar panel structures from

a PV facility closer to the observer may obstruct views of PV facility structures located further away, thereby negating the potential cumulative visual impact.

This statement should however not distract from the fact that there will potentially be a large number of solar energy generation structures and ancillary infrastructure (e.g. overhead power lines) within this area that currently has very little built structures besides the existing Khi Solar One Solar Energy Facility and the railway line south of the N10 national road

It is preferable to concentrate future solar energy infrastructure within this solar hub, considering the fact that there are already approved PV facilities and they are all in relative close proximity to the four Allepad PV Facilities. This will largely help to prevent the scattered proliferation of PV facility structures throughout the greater region.

The anticipated cumulative visual impact is expected to be of moderate significance, which is considered to be acceptable from a visual perspective. This is due to the relatively low viewer incidence within close proximity to the proposed development sites.

Nature: *Potential cumulative visual impact on the visual quality of the landscape* The potential cumulative visual impact of the PV facilities on the visual quality of the landscape.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	High (8)
Probability	Improbable (2)	Probable (3)
Significance	**Low (26)**	**Moderate (45)**
Status (positive 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.	
Mitigation: Planning: » Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude. 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 Impact: The visual impact will be removed after decommissioning, provided the solar energy facilities' infrastructure are removed. Failing this, the visual impact will remain.		

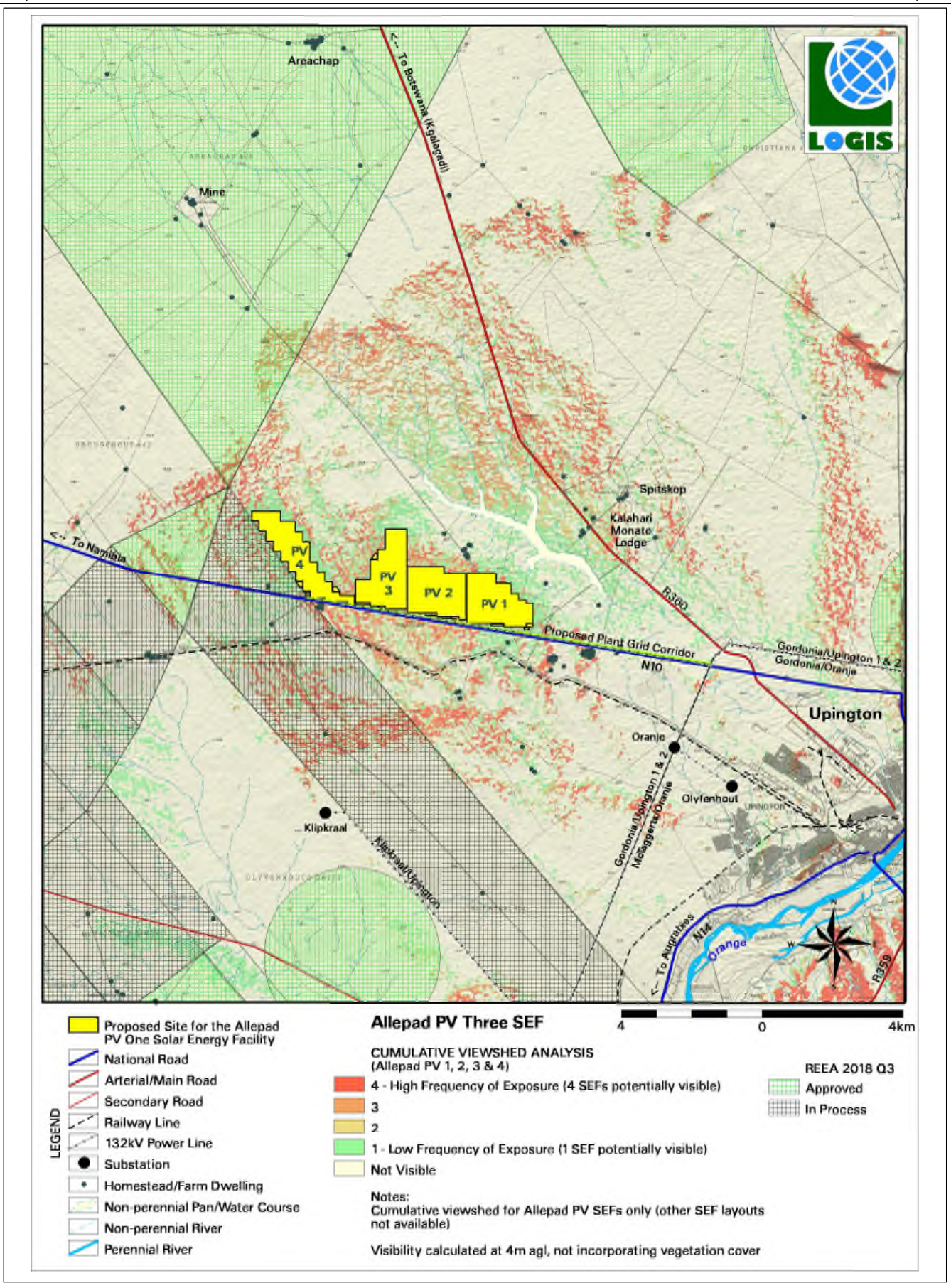

Figure 9.2: Cumulative viewshed analysis for Allepad PV Three, considering the four Allepad PV projects proposed within the project site.

9.6. Cumulative Social Impacts

The potential for social cumulative impacts to occur is likely. Potential cumulative social impacts identified for Allepad PV Three include positive impacts on the economy, business development, and employment, as well as negative impacts such as the increased risk of HIV infections, change in the area's sense of place, increased pressure on public services, supplies and infrastructure.

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

In addition, the fact that the project is proposed within an area characterised by good levels of solar irradiation suitable for the development of commercial solar energy facilities implies that the surrounding area is likely to be subject to considerable future applications for PV facilities. Levels of unemployment, and the low level of earning potential may attract individuals to the area in search of better employment opportunities and higher standards of living.

While the development of a single PV facility may not result in a major influx of people into an area, the development of several projects at one time may have a cumulative impact on the in-migration and movement of people. The influx of construction workers is likely to place pressure on accommodation and the need for both service delivery and supplies.

It is well documented on both an international and local basis that the construction industry carries a high level of HIV which can be spread amongst the local communities, particularly through the spread of prostitution that follows the availability of disposable income (Meintjes, Bowen, & Root, 2007; Bowen, Dorrington, Distiller, Lake, & Besesar, 2008; Wasie, et al., 2015; Bowen P. , Govender, Edwards, & Cattell, 2016; Kikwasi & Lukwale, 2017; Bowen P. , Govender, Edwards, & Lake, 2018). It is also well documented on both an international and local level that HIV is also spread by truck drivers (Singh & Malaviya, 1994; Ramjee & Gouws, 2002; Strauss, et al., 2018). It is likely that there will be an increase in truck drivers in the area as equipment and material is delivered to the various construction sites.

It is very difficult to control an influx of people into an area, especially in a country where unemployment rates are high. It is therefore important that the project proponent implement and maintain strict adherence with a local employment policy in order to reduce the potential of such an impact occurring, as well as to be able to communicate the process for employment so that people know how and where to apply.

Nature: *Increased risks of HIV*
With an HIV prevalence rate of 17.5 percent, the Northern Cape Province is the province with the lowest HIV prevalence rates as assessed in 2013 compared to all other provinces across the country. With the influx of labour, particularly following the construction of the various renewable energy projects within the region, the risk of HIV infections in the area is likely to rise significantly. With the area being extremely poor and the associated disposable income that will follow the construction workers and truck drivers to the area will heighten the risk of the spread of HIV infections across what is a relatively isolated region.

	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Regional (4)	Regional (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate to High (7)	High (8)
Probability	Highly probable(4)	Highly probable(4)
Significance	**High (60)**	**High (64)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:

Mitigation can only be implemented at a regional level and will need to be driven on a provincial and municipal basis. In this sense the following mitigation measures would need to be considered:

» Ensure that all companies coming into the area have and are implementing an effective HIV/AIDS policy.
» Introduce HIV/AIDS awareness programmes to schools and youth institutions.
» Carefully monitor and report on the HIV status of citizens in the region.
» Be proactive in dealing with any increase in the HIV prevalence rate in the area.

Residual Impact:

An increase in the HIV prevalence rate that will last well beyond the construction period and will have dire consequences for local communities.

Nature: *Cumulative impact on the area's sense of place*

Renewable Energy Development Zones (REDZ) have been identified as having a high potential for the development of renewable energy projects while also having the lowest negative impact on the environment. These zones are spread across the country and have resulted in several projects being clustered together. It is likely that due to the development density and the high visibility of PV facilities clustered together, there will be a change in the sense of place of the area.

	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Regional (4)	Regional (4)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low to Moderate (5)	High (8)
Probability	Definite (5)	Definite (5)
Significance	**High (65)**	**High (80)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	Yes
Can impacts be mitigated?	Yes	

Mitigation:

Mitigation can only be implemented at a regional level and will need to be driven on a provincial and municipal basis. In this sense the following mitigation measures would need to be considered:

» Consider undertaking a cumulative impact assessment to evaluate the changes taking place across the area on a broader scale.
» Form a regional work group tasked with addressing the effect of changes to the sense of place of the region.
» Engage with tourism businesses and authorities in the region to identify any areas of cooperation that may exist.
» Establish grievance mechanisms to deal with complaints associated with changes to the area.

- » Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprints of the facilities.
- » Maintain the general appearance of the facility as a whole.

Nature: *Cumulative impact associated with the disruption of public services, supplies and infrastructure*

With the proliferation of renewable energy facilities in the area, it is likely that the local municipality will find it difficult to keep up with service delivery. The influx of construction workers is likely to place pressure on accommodation and the need for both service delivery and supplies. On this basis, market demands could inflate costs that may have a negative effect on local communities, particularly the poor, who may be forced to pay higher prices for essential supplies resulting in an escalation of the cost of living in the area. Social services such as medical and educational facilities could also be placed under pressure due to increased demand. Although this may reach its peak during the construction phases, it should be mitigated to some extent by the fact that the construction of the various project will be spread across different timelines, with some project commencing while other reach completion. Where numerous projects are entering into construction phase simultaneously, the project companies should engage to align efforts. Employing local people across the various projects and project phases may also assist in reducing the stress placed on services, supplies and infrastructure in the area.

During the operational phases it is likely that these demands will continue as operational staff take up more long-term residency in the area and are supported by service and maintenance personnel who may spend some time on site on a contractual basis. An influx of temporary maintenance and service workers is likely to last over the operational phase of the projects but is likely to settle within the medium term as the economy adjusts and the municipal authorities are able to respond to this growth.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Regional (2)	Regional (4)
Duration	Short-term (1)	Long-term (4)
Magnitude	Minor to Low (3)	Moderate to High (7)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Low (24)**	**High (60)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

Mitigation can only be implemented at a regional level and will need to be driven on a provincial and municipal basis. In this sense the following mitigation measures would need to be considered:

- » Engage with the local municipality to ensure that they are aware of the expansion planned for the area and the possible consequences of this expansion.
- » Ensure that local labour is recruited in respect of these developments in the area.

Nature: *Cumulative impact associated with economic development within the area*

The proliferation of renewable energy facilities within the region is likely to result in significant and positive cumulative impacts in the area in terms of both direct and indirect job creation, skills development, training opportunities, and the creation of business opportunities for local businesses.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Regional (4)	Regional (5)

Duration	Long-term (4)	Long-term (4)
Magnitude	Low to Moderate (5)	Moderate to High (7)
Probability	Definite (5)	Definite (5)
Significance	**High (65)**	**High (80)**
Status (positive or negative)	Positive	Positive
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Enhancement:

Mitigation can only be implemented at a regional level and will need to be driven on a provincial and municipal basis. In this sense the following mitigation measures would need to be considered:

» Implement a training and skills development programme for locals.
» Ensure that the procurement policy supports local enterprises.
» Establish a social responsibility programme in line with the REIPPP Programme and work closely with the appropriate municipal structures in regard to establishing a social responsibility programme.
» Ensure that any trusts or funds are strictly managed in respect of outcomes and funds allocated.

9.7. Conclusion regarding Cumulative Impacts

Cumulative impacts are expected to occur with the development of Allepad PV Three throughout all phases of the project life cycle and within all areas of study considered as part of this EIA Report. The main aim for the assessment of cumulative impacts considering Allepad PV Three 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 assessment of the cumulative impacts was undertaken through the consideration of the Allepad PV Three impacts in isolation and compared to the cumulative impacts of Allepad PV Three and other PV facilities within a 20km radius from the proposed project site.

The significance of the cumulative impacts associated with the development of Allepad PV Three ranges from low to high, depending on the impacts being considered. A summary of the cumulative impacts are included in **Table 9.2** below.

Table 9.2: Summary of the cumulative impact significance for Allepad PV Three within the project site

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
Ecology	Low	Medium to Low (depending on the impact being considered)
Avifauna	Low	Medium
Heritage (archaeology and palaeontology)	Low	Low
Visual	Medium	Medium
Socio-Economic	Negative - Low to High (depending on the impact being considered) Positive - High	Positive and Negative - High

The following can be concluded regarding the cumulative impacts of Allepad PV Three:

- **Ecological processes:** Cumulative impacts associated with Allepad PV Three on ecological processes includes a reduced ability to meet conservation obligations and targets, impacts on Broad-Scale Ecological Processes due to the clearing of vegetation and impacts to fauna and flora due to the power line. The cumulative impact will be of a medium to low significance depending on the impact being considered. No impacts of a high significance were identified. There will be no unacceptable loss of threatened or protected vegetation types, habitats or species due to the development of the Allepad PV Three and other PV facilities within the surrounding area.
- **Avifauna:** Cumulative impacts associated with Allepad PV Three from an avifauna perspective includes habitat loss and transformation resulting from agriculture and other activities in the area. The significance of the cumulative impact associated with the development of Allepad PV Three and other PV facilities within the surrounding areas is considered to be of medium significance. The cumulative impacts can be mitigated to some extent and are not considered to pose an unacceptable risk or impact to the development of Allepad PV Three.
- **Heritage (including archaeology and palaeontology):** One cumulative impact on heritage has been identified and assessed which relates to the sense of place which will be impacted due to the intensification of industrial development within the area. The significance of the cumulative impact will be low due to a lack of significant heritage resources. There will be no unacceptable loss of heritage resources associated with the development of Allepad PV Three and other PV facilities within the surrounding areas.
- **Visual:** One visual cumulative impact has been identified and assessed which relates to a visual impact on the quality of the landscape. Due to the relatively low viewer incidence and the presence of the existing electricity infrastructure in the region, the significance of the impact is moderate. There will be no unacceptable impact on the visual quality of the landscape associated with the development of Allepad PV Three and other PV facilities within the surrounding area.
- **Socio-economic:** Several positive and negative social cumulative impacts have been identified and assessed for Allepad PV Three. The positive impact relates to employment opportunities, business opportunities and skills development. Positive impacts will be enhanced with the development of numerous developments in the area. The significance of the impacts will be high with the development of Allepad PV Three and other PV facilities within the surrounding area. The negative impact relates to a large-scale in-migration of people, an increased risk of HIV, pressure on service delivery, supplies and infrastructure, as well as the impact to the sense of place. The significance of the impacts will be high with the development of Allepad PV Three and other PV facilities within the surrounding area. There will be no unacceptable risk or impacts to the social aspects and characteristics of the town of Upington with the development of Allepad PV Three and other PV facilities within the surrounding area.

Based on the specialist cumulative assessment and findings, the development of Allepad PV Three and its contribution to the overall impact of all PV facilities to be developed within a 20km radius, it can be concluded that Allepad PV Three cumulative impacts will be of a low to moderate to high significance. There are however no impacts or risks identified to be considered as unacceptable with the development of Allepad PV Three and other PV facilities within the surrounding area. In addition, no impacts which will result in whole-scale change is expected.

CHAPTER 10 CONCLUSIONS AND RECOMMENDATIONS

ILEnergy Development (Pty) Ltd proposes the development of Allepad PV Three on a site near Upington in the Northern Cape Province. Allepad PV Three comprises a commercial solar energy generation facility and associated infrastructure and is intended to form part of the Department of Energy's (DoE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme. Allepad PV Three will be designed to have a contracted capacity of up to 100MW, and will make use of photovoltaic (PV) solar technology.

The Remaining Extent of Erf 5315 Upington was identified and assessed as the project site for the development of Allepad PV Three. The project will comprise the following key infrastructure and components:

- Arrays of PV panels with a generation capacity of up to 100MW.
- Mounting structures to support the PV panels (utilising either fixed-tilt / static, single-axis tracking, or double-axis tracking systems).
- Combiner boxes, on-site inverters (to convert the power from Direct Current (DC) to Alternating Current (AC)), and distribution power transformers.
- A 132kV on-site substation up to 1ha in extent to facilitate the connection between the solar energy facility and the Eskom electricity grid.
- A new 132kV double-circuit power line (which will make use of a loop-in and loop-out configuration utilising a double-circuit monopole construction), approximately 9.3km in length. The power line will connect the on-site substation to the upgraded 132kV double-circuit power line running between the new Upington Main Transmission Substation (MTS) (currently under construction approximately 15km south of the project site), and the Gordonia Distribution Substation (located in Upington town). The point of connection is located approximately 5km east of the project site.
- Cabling between the project's components (to be laid underground where practical).
- Meteorological measurement station.
- An energy storage area up to 2ha in extent.
- Access road and internal access road network.
- On-site buildings and structures, including a control building and office, ablutions and guard house.
- Perimeter security fencing, access gates and lighting.
- Temporary construction camp up to 1ha in extent, including temporary site offices, parking and chemical ablution facilities.
- Temporary laydown area up to 1ha in extent, for the storage of materials during the construction and for a concrete batching plant.

ILEnergy Development (Pty) Ltd has confirmed that the project site is suitable for a solar PV energy development from a technical perspective due to the available solar resources, access to the electricity grid, current land use, land availability and site-specific characteristics including accessibility. The aim of the EIA process was to confirm the feasibility of the site from an environmental perspective. A summary of the recommendations and conclusions for the proposed project as determined through the EIA process is provided in this Chapter.

10.1 Evaluation of Allepad PV Three

The preceding chapters of this report together with the specialist studies contained within **Appendices D-H** provide a detailed assessment of the potential impacts that may result from the development of Allepad PV Three. This chapter concludes the environmental assessment of the PV facility and associated infrastructure by providing a summary of the results and conclusions of the assessment of the project site and 300m power line corridor proposed for Allepad PV Three. In so doing, it draws on the information gathered as part of the EIA 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 highly sensitive features within the project site by the development footprint and the undertaking of monitoring, as specified by the specialists.

The potential environmental impacts associated with Allepad PV Three identified and assessed through the EIA process include:

» Impacts on ecology, flora and fauna.
» Impacts on avifauna.
» Impacts on heritage resources, including archaeology and palaeontology.
» Visual impacts on the area imposed by the components of the facility.
» Socio- economic impacts.

10.1.1 Impacts on Ecology

The Ecological Impact Assessment assessed the impact of Allepad PV Three on the sensitive ecological features present within the project site for the life-cycle of the project. The assessment identified impacts within the construction and operation phases of the project.

During the construction phase, the impacts expected to occur include impacts on vegetation and listed protected plant species and faunal impacts. The significance of the construction phase impacts ranges from medium to low, following the implementation of the recommended mitigation measures by the specialist. No impacts of a high significance were identified prior to the implementation of mitigation.

During the operation phase, the anticipated impacts include faunal impacts, negative impacts on broad-scale ecological processes, an increased erosion risk and potential for increased alien plant invasion. The significance of the impacts for the operation phase are low, following the implementation of the recommended mitigation measures by the specialist. No impacts of a high significance were identified for the project.

From the findings of the Ecological Impact Assessment (**Appendix D**) it can be concluded that no impacts of high ecological significance were identified which would hinder the development of Allepad PV Three and its associated infrastructure within the proposed development area. The proposed development is considered to be appropriate and acceptable from an ecological perspective at the proposed location, and will not result in detrimental impacts to ecosystems and habitat features present within the project site and within the surrounding properties. The specialist has therefore indicated that the development may be

authorised, constructed and operated, subject to the implementation of the recommended mitigation measures.

10.1.2 Impacts on Avifauna

The Avifauna Impact Assessment (**Appendix E**) is based on the findings of two site visits undertaken in July 2018 and February 2019 (i.e. wet and dry season site visits), ecological and biodiversity information available in the literature and various spatial databases with mapping based on the satellite imagery of the site as well as personal knowledge of the site obtained during the site visits. The avifauna impacts identified to be associated with Allepad PV Three will be negative and local in extent. The duration of the impacts will be short to long-term, for the lifetime of the PV facility.

During the construction phase of Allepad PV Three and the grid connection, a loss of habitat and disturbance due to clearance of vegetation is expected to occur. The significance of these impacts can be reduced to medium to low with the implementation of the recommended mitigation measures.

Impacts associated with the operation phase of Allepad PV Three include disturbance and collision with PV panels, as well as disturbance, electrocution and collision with power line infrastructure. The significance of the impacts will be low with the implementation of mitigation measures.

From the results of the avifauna assessment, it can be concluded that no fatal-flaws will be associated with the development of Allepad PV Three from an avifaunal perspective. The specialist has therefore indicated that the development may be authorised, constructed and operated, subject to the implementation of the recommended mitigation measures.

10.1.3 Impacts on Heritage Resources

The area surrounding the town of Upington has a rich historical and archaeological past (Fourie, 2014 SAHRIS NID 174335) and several heritage sites have been identified in close proximity to the project site. A number of archaeological resources were identified during the site visit undertaken by the heritage specialist. Only two of these sites are sites of some heritage significance and included a possible burial site and a concentration of artefacts. Neither of these sites are directly affected by the PV facility or power line infrastructure. The impact of the proposed Allepad PV Three and associated infrastructure on significant archaeological resources is considered to be low with the implementation of mitigation measures.

Considering the palaeontology of the project site, it was identified that the area in question is underlain by unfossiliferous igneous and metamorphic basement rocks (granites, gneisses etc.) or mantled by superficial sediments (wind-blown sands, alluvium etc.) of low paleontological sensitivity. Considering the defined criteria, the potential impact to fossil heritage resources is considered to be low.

The Heritage Impact Assessment (**Appendix F**) identified impacts associated with the construction and operation of Allepad PV Three. The impact on heritage resources include the archaeology and palaeontology of the project site.

Impacts on palaeontological and archaeological resources are expected to occur during the construction phase of Allepad PV Three. The impacts relate to the excavations required for the construction of the facility and will occur only in the event that an archaeological or palaeontological resource is present. The

significance of the impact will be low and no mitigation has been recommended by the specialist due to the lack of significant heritage resources within the area. The requirement for the development and implementation of a chance find procedure in the event of a heritage find has been included.

10.1.4 Visual Impacts

The Visual Impact Assessment (**Appendix G**) identified negative impacts on visual receptors during the undertaking of construction activities and the operation phase of Allepad PV Three.

During the construction phase the undertaking of construction activities will impact on sensitive visual receptors in close proximity to Allepad PV Three. The construction phase will result in a noticeable increase in heavy vehicles utilising the roads which may cause a visual nuisance to other road users and landowners in the area. The construction phase visual impacts will have a low significance following the implementation of the recommended mitigation measures.

Visual impacts expected to occur during the operation phase includes impact on sensitive visual receptors in close proximity (i.e. within 3km) of the facility, visual impact on sensitive visual receptors within the broader region (i.e. within 3-6km), lighting impacts, visual impact of the ancillary infrastructure, the visual impact on sensitive visual receptors located within a 500m radius of the associated power line infrastructure, and a visual impact on the sense of place in the region. The significance of the visual impacts range from low to moderate with the implementation of the recommended mitigation measures. Due to the limited number of sensitive receptors in the area, and due to the presence of other similar in the region, visual impacts are not considered to be a fatal flaw for the development. No mitigation is possible for the visual impact on sensitive visual receptors within 500m of the power line infrastructure, therefore only best practise measures can implemented and have been recommended by the specialist. The specialist has indicated support for the development of Allepad PV Three from a visual perspective provided that recommended mitigation measures are implemented.

10.1.5 Social Impacts

Traditionally, the construction phase of a PV solar development is associated with the majority of social impacts. Many of the social impacts are unavoidable and will take place to some extent, but can be managed through the careful planning and implementation of appropriate mitigation measures. A number of potential positive and negative social impacts have been identified for the project, however an assessment of the potential social impacts indicated that there are no perceived negative impacts that are sufficiently significant to allow them to be classified as fatal flaws.

The Social Impact Assessment (**Appendix H**) identified positive and negative impacts which are expected to occur during the construction and operation phases of Allepad PV Three. The assessment identified that the expected benefits associated with the project, which include local economic and social development, is likely to outweigh the perceived impacts associated with the project.

During the construction phase the positive impacts expected to occur include direct and indirect employment opportunities and skills development and socio-economic stimulation. The significance of these impacts are medium with the implementation of the recommended enhancement measures. The negative social impacts expected to occur during the construction phase includes an influx of construction workers and change in population, increase in crime, increased risk of HIV infections, impacts on daily living

and moving patterns, nuisance impacts (i.e. noise and dust), hazard exposure and disruption to social and community infrastructure and visual impacts. The significance of the negative construction phase impacts will be low to medium to high with the implementation of the recommended mitigation measures.

During the operation phase the positive impacts expected to occur includes direct and indirect employment opportunities and skills development and a contribution to Local Economic Development (LED) and social upliftment. The significance of the positive operation impacts will be medium to high with the implementation of the recommended enhancement measures. The negative impacts expected during the operation phase includes a visual and sense of place. The significance of the negative operation impacts will be high with the implementation of the recommended mitigation measures.

10.1.6 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. 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.

Within a 20km radius of the Allepad PV Three project site, there are seventeen (17) solar energy facilities (PV and CSP) which were considered as part of the cumulative impact assessment. The cumulative impacts associated with Allepad PV Three have been assessed to be acceptable, with no unacceptable loss or risk expected (refer to **Table 10.1** and Chapter 9).

Table 10.1: **Summary of the cumulative impact significance for Allepad PV Three**

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
Ecology	Low	Medium to Low (depending on the impact being considered)
Avifauna	Low	Medium
Heritage (archaeology and palaeontology)	Low	Low
Visual	Medium	Medium
Socio-Economic	Negative - Low to High (depending on the impact being considered) Positive - High	Positive and Negative - High

Based on the specialists' cumulative assessments and findings regarding the development of Allepad PV Three and its contribution to the overall impact of all solar energy facilities (PV and CSP) to be developed within a 20km radius, it can be concluded that Allepad PV Three cumulative impacts are expected to be both positive and negative and will be of a low to high significance. There are however no impacts or risks identified to be considered as unacceptable with the development of Allepad PV Three and other solar energy facilities within the surrounding area. In addition, no impacts which will result in whole-scale change are expected.

10.2. Environmental Sensitivity Mapping

From the specialist investigations undertaken for Allepad PV Three, the following sensitive areas/environmental features have been identified and demarcated within the project site (refer to **Figures 10.1 – 10.3** and **Appendix M**):

» **Ecology** – The majority of the 300m power line corridor and the development footprint for Allepad PV One has been identified as being of a low ecological sensitivity based on the widely distributed habitat in the region and the fact that the area does not support an extensive tree layer, besides scattered *Parkinsonia africana*. A small section of sandy habitat is traversed by the development footprint of Allepad PV Three which is considered to be acceptable from an ecological perspective. The western half of the site on undulating sandy soils is considered to be low sensitivity and suitable for development apart from the extensive area of mobile dunes which is considered to be medium or high sensitivity and not suitable for development as the loose sands are very vulnerable to erosion. There are dunes located in the north west and central part of this area and then the shrubby plains of the south and central part of the site. The dunes are considered to be medium or high sensitivity and not suitable for development as the loose sands are very vulnerable to erosion. Isolated dunes of medium ecological sensitivity is situated within the 300m power line corridor located adjacent to the main entrance road. The dunes are unlikely to fulfil the same ecological services as the contiguous dune fields located well beyond the development footprint and is considered acceptable. The eastern half of the project site occurs on shallow calcrete soils and has numerous drainage lines as well as a few small pans present. Due to the presence of the drainage system and the difficulty involved in avoiding impact to this feature should development encroach on it, this area is considered to be of very high ecological sensitivity and largely unsuitable for development. Areas of very high and high ecological sensitivity have been avoided by the development footprint. A small pan of high sensitivity is located within the 300m power line corridor and can easily be avoided by the power line route.

» **Bird Habitat and Sensitive Areas** – The project site supports three main avifaunal microhabitats, i.e. the gravel plains, sandy plains, and dunes habitat. These three habitats have different sensitivities, due to the subtle differences in the avifaunal assemblages that they support, especially with respect to red-listed species. The gravel plains located within the eastern section of the project site are considered to be of high sensitivity, due firstly to the habitat diversity of the area and the fact that it supports several pairs of the Near-Threatened Karoo Korhaan (resident) and the Endangered Ludwig's Bustard (nomadic). The drainage lines also intersect the gravel plains throughout and therefore the ecological functioning of these two habitats are intertwined. The dune habitat located within the western portion of the project site is well represented within the bioregion, but due to the deeper soils, supports a number of protected tree species, such as the *Acacia erioloba, A. haematoxylon* and *Boscia albitrunca, B. foetida subsp. foetida.* These tree species, in turn, provide important nesting and roosting sites for birds, including large raptors. This habitat is therefore considered to be of medium sensitivity due to its importance to a wide variety of avifaunal species. The 300m power line corridor traverse some isolated dunes of medium sensitivity, which is considered acceptable due to the isolated location of the dune. These dunes is also located adjacent the main entrance road to the project site, and therefore is unlikely to fulfil the same ecological services as the contiguous dunes fields located well beyond the development footprint.

The sandy plains habitat represents the most widely distributed habitat in the region, and occurs primarily on shallower soils that do not support an extensive tree layer, besides scattered *Parkinsonia africana*. This habitat is therefore regarded to be of low sensitivity. The development footprint for Allepad PV Three is located within sandy plains considered to be of low sensitivity.

The 300m power line corridor traverse the sandy plains and gravel plains identified within the project site. There are also a number of minor features along the power line corridor, including a small rocky outcrop, a stand of *Acacia mellifera* shrubs, a stand of alien *Prosopis* trees near human habitation, a very small ephemeral pan, as well as some small sewage ponds. These features lie directly adjacent the N10 road and may attract raptors and waterbirds on occasion, although no large red-listed species are expected to be supported by these features. In particular, the small pan is considered far too insignificant in size to support either waterbirds when inundated or coursers when dry. Therefore, the entire length of the 300m power line corridor, which follows the N10 road, is considered to be of low ecological sensitivity.

» **Heritage:** Two heritage sites of some significance were identified within the broader project site and are avoided by the development footprint of Allepad PV Three and the 300m power line corridor. A possible burial site (Grade IIIA) (Site 0506) has been identified within the eastern section of the project site and a no-go buffer of 30m has been recommended by the specialist. A concentration of artefacts (Grade IIIB) (Site 0526) has been identified directly north of the possible burial site and a no-go buffer of a 100m was recommended by the specialist.

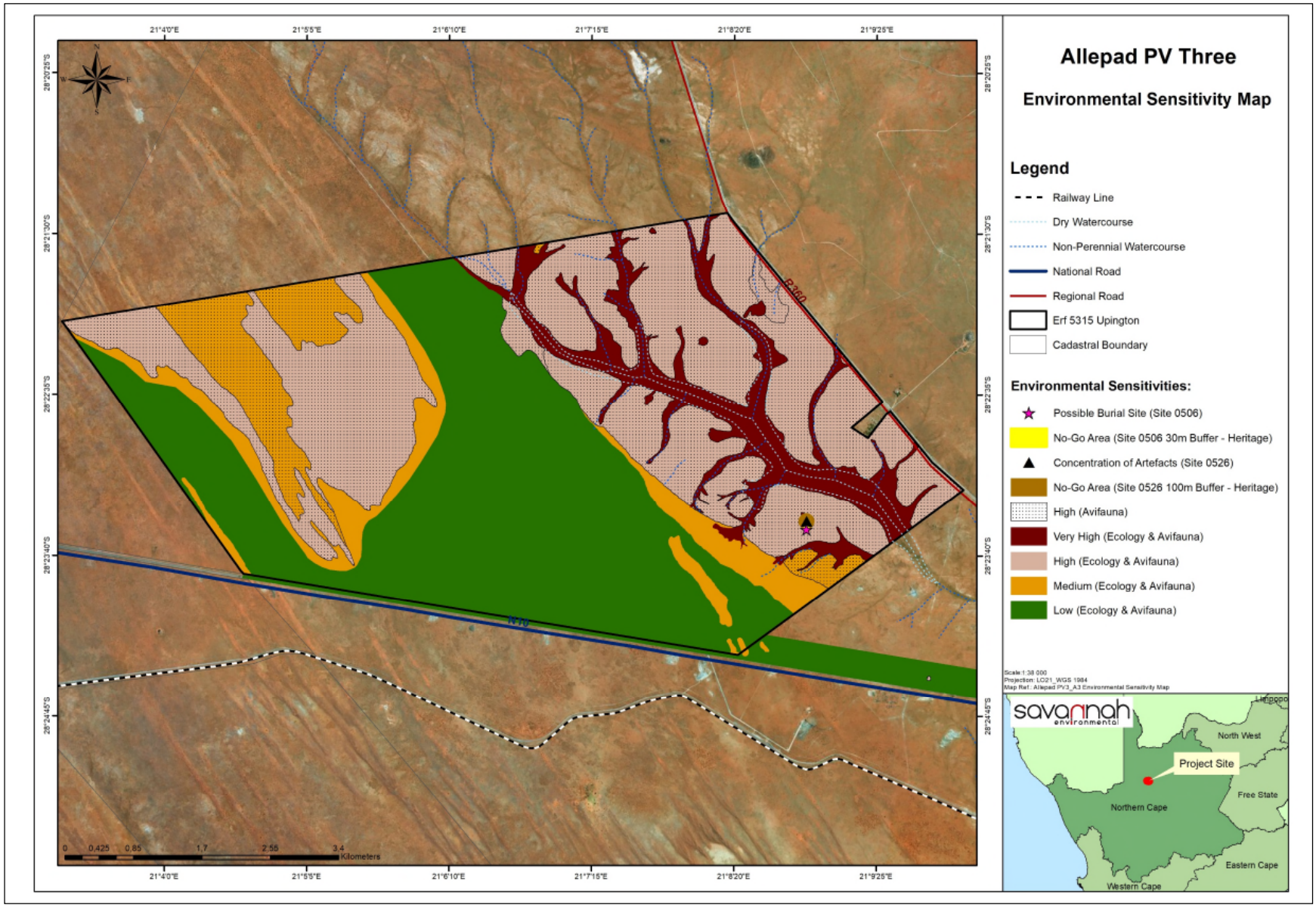

Figure 10.1: Environmental sensitivity map of the project site considered for Allepad PV Three.

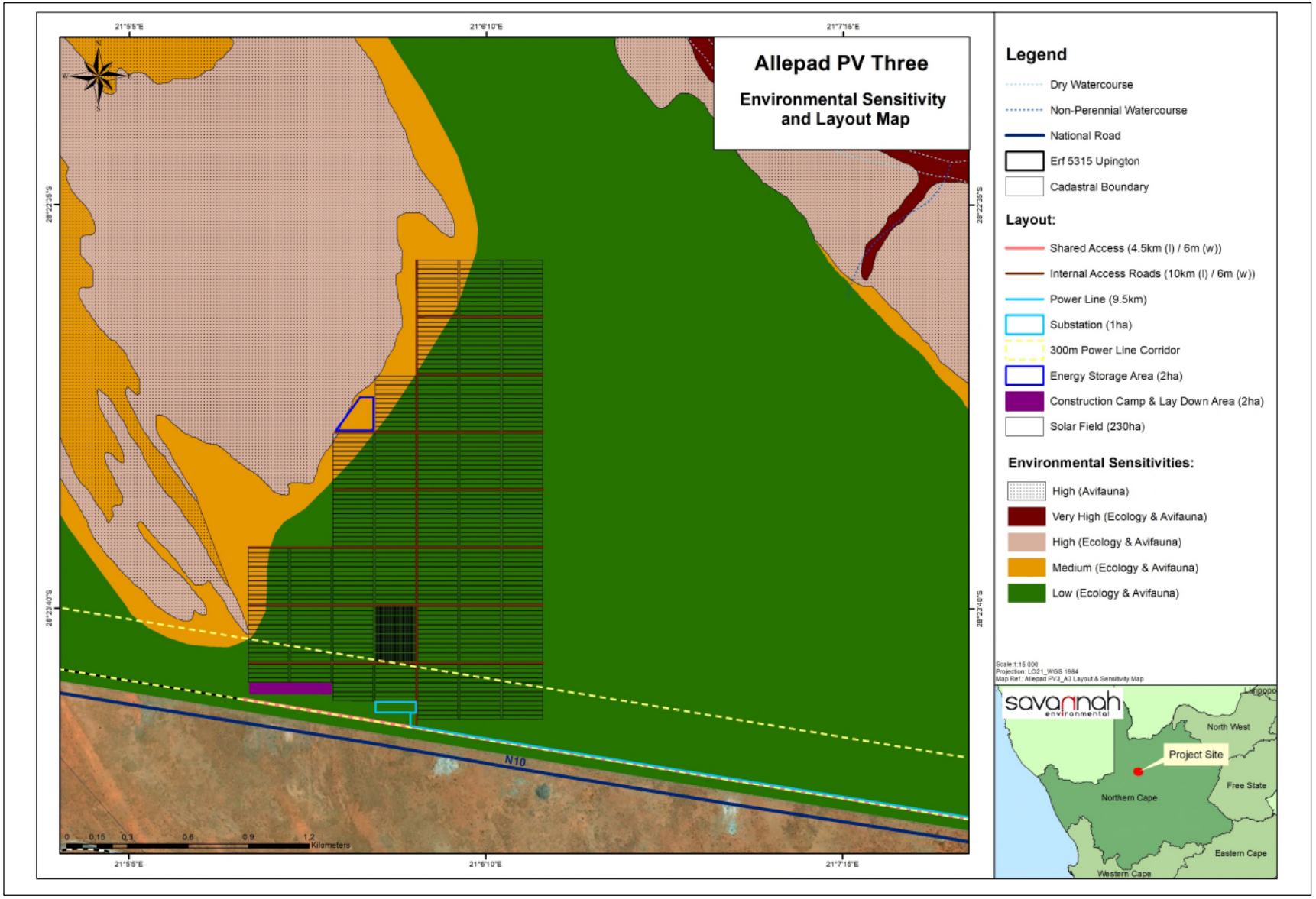

Figure 10.2: Environmental sensitivity map of the project site overlain by the layout assessed for Allepad PV Three.

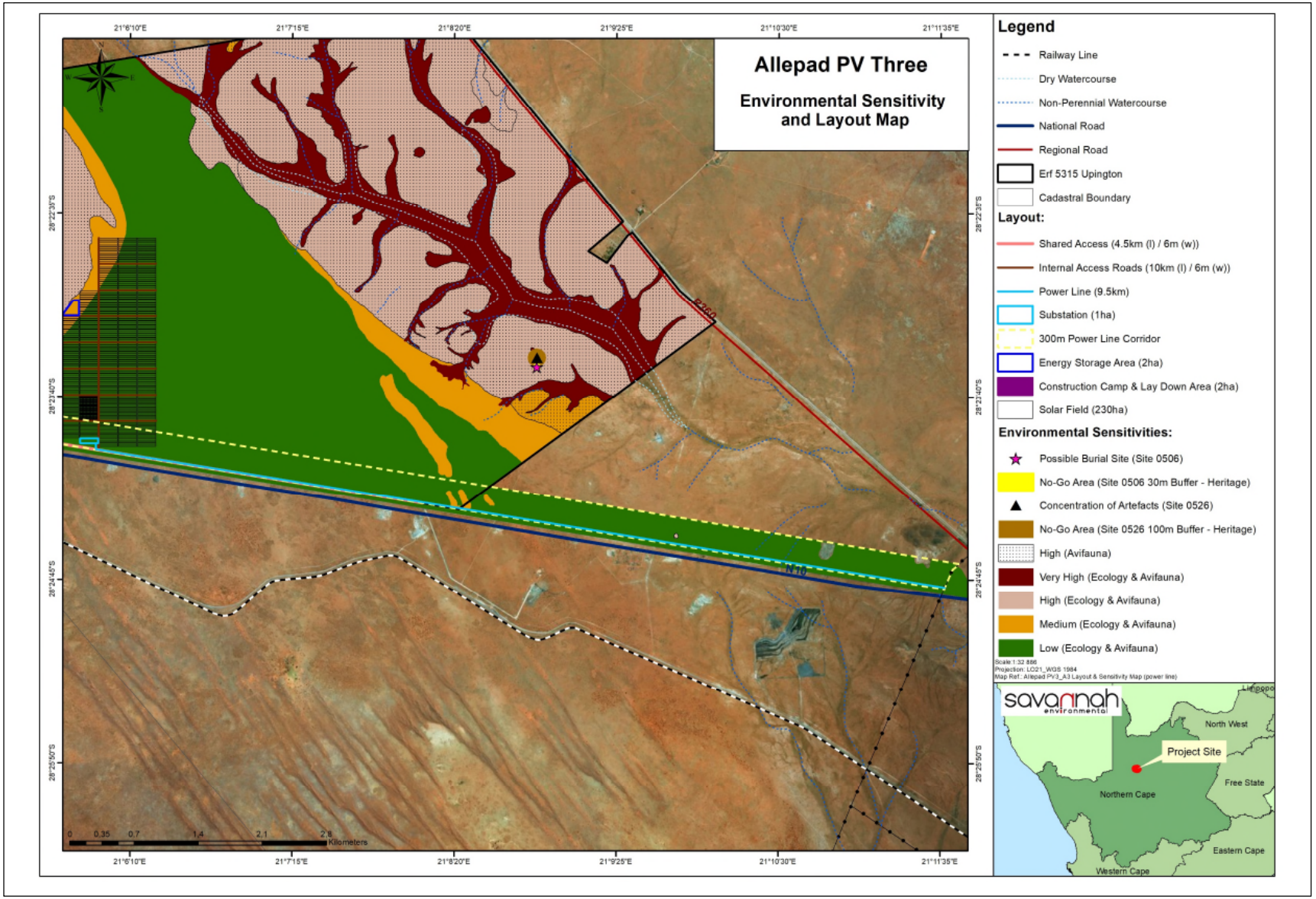

Figure 10.3: Environmental sensitivity map of the project site and 300m power line corridor assessed for Allepad PV Three.

10.3. Environmental Costs of the PV Facility versus Benefits of the 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 EIA 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 is considered to be limited due to the placement of infrastructure within vegetation considered to be of a low to medium sensitivity.
- *Visual impacts associated with the PV Facility* - The development of Allepad PV Three may have a visual impact within (but not restricted to) a 3km radius of the PV facility, which will be of a low significance with the implementation of the recommended mitigation measures.
- *Change in land-use and loss of land available for agricultural activities within the development footprint* - The cost in this regard is expected to be limited due to the low agricultural potential of the property and the fact that current grazing activities can continue on the remainder of the property during construction and operation.

Benefits of Allepad PV Three include the following:

- The project will result in important economic benefits at the local (specifically Upington) and regional scale through job creation, income and other associated downstream economic development. These will persist during the pre-construction, construction, operation and decommissioning phases of the project.
- 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 development.
- The water requirement for a PV 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. Allepad PV Three will contribute to achieving goals for implementation of renewable energy and sustaining a 'green' economy within South Africa.

The benefits of Allepad PV Three 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 areas considered to be acceptable for the proposed development, the benefits of the project are expected to outweigh the environmental costs of the PV facility.

10.4. Overall Conclusion (Impact Statement)

The construction and operation of a PV facility with a contracted capacity of up 100MW on a project site located near Upington in the Dawid Kruiper Local Municipality, and the greater ZF Mgcawu District Municipality has been proposed by ILEnergy Development (Pty) Ltd. A technically viable project site and development footprint was proposed by the developer and assessed as part of the EIA process. The environmental assessment of the development footprint within the project site was undertaken by independent specialists and their findings have informed the results of this EIA Report.

The specialist findings have indicated that there are no identified environmental fatal flaws associated with the implementation of Allepad PV Three within the project site. The developer has proposed a technically viable and suitable layout for the project and associated infrastructure which has been assessed as part of the independent specialist studies. Through this assessment the preferred development footprint from an environmental perspective has been identified, and assigned as part of the layout map for the Allepad PV Three. This layout avoids all identified areas of very high environmental sensitivity and therefore minimises impacts as far as possible. The layout from an environmental perspective identified through this EIA process is therefore considered as the most appropriate alternative to form part of the development footprint for the Allepad PV Three development and are considered to be acceptable within all fields of specialist study undertaken for the project. All impacts associated with the preferred layout can be mitigated to acceptable levels or enhanced through the implementation of the recommended mitigation or enhancement measures. The layout map (including the details of the project) is included as **Figure 10.4** and is considered to be the preferred layout for Allepad PV Three.

Through the assessment of the development of Allepad PV Three within the project site it can be concluded that the development of the PV facility is environmentally acceptable (subject to the implementation of the recommended mitigation measures).

10.5. Overall Recommendation

Considering the findings of the independent specialist studies, the impacts identified, the development footprint proposed by the developer which avoids all identified highly sensitive environmental features within the project site, 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 development of Allepad PV Three is acceptable within the landscape and can reasonably be authorised (**Figure 10.4**).

The following infrastructure would be included within an authorisation issued for the project:

- Arrays of PV panels with a generation capacity of up to 100MW.
- Mounting structures to support the PV panels.
- Combiner boxes, on-site inverters (to convert the power from Direct Current (DC) to Alternating Current (AC)), and distribution power transformers.
- A 132kV on-site substation up to 1ha in extent to facilitate the connection between the solar energy facility and the Eskom electricity grid.
- A new 132kV double-circuit power line (which will make use of a loop-in and loop-out configuration utilising a double-circuit monopole construction), approximately 9.3km in length, between the on-site substation and Eskom grid connection point.
- Cabling between the project's components (to be laid underground where practical).
- Meteorological measurement station.
- An energy storage area up to 2ha in extent.
- Access road and internal access road network.
- On-site buildings and structures, including a control building and office, ablutions and guard house.
- Perimeter security fencing, access gates and lighting.
- Temporary construction camp up to 1ha in extent, including temporary site offices, parking and chemical ablution facilities.
- Temporary laydown area up to 1ha in extent, for the storage of materials during the construction and concrete batching plant.

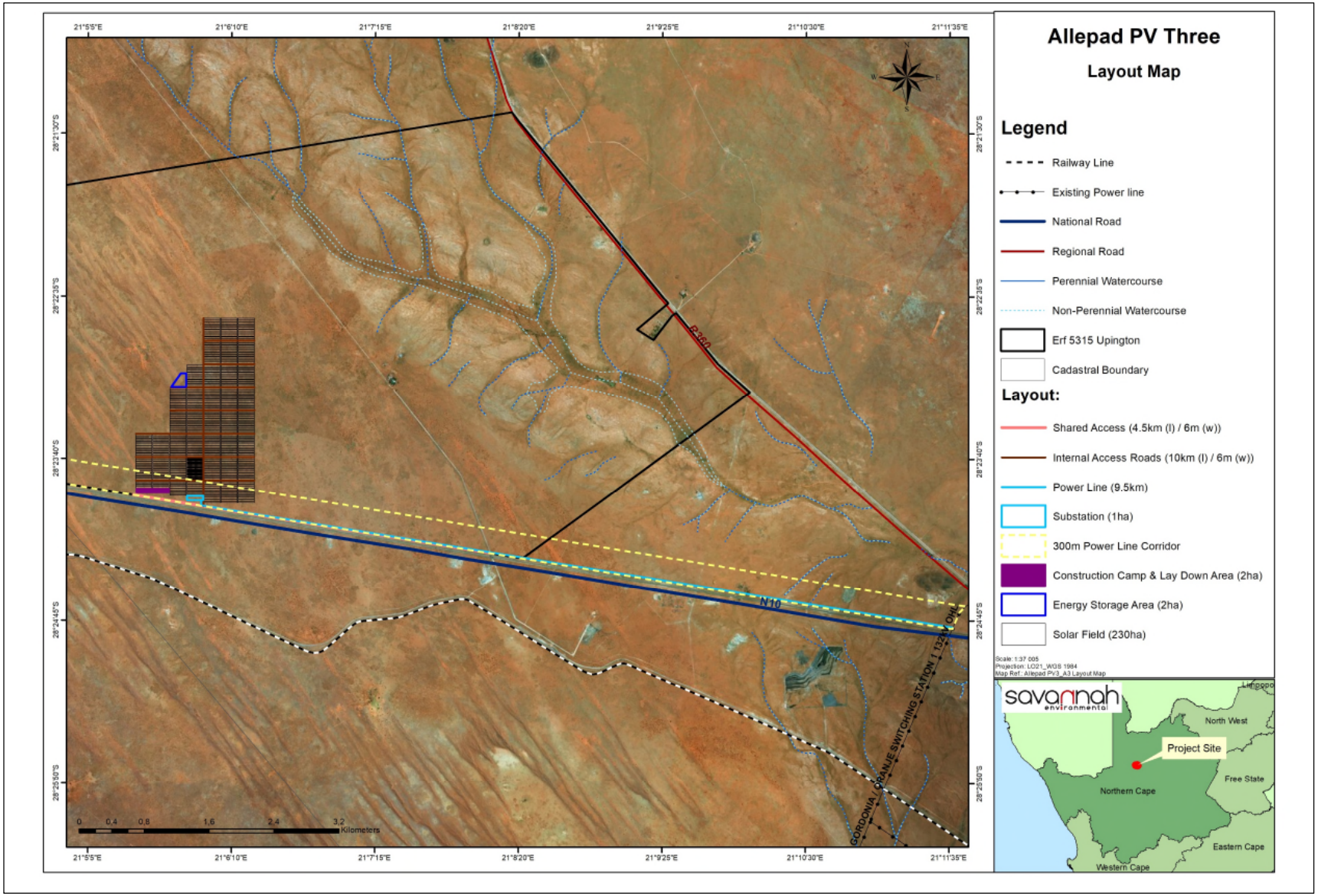

Figure 10.4: Final preferred layout map of the preferred development footprint for Allepad PV Three, as was assessed as part of the EIA process (A3 map included in Appendix M)

The following key conditions would be required to be included within an authorisation issued Allepad PV Three:

- All mitigation measures detailed within this EIA Report, as well as the specialist reports contained within **Appendices D to H**, are to be implemented.
- The EMPr as contained within **Appendix I** of this EIA Report should form part of the contract with the Contractors appointed to construct and maintain the PV facility in order to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of Allepad PV Three is considered key in achieving the appropriate environmental management standards as detailed for this project.
- Following the final design of Allepad PV Three, a final layout must be submitted to DEA for review and approval prior to commencing with construction. No development is permitted within the identified no-go, very high and high sensitivity areas as detailed in **Figure 10.1.**
- A pre-construction walk-through of the final development footprint for species of conservation concern that would be affected and that can be translocated must be undertaken prior to the commencement of the construction phase.
- Before construction commences individuals of listed species within the development footprint that would be affected, must be counted and marked and translocated, where deemed necessary by the ecologist conducting the pre-construction walk-through survey. Permits from the relevant provincial authorities, i.e. the Northern Cape West Department of Environment and Nature Conservation (DENC), must be obtained before the individuals are disturbed.
- Prior to construction, the design and layout of any proposed power lines must be endorsed by members of the Eskom-EWT Strategic Partnership, taking into account the mitigation guidelines recommended by Birdlife South Africa (Jenkins et al., 2017; Jenkins et al., 2016).
- Areas where the power line should be fitted with bird flight diverters to reduce collision risk should be identified post-construction through searches for bird carcasses along the power line, and particularly in the vicinity of the above mentioned features.
- The project footprint must be kept as small as possible.
- A chance find procedure must be developed and implemented in the event that archaeological or palaeontological resources are found. In the case where the proposed development activities bring these materials to the surface, work must cease and SAHRA must be contacted immediately.

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