Naledi PV

Northern Cape Province

Final Basic Assessment Report

14/12/16/3/3/1/2202

August 2020

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PROJECT DETAILS

DEA Reference 14/12/16/3/3/1/2202

Title : Basic Assessment Process: Final Basic Assessment Report for Naledi PV, a solar PV facility and associated infrastructure proposed on a site near Upington and within the Upington Renewable Energy Development Zone (REDZ), in the Northern Cape Province.

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Report Revision : Revision 0

Date : August 2020

When used as a reference this report should be cited as: Savannah Environmental (2020) Final Basic Assessment Report for Naledi PV, Northern Cape Province.

PURPOSE OF THE FINAL BA REPORT

Naledi PV (Pty) Ltd, a Special Purpose Vehicle (SPV), the Developer, proposes the development of a 100MW solar photovoltaic (PV) facility, as well as, associated infrastructure on a study area and development area located near the town of Upington in the Northern Cape Province. The solar PV facility will be known as Naledi PV. The study area falls within the jurisdiction of the Kai !Garib Local Municipality and the greater ZF Mgcawu District Municipality, as well as, the Upington Renewable Energy Development Zone (REDZ). The study area borders the Dawid Kruiper Local Municipality to the east.

The project development footprint is within the development area that will house the proposed development, and which has been considered fully within this Basic Assessment (BA) process and assessed in terms of its suitability from an environmental and social perspective within this Final Basic Assessment (BA) Report.

In terms of NEMA, the EIA Regulations, 2014 (GNR 326), and Listing Notices (Listing Notice 1 (GNR 327), Listing Notice 2 (GNR 325), and Listing Notice 3 (GNR 324)), the development of Naledi PV requires Environmental Authorisation (EA) from the National Department of Environmental Affairs (DEA) subject to the completion of a Basic Assessment process, as prescribed in Regulations 21 to 24 of the EIA Regulations, 2014 (GNR 326) and as per GNR 114. The need for EA, subject to the completion of Basic Assessment process, is triggered by the inclusion of, amongst others, Activity 1 of Listing Notice 2 (GNR 325) as well as the location of the development area within the Upington REDZ.

The BA Report was made available for a 30-day review and comment period in accordance with Regulation 19(1)(a) of the EIA Regulations, 2014 (as amended) from **Wednesday, 08 July 2020** to **Friday, 07 August 2020**. The Final BA Report includes all comments received, as well as responses to those comments, which are included in **Appendix C9** of the Final BA Report. Where applicable, this Final BA Report has been amended to address these comments. All amendments/changes/or additions made to this Final BA Report have been underlined for ease of reference.

EXECUTIVE SUMMARY

Naledi PV (Pty) Ltd, a Special Purpose Vehicle (SPV) proposes the development of Naledi PV, a photovoltaic (PV) solar energy facility, as well as, associated infrastructure on a site located 18km south-west of the town of Upington in the Northern Cape Province. A study area has been identified for the development of Naledi PV which constitutes Portion 3 of the Farm McTaggarts Camp 453 and Portion 12 a portion of Portion 3 of the Farm Klip Punt 452. The study area falls within the Kai !Garib Local Municipality and the greater ZF Mgcawu District Municipality. The study area also borders the Dawid Kruiper Local Municipality to the east.

A development area of 330ha has been identified within the study area by the proponent for the development of Naledi PV and associated infrastructure, which has been fully considered within this BA process and assessed in terms of its suitability from an environmental and social perspective within this Final BA Report.

The development area is regarded as being of a sufficient extent to provide opportunity for the avoidance of major environmental sensitivities. Naledi PV will have a contracted capacity of up to 100MW and will include specific infrastructure, namely:

- Fixed-tilt or tracking solar PV panels with a maximum height of 3.5m;
- Centralised inverter stations or string inverters;
- A permanent laydown area;
- Cabling between the panels, to be laid underground where practical;
- A 22kV or 33kV/132kV on-site facility substation of up to 1ha in extent to facilitate the connection between the solar PV facility and the electricity grid;
- An access road to the development area with a maximum width of 6m;
- Internal access roads within the PV panel array area with a maximum width of 5m; and
- Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses, a workshop and visitors centre.

Naledi PV (Pty) Ltd has confirmed that the development area is suitable for the development of a solar energy facility from a technical perspective due to the available solar resource, access to the electricity grid, current land use, land availability, site-specific characteristics such as topography and accessibility, the location within the Upington REDZ, as well as the proximity of the area to authorised and constructed solar energy facilities, i.e. the operational Khi Solar One CSP facility, Sirius Solar PV Project One, Dyasons Klip 1 and 2 solar PV projects.

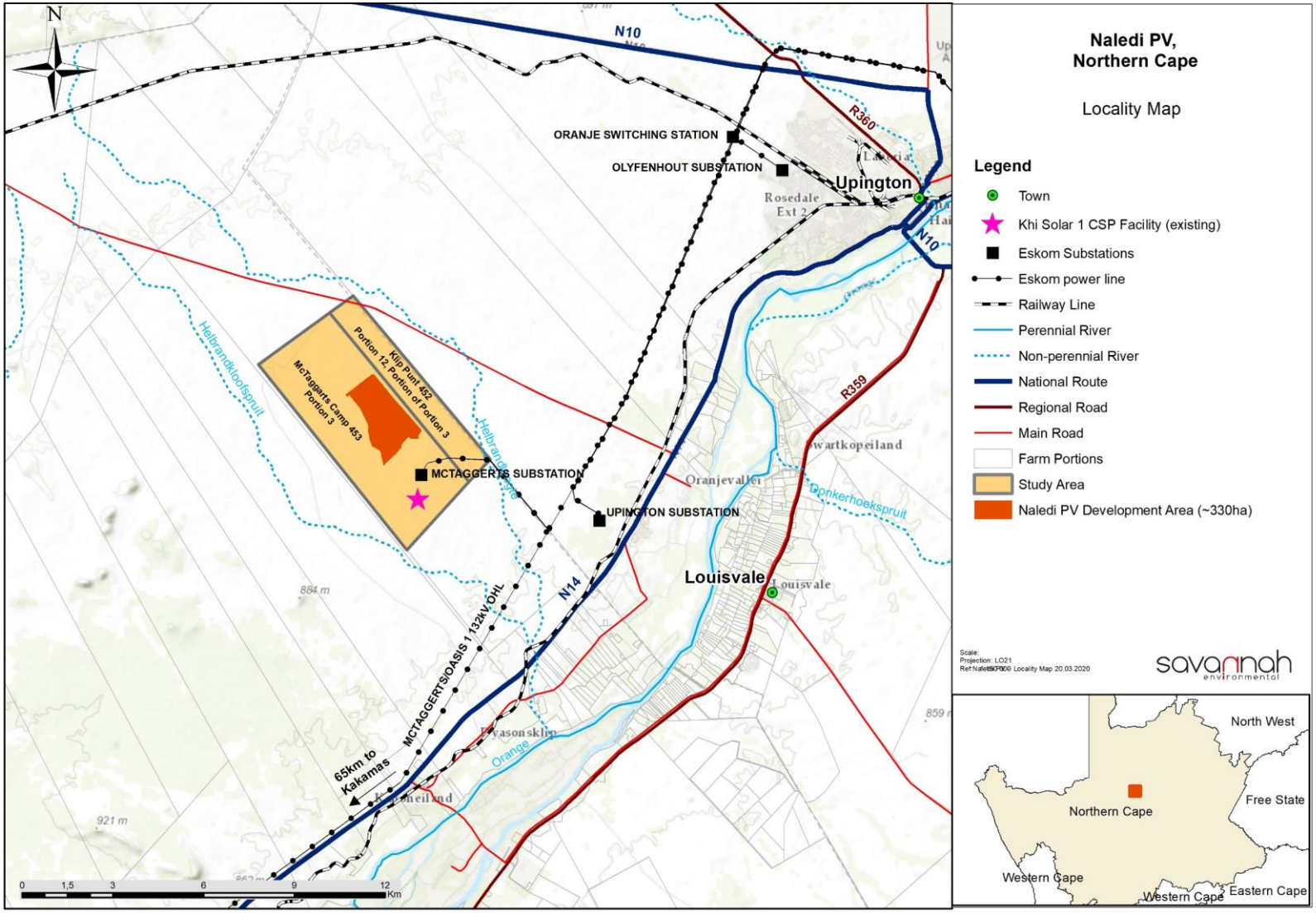

Figure 1: Locality map illustrating the location of the study area and development area under investigation for the development of Naledi PV

No environmental fatal flaws were identified in the detailed specialist studies conducted, and no impacts of unacceptable significance are expected to occur with the implementation of the recommended mitigation measures. These measures include, amongst others, the avoidance of sensitive features and the undertaking of monitoring, as specified by the specialists. Some mitigation measures have already been considered and implemented through the micro-siting of the solar PV facility development footprint, such as the avoidance of the major drainage features located within the development area of Naledi PV.

The potential environmental impacts associated with Naledi PV identified and assessed through the BA process include:

- Impacts on ecology, flora and fauna.
- Impacts on avifauna.
- Impacts on aquatic resources.
- Impacts to soils, land types and agricultural potential.
- Impacts on heritage resources, including archaeology and palaeontology.
- Visual impacts on the landscape as a result of the facility.
- Positive and negative social impacts.
- Traffic impacts.

Impacts on Ecology

The Ecological Impact Assessment (**Appendix D**) assessed the impact of Naledi PV on the sensitive ecological features present within the development area for the life-cycle of the development. The assessment identified impacts associated with the construction, operation and decommissioning phases of the project.

During the pre-construction and construction phase (and the decommissioning phase), the impacts include impacts on vegetation and listed or protected plant species and direct faunal impacts. The duration of the impacts ranges from long-term to short-term, with the magnitude of the impacts ranging from medium to low. The significance of the construction phase impacts is medium and low, depending on the impact being considered, and with the implementation of the mitigation measures recommended by the specialist. No impacts of high significance were identified from an ecological perspective.

During the operation phase, the anticipated impacts include habitat degradation due to erosion and alien plant invasion and faunal impacts due to the operation of the facility and maintenance activities. The duration of the impacts will be long-term, with the magnitude of the impacts ranging from low to minor. The significance of these impacts for the operation phase will be low, with the implementation of the recommended mitigation measures. No impacts of a medium or high significance were identified.

From the findings of the Ecological Impact Assessment it can be concluded that no impacts of high ecological significance or fatal flaws were identified which would hinder the development of Naledi PV. The development area is considered suitable for the establishment of Naledi PV and all impacts associated with the development can be mitigated to an acceptable level of significance of either low or medium, depending on the impact under consideration. Therefore, the proposed development is considered to be appropriate and the ecological impact acceptable from an ecological perspective and will not result in detrimental impacts to ecosystems and habitat features within the development area

and within the adjacent properties. As a result, the specialist has indicated that the development may be authorised, constructed and operated subject to the implementation of the recommended mitigation measures.

Considering the development footprint assessed for Naledi PV, the specialist has indicated that the project can be supported from a terrestrial ecology point of view.

Impacts on Avifauna

The Avifauna Impact Assessment (**Appendix E**) is based on the findings of two field surveys undertaken in spring (4 – 8 October 2018) and late summer (9 -12 April 2019). The avifauna impacts identified to be associated with the pre-construction and construction phase (including decommissioning) will be negative with a short-term duration and will have a magnitude ranging from moderate to low. For the operation phase, the impact will also be negative, with a long-term duration for the life of the facility and a magnitude of moderate to low.

During the pre-construction and construction phase (and decommissioning phase) of Naledi PV, direct avifauna impacts include habitat loss and disturbance related to vegetation clearance and the displacement of shy avifauna species as a result of noise and an increased human presence associated with construction-related activities. The significance of the construction phase impact will be medium, with the implementation of mitigation measures. No impacts of a high significance for the construction phase are expected to occur.

Impacts on avifauna during the operation phase of Naledi PV include collisions with PV panels, entrapment along perimeter fencing, disturbance due to traffic and night lighting. The significance of the impacts will be low, with the implementation of mitigation measures. However, impacts with medium significance post mitigation are expected to occur during the construction phase.

From the results of the Avifauna Impact Assessment, it can be concluded that the development area for Naledi PV is considered to represent a broadly suitable environment for the location of a solar PV facility. Taking into consideration that the development area supports a typical bioregional avifaunal assemblage, and that there are no known communal breeding or roosting sites of red-listed species, there are no impacts associated with the development that are regarded to be of a high residual significance and which cannot be mitigated to a low significance. Therefore, the development of Naledi PV is considered to be acceptable and supported from an avifaunal perspective.

From the results of the Avifauna Impact Assessment, it is concluded that no fatal flaws will be associated with the development of Naledi PV. The specialist has indicated that the project can be authorised subject to the implementation of the recommended mitigation measures.

Impacts on Aquatic Resources

The Aquatic Resources Impact Assessment (**Appendix F**) assessed the impact of Naledi PV on aquatic resources and/or features present within the study area and development area for the life-cycle of the project.

During the construction and operation phases, impacts will include a loss of the larger pans and the major riparian systems associated with the mainstem rivers Helbrandleegte and Helbrandkloofspruit through physical disturbance; impacts on secondary alluvial watercourses with fragmented riparian systems; an impact on riparian systems through a possible increase in surface water run-off on riparian form and function; increase in sedimentation and erosion within the development footprint; and an impact on localised surface water quality. The impacts will be negative with mainly a long-term duration and moderate to low magnitude.

From the findings of the Aquatic Resources Impact Assessment, it is concluded that the proposed layout for Naledi PV would have no direct impact on the larger drainage features within the surrounding area (e.g. Helbrandleegte and Helbrandkloofspruit rivers) and the aquatic environment for the most part, as the layout avoids the significant high sensitivity watercourses. Some impacts such as road crossings and the PV panels are located in the smaller drainage areas (medium sensitivity), which are fragmented and contain no riparian zones; therefore, with suitable mitigation (proper stormwater management and post construction rehabilitation), the impacts would be of a low significance. This is also based on the fact that some of the aquatic features to be affected by the proposed development contain no aquatic habitat and only function as a means to sustain or convey baseflows within the catchment. The development of Naledi PV would not have an impact on this aspect, as surface run-off will emanate from the development footprint (when significant rainfall occurs); therefore, the hydrological system observed within the area will be maintained. Furthermore, the significance of the remaining impacts assessed for aquatic systems after mitigation would be low. This includes the internal roads and the sections of the PV panel area that will infringe on some of these systems. The infringement is considered to be acceptable from an aquatic perspective, particularly for the one small depression that could not be avoided by the layout, as it is rather small and showed little wetland functionality (i.e. important aquatic habitat or associated species). Therefore, the loss is considered to be acceptable on the basis that all other similar features within the study area but located outside the development area of Naledi PV would remain intact and attempts will be made to protect these systems from further degradation.

The construction and operation of Naledi PV and the associated infrastructure is supported from an aquatic resources perspective and is considered acceptable subject to the developer obtaining the necessary water use authorisation from the Department of Water and Sanitation.

Impacts on Soil and Agricultural Potential

The Agricultural Compliance Statement for the proposed Naledi PV (**Appendix G**) has identified and assessed impacts associated with the development of Naledi PV. These impacts are expected during the construction and operation phases and include, soil erosion, chemical pollution and an impact on the current land capability of the development area. These impacts will be negative with a permanent to medium-term duration depending on the impact being considered and will have a magnitude of moderate to low. The significance of the impacts is medium and low, depending on the impact being considered and following the implementation of the recommended mitigation measures. No impacts of a high significance have been identified.

No fatal flaws have been identified from a soils and agricultural perspective; therefore, all impacts can be mitigated to be within an acceptable level of impact during life cycle of the project. Therefore, the development of Naledi PV is considered to be acceptable from a soils and agricultural perspective.

The specialist has indicated that the development of Naledi PV can be authorised and that the development footprint proposed and assessed as part of this BA Report is acceptable from a soils and agricultural potential perspective. This is subject to the implementation of the recommended mitigation measures as provided by the specialist.

Impacts on Heritage Resources (including archaeology and palaeontology)

The Heritage Impact Assessment (**Appendix H**) assessed the impact of Naledi PV on archaeological and palaeontological resources within the study area and development area for the life cycle of the project. It is expected that impacts to heritage resources will occur during the construction phase due to the on-ground disturbance required by the construction activities.

No significant heritage resources or formal and informal graves were identified within the development area for Naledi PV. Two (2) Stone Age archaeological resources were identified within development area, with other additional archaeological resources located outside the development area for Naledi PV. These resources are not considered to be conservation worthy as they are widely scattered and have no contextual material. The lithic and historic material identified is of a low significance and considering that the resources may be destroyed during the construction phase of the solar PV facility, the impact is inconsequential, and no further mitigation would be required. The significance of the impact on archaeological resources is therefore low, with a long-term duration and a low magnitude. Therefore, the development of Naledi PV will not have a significant negative impact on the heritage resources identified within the development area.

Taking into consideration the nature of the development, construction-related activities may have an impact on the fossil heritage if preserved within the development area, however, for Naledi PV, the geological structures of the area suggests the rocks are either of an igneous origin and too old to contain any fossil heritage. Therefore, based on the experience of the specialist and the lack of any previously recorded fossils from the study area, it is unlikely that any fossil heritage will be preserved and therefore the impact is considered to be of a low significance. However, there is a small opportunity for fossils to occur within the adjacent shales of the early Permian Vryheid Formation; therefore, a Fossils Finds Chance Protocol (**Appendix L** of the EMPr) has been included in the EMPr.

Based on the nature of the heritage resources identified and the lack of any fossils recorded or expected in the area, the significance of the impacts will be low, without the implementation of the recommended mitigation measures. As such, the development of Naledi PV is not associated with any fatal flaws from a heritage, archaeological and palaeontological perspective, and it is for this reason that the project is considered to be acceptable.

Visual Impacts

The Visual Impact Assessment (**Appendix I**) identified negative and neutral impacts on visual receptors during the construction and the operation phases of Naledi PV. The impacts includes a change in the character and sense of place of the landscape setting; a change in the character of the landscape as seen from the N14, the R359 and the Lutzputs Road; a change in the landscape as seen from local homesteads and settlement areas in the area and impacts from glare and lighting, particularly during the operation phase of the facility at night for night-time observers.

The duration of the impacts is expected to be long-term for majority of the visual impacts and with a magnitude ranging from low to small. The significance of the impacts will be medium and low with the implementation of mitigation, depending on the impact being considered. No impacts of a high significance are expected to occur and it can be concluded that the development of Naledi PV will be viewed in the context of the operational Khi Solar One, Dyasons Klip 1 & 2 PV sites, and Sirius Solar PV Project One located within the vicinity of the development area of Naledi PV. The development of Naledi PV is therefore considered to be acceptable from a visual perspective.

Social Impacts

The Social Impact Assessment (**Appendix J**) identified that most social impacts associated with the development of Naledi PV will have a short-term duration associated with the construction phase and long-term duration during the operation phase of the project. The magnitude of the impacts ranges from high to small depending on the impact being considered and the status thereof. Both positive and negative impacts have been identified for both the construction and operation phases of the development.

During the construction phase, negative impacts include, nuisance impacts (including noise and dust); an influx of construction workers and job seekers to the area and a change in population; safety and security impacts; impacts on daily living and movement patterns; and visual and a sense of place impacts. The significance of the negative construction phase impacts will be low with the implementation of the recommended mitigation measures. The positive social impacts associated with the construction phase of Naledi PV include, an economic multiplier effect, and direct and indirect employment and skills development opportunities. The significance of the positive impacts will be medium with the implementation of the recommended enhancement measures by the specialist.

Impacts associated with the operation of Naledi PV will be both positive and negative. The negative impacts are related to the change in the sense of place and the loss of agricultural land and overall productivity as a result of the operation of the solar PV facility. The significance of the negative impacts will be low with the implementation of the recommended mitigation measures. The positive impacts associated with the operation of the facility relate to the development of non-polluting renewable energy infrastructure, a contribution to Local Economic Development (LED) and social upliftment, and the creation of employment and skill development opportunities for the local economy and the country. The significance of the positive impacts will be low and medium with the implementation of the recommended enhancement measures.

Naledi PV is unlikely to result in permanent damaging social impacts. From a social perspective it is concluded that the project is acceptable subject to the implementation of the recommended mitigation and enhancement measures and management actions identified for the project. Considering the findings of the report and potential for mitigation it is the reasoned opinion of the specialist that Naledi PV can be authorised from a social perspective.

Impacts on Traffic

Traffic impacts are expected with the development of Naledi PV which were identified and assessed as part of a Traffic Impact Assessment (**Appendix K**).

During the construction phase, traffic, noise and dust will be generated through the transportation of project components and employees to the development area. The duration of the impacts will be of a very short-term and will have a moderate to low magnitude. The significance of the construction phase impacts on traffic will be low, with the implementation of the mitigation measures recommended by the specialist.

The traffic generated during the operation phase of Naledi PV will be minimal and of no significance to the existing road network. Therefore, the impacts of traffic for this phase are not considered further.

No fatal flaws and impacts of a high significance are expected, and therefore the development of Naledi PV is considered to be acceptable from a traffic perspective.

Assessment of Cumulative Impacts

The Naledi PV facility is located within the Upington Renewable Energy Development Zone (REDZ), or REDZ 7. The REDZ areas are zones identified by the DEA as a geographical area of strategic importance for the development of large-scale solar photovoltaic and wind energy development activities. Therefore, the REDZ areas are considered as nodes for the development of renewable energy developments. At present one CSP facility and three (3) PV solar energy facilities are operational and located within the vicinity of the development area for Naledi PV. These include Khi Solar One, Dyasons Klip 1 & 2 and Sirius Solar PV Project One.

Considering all aspects, cumulative impacts associated with Naledi PV have been assessed to be acceptable with no unacceptable loss or risk expected.

Figure 2 provides an environmental sensitivity map of the preferred layout for Naledi PV

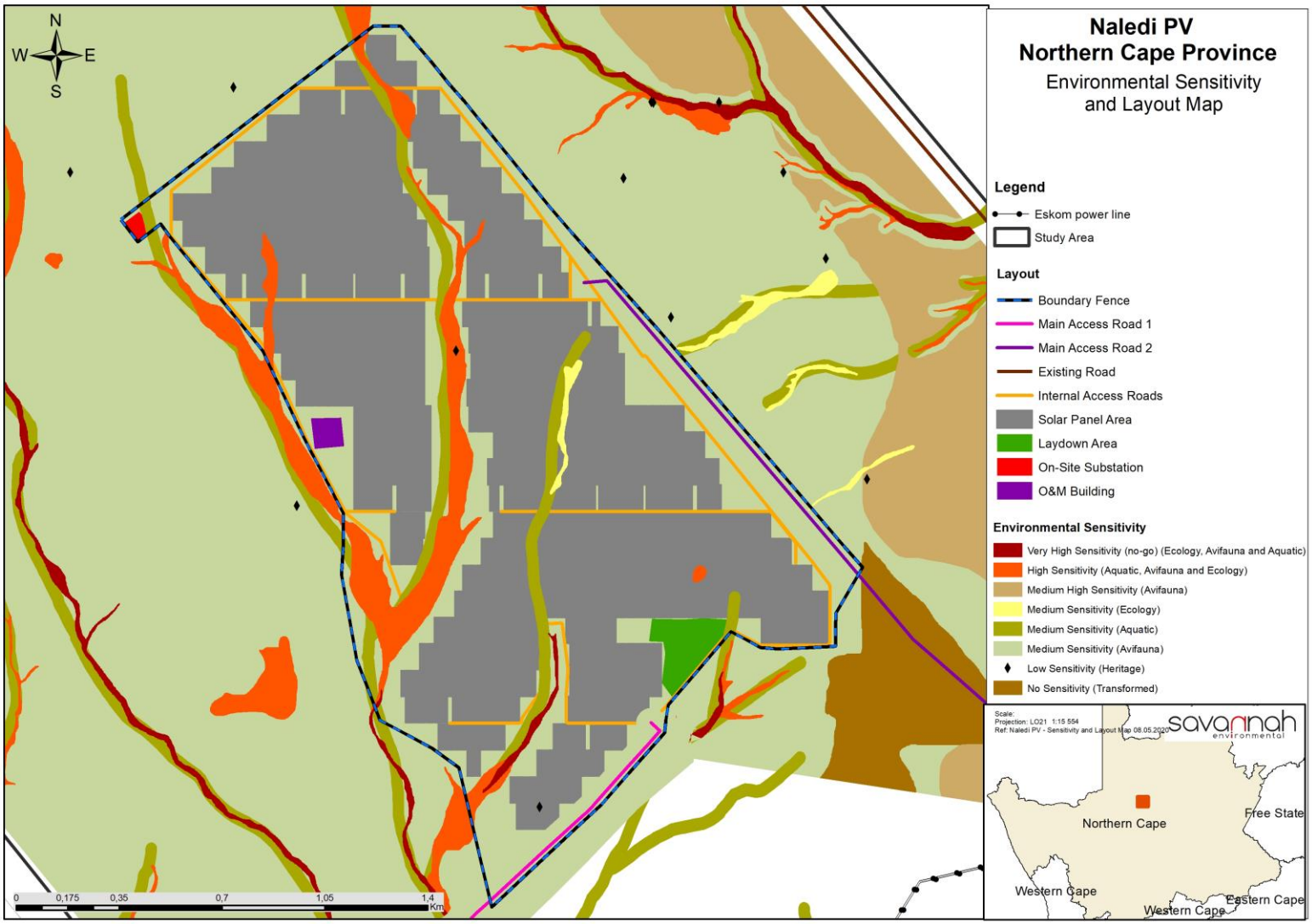

Figure 2: Final preferred layout map of the preferred development footprint for Naledi PV, as was assessed as part of the BA process, overlain with the environmental sensitivities (refer to **Appendix O** for A3 maps)

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 Authorisation (EA): means the authorisation issued by a competent authority (Department of Environmental Affairs) of a listed activity or specified activity in terms of the National Environmental Management Act (No 107 of 1998) and the EIA Regulations promulgated under the Act.

Environmental assessment practitioner (EAP): An individual responsible for the planning, management and coordinating of environmental management plan or any other appropriate environmental instruments introduced by legislation.

Environmental assessment practitioner (EAP): An individual responsible for the planning, management and coordinating of environmental management plan or any other appropriate environmental instruments introduced by legislation.

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 (EMPr): A plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a project or facility and its ongoing maintenance after implementation.

Environmental Officer (EO): The Environmental Officer (EO), employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this EMPr, and for the compilation of regular (usually weekly) Monitoring Reports. The EO must act as liaison and advisor on all environmental and related issues

and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor.

Habitat: The place in which a species or ecological community occurs naturally.

Hazardous waste: Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment.

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

Incident: An unplanned occurrence that has caused, or has the potential to cause, environmental damage.

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 by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager is able to assess whether the Contractor's proposal is in accordance

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.

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: as per the NEM: Waste Amendment Act, 2014 (Act No. 26 of 2014)

(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.

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

but any waste or portion of waste, referred to in paragraph (a) and (b), ceases to be a waste –

(i) once an application for its re-use, recycling or recovery has been approved or, after such approval, once it is, or has been re-used, recycled or recovered;

(ii) where approval is not required, once a waste is, or has been re-used, recycled or recovered;

(iii) where the Minister has, in terms of section 74, exempted any waste or a portion of waste generated by a particular process from the definition of waste; or

(iv) where the Minister has, in the prescribed manner, excluded any waste stream or a portion of a waste stream from the definition of waste.

ACRONYMS

BA	Basic Assessment
BAR	Basic Assessment Report
DAFF	Department of Agriculture, Forestry and Fisheries
dB	Decibels
DEA	Department of Environmental Affairs
DEFF	Department of Environment, Forestry and Fisheries
DENC	Northern Cape Department of Environment and Nature Conservation
DoE	Department of Energy
DMRE	Department of Mineral Resources and Energy
EAP	Environmental Impact Practitioner
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPr	Environmental Management Programme
GPS	Global Positioning System
GWh	Giga Watt hour
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
kV	Kilo Volt
MW	Mega Watt
NEMA	National Environmental Management Act
NEMAA	National Environmental Management Amendment Act
NEMBA	National Environmental Management: Biodiversity Act
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act
NWA	National Water Act
PM	Post Meridiem; "Afternoon"
SAHRA	South African National Heritage Resources Agency
SWMP	Stormwater Management Plan

TABLE OF CONTENTS

APPENDICES LIST

Appendix A: Curriculum Vitae
Appendix B: Correspondence with Authorities
Appendix C: Public Participation Process
Appendix C1 *Public Participation Plan*
Appendix C2: *I&AP Database*
Appendix C3: *Site Notices and Advertisements*
Appendix C4: *Background Information Document*
Appendix C5: *Organs of State Correspondence*
Appendix C6: *Stakeholder Correspondence*
Appendix C7: *Comments Received*
Appendix C8: *Minutes of Meetings*
Appendix C9: *Comments and Responses Report*
Appendix D: Ecology Impact Assessment
Appendix E: Avifauna Impact Assessment
Appendix F: Aquatic Impact Assessment
Appendix G: Soils and Agricultural Potential Impact Assessment
Appendix H: Heritage Impact Assessment (including Archaeology & Palaeontology)
Appendix I: Visual Impact Assessment
Appendix J: Social Impact Assessment
Appendix J(a): *Social Impact Assessment Review*
Appendix K: Traffic Impact Assessment
Appendix L: Screening Report
Appendix M: Environmental Management Programme (EMPr)
Appendix A: *Curriculum Vitae*
Appendix B: *Grievance Mechanism for Public Complaints and Issues*
Appendix C: *Alien Plant and Open Space Management Plan*
Appendix D: *Plant Rescue and Protection Plan*
Appendix E: *Re-vegetation and Rehabilitation Plan*
Appendix F: *Erosion Management Plan*
Appendix G: *Stormwater Management Plan*
Appendix H: *Waste Management Plan*
Appendix I: *Traffic Management Plan*
Appendix J: *Emergency Preparedness, Response and Fire Management Plan*
Appendix K: *Key Legislation*
Appendix L: *Chance Find Protocol*
Appendix M: *A3 Maps*
Appendix N: *Generic EMPr for Naledi PV On-site Facility Substation*
Appendix N: EAP Affirmation and Specialist Declarations
Appendix O: A3 Maps
Appendix P: Additional Information

CHAPTER 1: INTRODUCTION

Naledi PV (Pty) Ltd, a Special Purpose Vehicle (SPV) proposes the development of Naledi PV, a photovoltaic (PV) solar energy facility, as well as, associated infrastructure on a site located 20km south-west of the town of Upington in the Northern Cape Province (refer to **Figure 1.1**). The site falls within the jurisdiction of the Kai !Garib Local Municipality within the greater ZF Mgcawu District Municipality. The Dawid Kruiper Local Municipality borders the site to the east, but is not directly affected. The project will be known as **Naledi PV**. A study area consisting of Portion 3 of the Farm McTaggarts Camp 453 and Portion 12 a portion of Portion 3 of the Farm Klip Punt 452 is being considered for the Naledi PV. A development area[1] of 330ha has been identified within the study area for the construction and operation of the Naledi PV and its associated infrastructure, which is assessed within this Final Basic Assessment (BA) Report.

An operational renewable energy facility known as Khi Solar One, a Concentrated Solar Power (CSP) Plant, is located directly to the south of the development area identified for Naledi PV within the study area on Portion 3 of the Farm McTaggarts Camp 453. From a regional perspective, the Upington area is considered favourable for the development of commercial solar energy facilities by virtue of prevailing climatic conditions, as the economic viability of a solar energy facility is directly dependant on the annual solar irradiation values of a particular area, relief, aspect, the extent of the affected property/properties, the availability of a direct grid connection (i.e. a point of connection to the national grid) and the availability of land on which the development can take place. The complete extent of the study area, inclusive of the development area, is located within Focus Area 7 of the Renewable Energy Development Zones (REDZs), also known as the Upington REDZ.

The REDZ are zones identified by the Department of Environment, Forestry and Fisheries (DEFF) as geographical areas of strategic importance for the development of large-scale solar PV and wind energy development activities and which have been earmarked for the development of renewable energy facilities within South Africa as per GN R114 of February 2018.

Naledi PV is planned to be bid into the Department of Mineral Resource and Energy's (DMRE) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme with the aim of evacuating the generated power into the national grid. This will aid in the diversification and stabilisation of the country's electricity supply with the Naledi PV set to inject 100MW into the national grid. In order to connect Naledi PV to the national grid, a grid connection solution (known as the Khunab Grid Connection) will need to be developed and implemented, which has been assessed in a separate BA process.[2]

[1] The development area is the identified area within Portion 3 of the Farm McTaggarts Camp 453 and Portion 12 a portion of Portion 3 of the Farm Klip Punt 452 within which the required infrastructure for Naledi PV will be sited. The facility layout of the infrastructure and the area to be covered by the infrastructure is known as the development footprint.
[2] DEA Reference No: 14/12/16/3/3/1/2124

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

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

Requirement	Relevant Section
1(a) the details of the EAP who prepared the report and (ii) the expertise of the EAP, including a curriculum vitae.	The details and expertise of the EAP who prepared the report is included in section 1.4 and CVs of the project team are included in **Appendix A**.
(b) the location of the activity including (i) the 21 digit Surveyor General code of each cadastral land parcel, (ii) where available the physical address and farm name and (iii) where the required information in items (i) and (ii) is not available, the co-ordinates of the boundary of the property or properties.	A description of the location of Naledi PV is included in **Table 1.1** and **Figure 1.1**. The information provided includes the 21-digit Surveyor General Code of the affected properties and the farm names. Information on the relevant province, local and district municipalities, ward and current land zoning is also provided.

The Final BA Report is structured according to the following chapters:

- **Chapter 1** provides background to Naledi PV and the BA process.
- **Chapter 2** provides a description of Naledi PV.
- **Chapter 3** provides site selection information and identified project alternatives.
- **Chapter 4** outlines strategic regulatory and legal context for energy planning in South Africa and specifically relating to Naledi PV.
- **Chapter 5** describes the need and desirability of Naledi PV within the study area.
- **Chapter 6** outlines the approach to undertaking the BA process.
- **Chapter 7** describes the existing biophysical and social environment within and surrounding the broader study and development area.
- **Chapter 8** provides an assessment of the potential issues and impacts associated with the solar PV facility and presents recommendations for the mitigation of significant impacts.
- **Chapter 9** provides an assessment of the potential cumulative impacts.
- **Chapter 10** presents the conclusions and recommendations based on the findings of the BA Report.
- **Chapter 11** provides references used in the compilation of the BA Report.

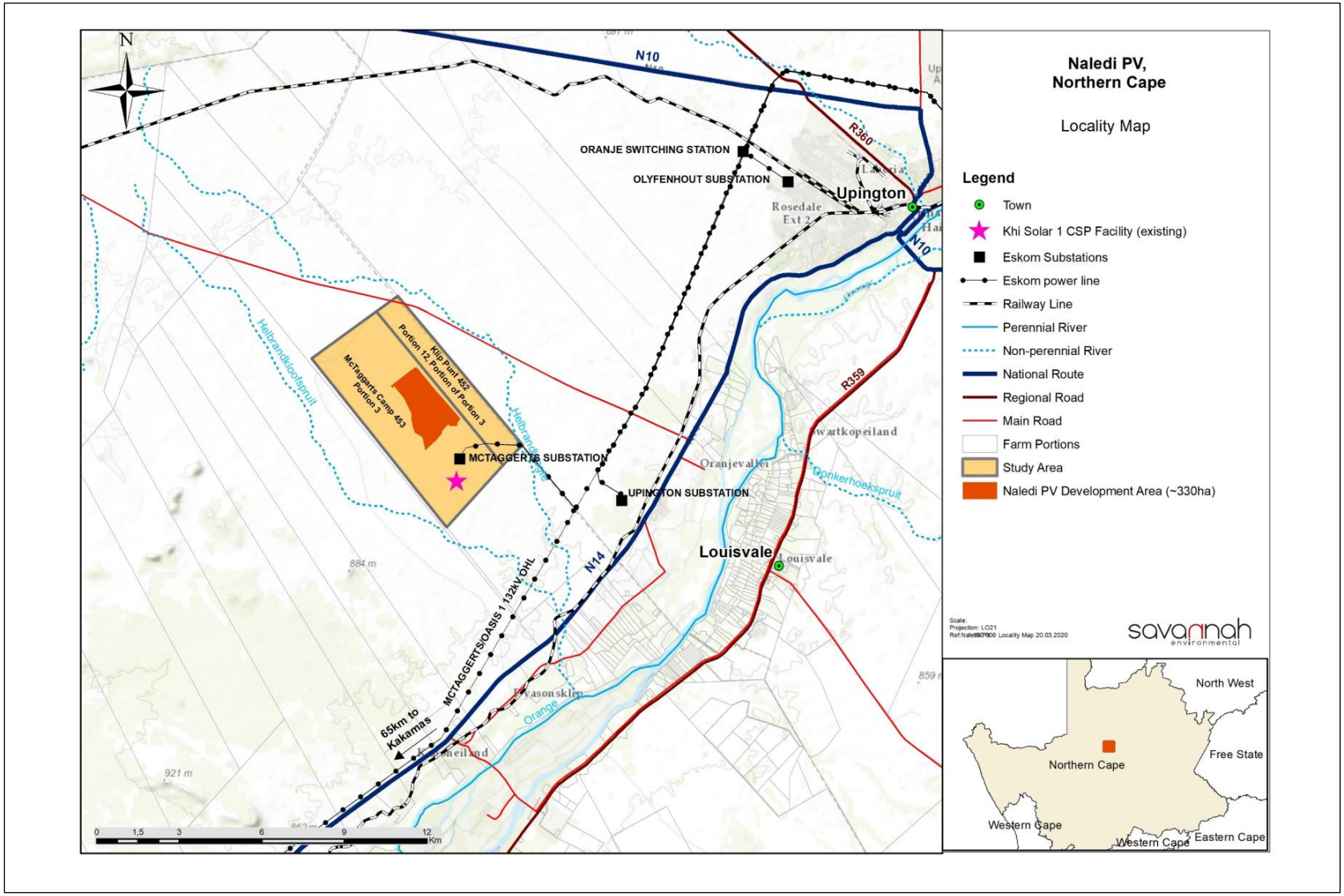

Figure 1.1: A locality map illustrating the Naledi PV development area within the study area.

1.2 Project Overview

The locality information of the study area and development area considered for the development of Naledi PV is included in **Table 1.1** below.

Table 1.1: A detailed description of the Naledi PV development area

Province	**Northern Cape Province**
District Municipality	ZF Mgcawu District Municipality
Local Municipality	Kai !Garib Local Municipality
Ward number(s)	Ward 8 of Kai !Garib Local Municipality
Nearest town(s)	Upington (20km) and Keimoes (24km)
Affected Properties (Study Area) of the development area: Farm name(s), number(s) and portion numbers	Portion 3 of the Farm McTaggarts Camp 453 Portion 12 a portion of Portion 3 of the Farm Klip Punt 452
SG 21 Digit Code (s)	C02800000000045300003 C02800000000045200012
Current zoning of the study area	Agricultural (i.e. grazing) and special use (i.e. energy generation)
Site Co-ordinates (centre of the development area)	28°31'9.08"S 21°3'54.55"E Corner point coordinates of the development area are included in **Appendix O.**

Naledi PV will have a contracted capacity of up to 100MW and will include specific infrastructure, namely:

- Fixed-tilt or tracking solar PV panels with a maximum height of 3.5m;
- Centralised inverter stations or string inverters;
- A permanent laydown area;
- Cabling between the panels, to be laid underground where practical;
- A 22kV or 33kV/132kV on-site facility substation of up to 1ha in extent to facilitate the connection between the solar PV facility and the electricity grid;
- An access road to the development area with a maximum width of 6m;
- Internal access roads within the PV panel array area with a maximum width of 5m; and
- Operation and Maintenance buildings including a gate and security building, control centre, offices, warehouses, a workshop and visitors centre.

The key infrastructure components associated with the development of Naledi PV are described in greater detail within Chapter 2 of this Final BA Report.

1.3 Requirement for a Basic Assessment Process

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

charged by the NEMA with the granting of the relevant environmental authorisation being applied for through this BA process.

Naledi PV is located within the Upington REDZ, one of the eight (8) designated REDZ areas. As the proposed development is located within the Upington REDZ, Naledi PV is subject to a BA process and not a full Scoping and Environmental Impact Reporting (SEIR) process, as well as a shortened timeframe of 57 days for the processing of an application for environmental authorisation. The process to be followed in applying for environmental authorisation for a large-scale PV project in a REDZ area was formally gazetted on 16 February 2018, in GN R114.

The development (i.e. construction and operation) of Naledi PV is subject to the requirements of the EIA Regulations of 2014 (as amended), published in terms of Section 24(5) of NEMA. Therefore, in terms of the EIA Regulations of 2014, promulgated under Section 24 and 24D of NEMA, various aspects of Naledi PV are listed as activities that may have a detrimental impact on the environment. The primary listed activity triggered by Naledi PV is Activity 1 of Listing Notice 2 (GN R325) which relates to the development of facilities or infrastructure for the generation of electricity from a renewable resource where the generating capacity is 20MW or more. Naledi PV will have a contracted capacity of 100MW.

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

1.4 Details and Expertise of the Environmental Assessment Practitioner (EAP)

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

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. The company was established in 2006 with a clear objective to provide services to the infrastructure development sector. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team that has been actively involved in undertaking environmental studies for a wide variety of projects (including those associated with electricity generation and transmission) throughout South Africa and neighbouring countries. Strong competencies have been developed in project management of

environmental processes, as well as strategic environmental assessment and compliance advice, and the assessment of environmental impacts, the identification of environmental management solutions and mitigation/risk minimising measures.

The Savannah Environmental team includes:

» **Reuben Maroga -** the principle author of this report. He holds a Bachelor degree in Environmental Management and an Honours degree in Geology and has three years of experience in the environmental management field. His key focus is on undertaking environmental impact assessments, public participation, environmental management plans and programmes.

» **Lisa Opperman** - the co-author of this report. She holds a Bachelor degree with Honours in Environmental Management and has five 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.

» **Jo-Anne Thomas –** is the registered EAP for this project. Jo-Anne holds a Master of Science Degree in Botany (M.S.c Botany) from the University of the Witwatersrand and is registered as an Environmental Assessment Practitioner (2019/726) with the Environmental Assessment Practitioners Association of South Africa (EAPASA), as well as a Professional Natural Scientist (400024/2000) with the South African Council for Natural Scientific Professions (SACNASP). She has over 20 years of experience in the field of environmental assessment and management, and the management of large environmental assessment and management projects. Her responsibilities for environmental studies include project management, review and integration of specialist studies, identification and assessment of potential negative environmental impacts and benefits, and the identification of mitigation measures, and compilation of reports in accordance with applicable environmental legislation.

» **Nicolene Venter** – a Board Member of IAPSA (International Association for Public Participation South Africa). She holds a Higher Secretarial Diploma and has over 21 years of experience in public participation, stakeholder engagement, awareness creation processes and facilitation of various meetings (focus group, public meetings, workshops, etc.). She is responsible for project management of public participation processes for a wide range of environmental projects across South Africa and neighbouring countries.

Curricula Vitae (CVs) detailing Savannah Environmental team's expertise and relevant experience are included in **Appendix A** of the Final BA Report.

1.5 Details of the Independent Specialist Team

In order to adequately identify and assess potential impacts associated with the project, a number of specialists have been appointed as part of the project team and have provided specialist input into this BA Report (refer to **Table 1.2**). CVs detailing the independent specialists' expertise and relevant experience are provided in **Appendix A**.

Table 1.2: Independent Specialists that contribute to the Final BA Report

Company	Specialist Area of Expertise	Specialist Name
3Foxes Biodiversity Consulting	Ecology	Simon Todd
3Foxes Biodiversity Consulting	Avifauna	Eric Hermann
EnviroSci (Pty) Ltd	Aquatic	Brian Colloty
TerraAfrica	Soils and Agricultural Potential	Marinè Pienaar
Environmental Planning and Design	Visual	Jon Marshall
CTS Heritage	Heritage and Palaeontology	Jenna Lavin
Savannah Environmental and Neville Bews and Associates	Social Environment	Lisa Opperman with peer review by Neville Bews
JG Afrika	Traffic Impact Assessment	Iris Wink
SRK Consulting	Storm Water Management Plan	Jeandre Thompson

CHAPTER 2: PROJECT DESCRIPTION

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

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

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

Requirement	Relevant Section
(c) a plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale.	A plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale is included in **Figure 2.1**.
(h)(ix) the outcome of the site selection matrix;	The outcome of the site selection process undertaken for the identification of the study and development areas is included in section 2.3.

2.2 Project and Site Description

A study area has been identified for the development of Naledi PV which consists of two properties known as Portion 3 of the Farm McTaggarts Camp 453 and Portion 12 a portion of Portion 3 of the Farm Klip Punt 452. The study area is located within Ward 8 of the Kai !Garib Local Municipality and borders to the east, Ward 11 of the Dawid Kruiper Local Municipality within the ZF Mgcawu District Municipality in the Northern Cape Province. It is within the study area that the development area for Naledi PV has been identified and located. The development area is 330ha in extent. The study area and development area can be accessed via the existing Khi Solar One tarred access road off the N14 to the south of the development area for Naledi PV and the Lutzputs gravel road which runs along the east and north-east boundary of the study area and development area.

It must be noted that the development area identified for Naledi PV is located on a site which previously received Environmental Authorisation for the development of a CSP facility, known as the Kai Garib CSP Facility (DEA Ref.: 14/12/16/3/2/656). Due to the lack of opportunity for development of new CSP projects in South Africa, the applicant of the project has subsequently lapsed the validity of the Environmental Authorisation, which has made the area available to undertake a new BA process for a different solar development.

The Naledi PV development area is located within a broader area housing a cluster of operational and proposed solar renewable energy projects and grid connection infrastructure. The development area borders the operational Khi Solar One Facility which is located directly to the south and the Sirius PV Project One located directly to the south of Khi Solar One on the Remaining Extent of the Farm Tungsten Lodge 638. The Dyasons Klip 1 and 2 solar PV projects are located 6km to the south-west of the Naledi PV development area and are also operational. The Klip Punt PV1, McTaggarts PV1, PV2, PV3 (all located within the study area) and the Sirius Solar PV Projects Three and Four have been granted environmental

authorisation by the DEFF and will be bid under future Department of Mineral Resources and Energy's REIPPP Programme/s. Another solar PV facility, Ngwedi PV, is proposed directly to the west of the Naledi PV development area, and within the study area and is being assessed as part of a separate BA process. These projects are located within a 10km radius from the development area of Naledi PV. Furthermore, operational grid connection infrastructure present within the vicinity of the study area include the McTaggerts Substation (including a Power Line, the Sirius PV One Substation and the Dyasons Klip 1 & 2 Substation. These substations are each associated with 132kV power lines which connect each facility to the Upington Main Transmission Substation (MTS) located 7km south-east of the study area and development area of Naledi PV. Furthermore, other power line infrastructure within the vicinity of the study area and development area for Naledi PV include the McTaggerts / Oasis 132kV and the Gordonia/Upington 132kv power lines which connect into and out of the Upington MTS.

A single-circuit, 132kV overhead power line has been assessed within a 300m wide and 13km long corridor (within a stand-alone BA Report) which will be used to connect Naledi PV to the Upington MTS[3].

Naledi PV will use either fixed tilt, single or double axis tracking photovoltaic (PV) panel technology to harness solar irradiation during the operation phase of the project. A layout has been proposed by the proponent, Naledi PV (Pty) Ltd, which is included in **Figure 2.1** and which is assessed in its entirety within this BA Report.

Table 2.1 provides the details of Naledi PV, including the main infrastructure components and services that will be required during the project life cycle.

Table 2.1: Details of Naledi PV and associated infrastructure

Component	Description / Dimensions
Total extent of the Affected Properties, also referred to as the study area	~2 904.7665ha
Total extent of the Development area[4]	~330ha
Total extent of the Development footprint[5]	~230ha
Contracted capacity of the facility	100MW
Technology	Fixed tilt, single or double axis tracking photovoltaic (PV) panel technology.
PV panels	» Height: ~3.5m from ground level (installed). » Constructed over an area of up to 220ha. » Between 350 000 – 400 000 panels required.
On-site Facility Substation	» Located within Portion 3 of the Farm McTaggarts Camp 453. » Approximately 1ha in extent.
Site and internal access	» Direct access to the study area and the development area is

[3] The grid connection solution to connect Naledi PV to the Upington MTS includes the development of a single-circuit 132kV power line and a collector substation (including switching station components), as well as associated infrastructure which has been assessed within a separate BA process (DEA Ref No:14/12/16/3/3/1/2124).
[4] The area within which the infrastructure for Naledi PV will be accommodated.
[5] The area to be covered by the facility layout and infrastructure of Naledi PV.

	provided by the existing Lutzputs gravel road and the existing access road to the Khi Solar One facility which are both connected to the N14 national road. » A 6m wide main gravel/hard surfaced access road will be constructed to provide direct access to the development area. » Two alternative main access roads are being assessed and considered (further details provided in Chapter 3). » A network of 5m wide (with a total length of 10km) gravel internal access roads will be constructed to provide access to the various components of the Naledi PV development.
Permanent laydown area	» Up to 3ha.
Other infrastructure	» Gate and security house » Control centre » Office building » Warehouse » Canteen and visitors centre » Staff locker rooms

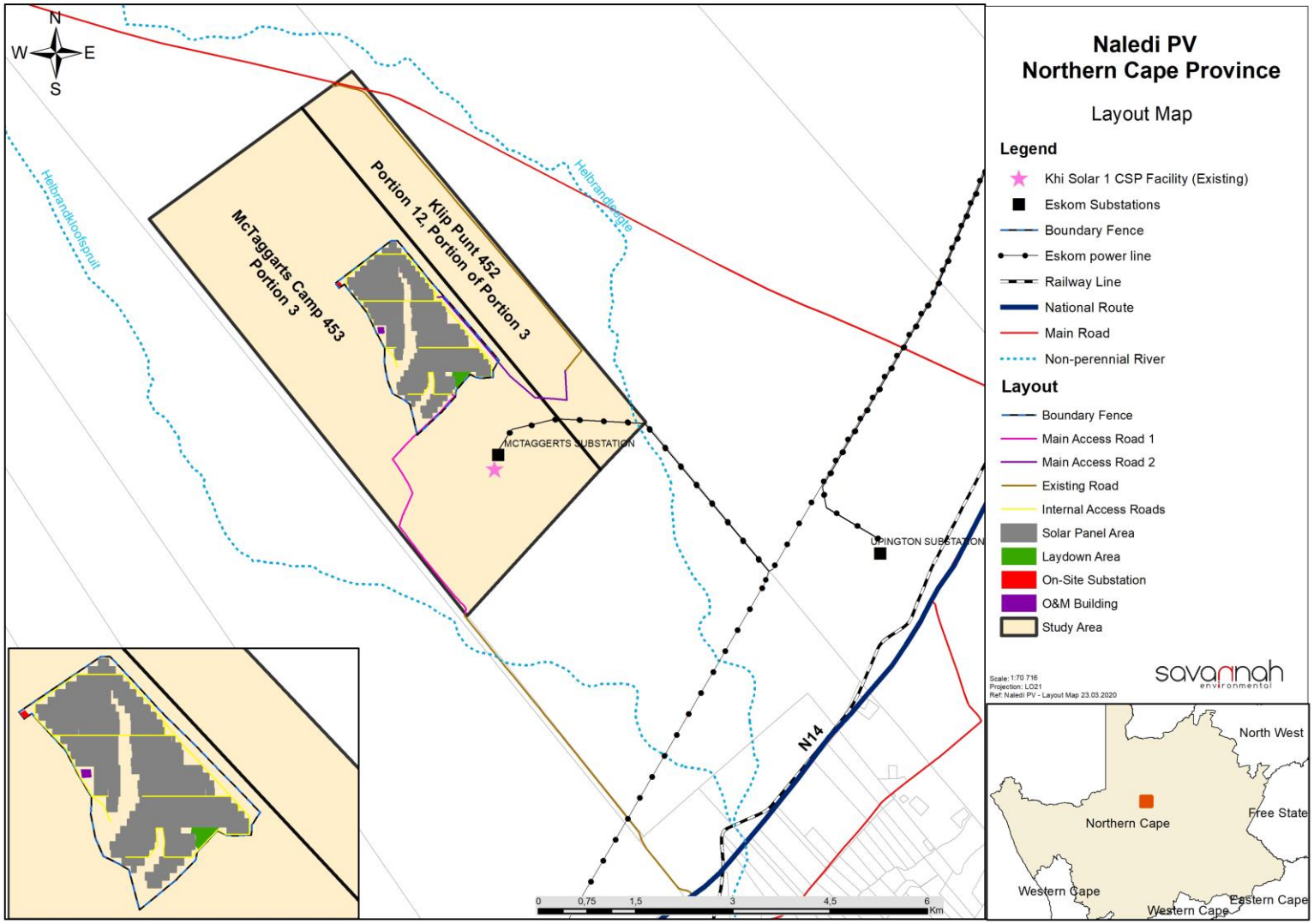

Figure 2.1: Map illustrating the facility layout (i.e. development footprint) for Naledi PV within the development area, which is assessed in this Final BA Report

2.3 Summary of the Site Selection Process

The affected properties, Portion 3 of the Farm McTaggarts Camp 453 and Portion 12 a portion of Portion 3 of the Farm Klip Punt 452, are currently owned by Khi CSP South Africa (Pty) Ltd who purchased the land for the development of the Khi Solar One facility located to the south of the development area for Naledi PV. Naledi PV (Pty) Ltd, the proponent for this application, has entered into a notarial lease agreement with the landowner Khi CSP South Africa (Pty) Ltd. The landowner is therefore in favour of the development and does not view the establishment of the solar PV facility as a conflict with the current land use practices on Portion 3 of the Farm McTaggarts Camp 453 and Portion 12 a portion of Portion 3 of The Farm Klip Punt 452 properties.

A large portion of the Upington area is located within a REDZ and the Northern Corridor of the Strategic Transmission Corridors, which are areas designated by the South African government for the development of large-scale solar PV facilities and grid connection solution infrastructure.

The detail regarding site-specific characteristics and the motivation for the selection of the study area and development area for the development of Naledi PV is provided below:

Study Area Extent, Conditions and Land Availability: The availability of level land of sufficient extent can be a restraining factor for the development of a solar PV facility. The area within which the development area (and study area) is located was previously authorised for the development of the 150MW Kai !Garib CSP Facility. However, considering the allocations made in terms of energy generation technology in the Integrated Resources Plan (IRP), 2019 (which excludes the use and implementation of CSP and includes the generation of 6000MW using Solar PV), the applicant has lapsed the validity of the Environmental Authorisation to make way for the use of technologies given preference in terms of the IRP. The proposed project is, therefore, planned to be developed within an area previously authorised for solar power generation. This is the main consideration in the proponent's site selection process for the project and demonstrates the planned efficient use of a site already planned for energy generation with the most relevant technology as required for the country.

Naledi PV will have a contracted capacity of up to 100MW and would require sufficient space for the placement of infrastructure in order to generate the envisaged contracted capacity. The development area proposed for Naledi PV is ~330ha in extent, which provides for sufficient space for the solar PV facility and allows for the avoidance of any environmental sensitivities where these may be present.

The following are key considerations in terms land availability:

- The study area and development area terrain conditions are optimal for a development of this nature, with the area being of a suitable gradient.
- The region within which the study area is located can be described as a flat plateau. The area is consistent with the land type and classifies the landscape with an average slope of between 0% and 2% which is suitable for a development of this nature.
- The development area would comprise ~11% of the total extent of the affected properties (i.e. Portion 3 of the Farm McTaggarts Camp 453 and Portion 12 a portion of Portion 3 of the Farm Klip Punt 452).
- The development area was previously authorised for a CSP facility, which is considerably more land-intensive than the planned PV facility.

The study area, including the development area, is therefore considered suitable and appropriate from a technical perspective for the construction and operation of Naledi PV.

Site access: Access to the study area and development area is considered as an important characteristic as appropriate access is required for the transportation of project-related infrastructure and heavy machinery during construction. The proximity of the study area to viable access routes decreases the traffic impact on secondary roads during the construction and operation phases of the project. The study area can be readily accessed via the Lutzputs gravel road and the existing tarred access road of the Khi Solar One facility (**Figure 2.1**). The N14 national road is also located 8km south of the study area and connects the town of Upington with other towns/cities such as Springbok, Aggeneys, Pofadder, Kakamas, Keimoes and Johannesburg.

Considering the readily available site access to the study area and the development area, the location of Naledi PV is considered to be suitable and appropriate.

Land use considerations: The current land use of a site is an important consideration in the site selection process in terms of limiting disruption to existing and possible future land use practices. There is no cultivated agricultural land within the affected properties (as a result of low agricultural potential) that could be impacted upon by the development of Naledi PV. The two affected properties are currently used for livestock grazing (Portion 12 a portion of Portion 3 of the Farm Klip Punt 452) and renewable energy generation (Portion 3 of the Farm McTaggarts Camp 453, where the Khi Solar One facility is located). Other activities present within and around the study area include the three operational solar PV facilities, Dyasons Klip 1 and 2 and the Sirius PV Project One. These three projects started operations in February 2020. In addition, other renewable energy projects have been approved by the DEFF or are proposed within the study area and on directly adjacent properties to the study area. These include the following:

Project Name	DEA Reference	Project Status
Klip Punt PV1	14/12/16/3/3/1/2110	Approved
McTaggarts PV1	14/12/16/3/3/1/2111	Approved
McTaggarts PV2	14/12/16/3/3/1/2112	Approved
McTaggarts PV3	14/12/16/3/3/1/2113	Approved
Sirius Solar PV Project Two	14/12/16/3/3/2/470	Approved
Sirius Solar PV Project Three	14/12/16/3/3/1/2704	Approved
Sirius Solar PV Project Four	14/12/16/3/3/1/2705	Approved
Rooipunt CSP	14/12/16/3/3/1/427	Approved
Solis Power 1 & II	14/12/20/16/3/3/3/82 14/12/16/3/3/2/621	Approved
Bloemsmond Solar 1 & 2	14/12/16/3/3/2/815 14/12/16/3/3/2/816	Approved
Bloemsmond Solar 3, 4 & 5	14/12/16/3/2/2/2042 14/12/16/3/2/2/2044 14/12/16/3/2/2/2043	Approved

Considering the current land uses and activities undertaken within the study area and the surrounding areas, the proposed development is not considered to be in contradiction with these uses and will rather

add to the current activities being undertaken. Therefore, the location of the study area is considered to be acceptable in this regard.

Grid connection considerations: Ease of access into the Eskom national electricity grid is vital to the viability of a solar PV facility and addresses Eskom's concerns for lower cost connection alternatives given current funding constraints. Solar PV facilities that are located near a grid connection point and/or demand centre are favourable and reduce the losses associated with power transmission. Various existing grid connection infrastructure is located within the Upington area and the surrounds of the study area. These include both power lines and substations, namely:

- Oasis / Oranje Switching Station 1 132kV power line;
- Gordonia / Oranje Switching Station 1 132kV power line;
- Oranje Switching Station;
- Olyfenhout Substation;
- McTaggerts Substation (as part of Khi Solar One); and
- Upington Main Transmission Substation (MTS)

The grid connection point for Naledi PV will be the existing Upington MTS located 7km to the south-east of the development area. In order to connect Naledi PV to the national grid, a grid connection solution comprising specific grid connection infrastructure needs to be developed. The grid connection infrastructure has been assessed as part of a separate application for environmental authorisation through a BA process.

2.4 PV Technology considered for Naledi PV and the Generation of Electricity

Solar PV energy facilities use the energy from the sun to generate electricity through a process known as the **Photovoltaic Effect**. This effect refers to photons of light colliding with electrons and placing them into a higher state of energy to create electricity. A PV cell is made of silicon acting as a semi-conductor and used to produce the photovoltaic effect. Individual PV cells are linked and placed behind a protective glass sheet to form a PV panel. The PV cell is positively charged on one side and negatively charged on the other side and electrical conductors are attached to either side to form a circuit. This circuit then captures the released electrons in the form of an electric current (direct current). An inverter must be used to convert direct current (DC[6]) to alternating current (AC[7]). The electricity is then stepped up to a higher voltage via a transformer before being evacuated into the national grid via a power line.

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

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

The Photovoltaic Effect is achieved using the following components:

Photovoltaic Cells

A PV cell is made of silicon that acts as a semiconductor used to produce the photovoltaic effect. A single cell is sufficient to power a small device such as an emergency telephone. However, to produce up to 100MW of power, the solar PV facility will require numerous cells arranged in multiples/arrays which will be placed behind a protective glass sheet and fixed to a support structure. Each PV cell is positively charged and negatively charged on each side, with electrical conductors attached to either side to form a circuit. This circuit captures the released electrons in the form of an electrical current (DC).

The Inverter

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

The Support Structure

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 2.2**). 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 that utilise tracking support structures track the movement of the sun throughout the day so as to receive the maximum amount of solar irradiation.

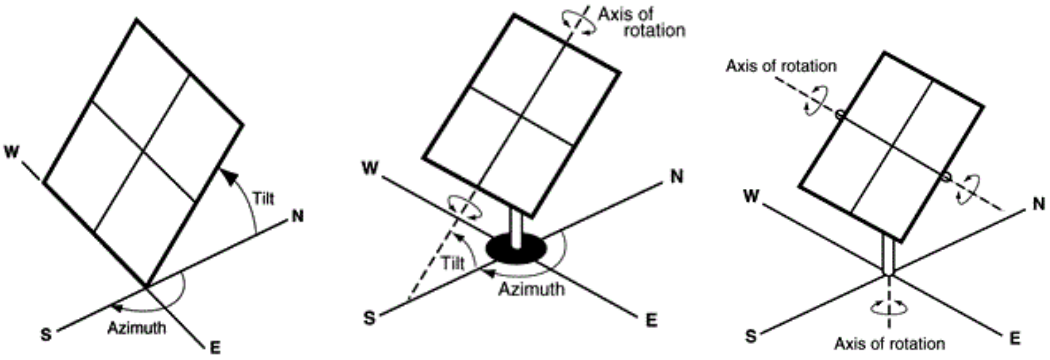

Figure 2.2: Overview of different PV tracking systems (from left to right: fixed-tilt, single-axis tracking, and double-axis tracking) (Source: pveducation.com).

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

2.5 Activities during the Project Development Stages

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

2.5.1 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 and/or associated infrastructure. While an objective of the Engineering, Procurement and Construction (EPC) Contractor, who will be responsible for the overall construction phase of the project, will be to comply with the approved facility design as far as possible, it should be understood that the construction process is dynamic and that unforeseen changes to the project specifications will take place. This BA 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 DEFF. Importantly, should there be any substantive changes or deviations from the original scope or layout of the project following the layout being approved, the DEFF will need to be notified and where relevant, approval obtained.

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

2.5.2 Construction Phase

The construction phase will entail a series of activities including:

Procurement and employment

Naledi PV is likely to create approximately 300 (at its peak) temporary employment opportunities for a period of ~12 to 18 months, depending on the final design, during the construction phase. Approximately 60% of the opportunities will be available to low skilled workers (construction labourers, security staff, drivers, equipment operators etc.), 25% will be available to semi-skilled personnel (electricians, site managers etc.) and 15% of employment opportunities will be available to skilled individuals (engineers, project managers, site managers etc.). Solar PV facilities make use of high numbers of low skilled and semi-skilled labour during the construction phase which provides opportunity to local labour, where available within the surrounding areas and towns. Employment opportunities for Naledi PV will peak during the construction phase and significantly decline during the operation phase.

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

The study area is accessible via the existing Lutzputs gravel road (D3276) and the access road of the Khi Solar One facility, which at separate sections come off the N14 national road, which is located to the south of the development area for Naledi PV. Within the study area itself, access will be required from new/existing roads for construction purposes (and limited access for maintenance during operation). A 6m wide access road and a network 5m wide internal access roads (with a combined length of 10km) will be developed to provide access to the development area and to the various project components within the development footprint of Naledi PV.

Undertake Site Preparation

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

Water Usage and Waste Requirements

During the construction phase water will be required for the undertaking of the required construction activities as well as for potable use. For the duration of the construction phase (i.e. 12-18 months) ~12 250m^3 of water will be required. Water for the construction phase will be sourced directly from the Kai !Garib Local Municipality.

Services Required

During the construction phase specific services will be required for the undertaking of the construction activities. The services required include refuse material disposal and sanitation. Chemical toilets will be the primary source of effluent collection. Any other effluent discharge during the construction phase will be collected in sealed containers/tanks and collected via a honey-sucker truck and treated by a service provider (either the local municipality or a Contractor) at a licensed disposal site.

Transport of Components and Equipment to Site

The components for the solar PV facility will be transported to site by road. For Naledi PV, transport of the components would be via the N14 and Lutzputs roads or the access road to Khi Solar One. Some of the components (i.e. substation transformer) may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)[8] by virtue of the dimensional limitations. Typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.) as well as components required for the mounting of the PV support structures, construction of the substation and site preparation.

Establishment of Laydown Areas on Site

A permanent laydown and storage area will be required for the typical construction equipment. Once the required equipment has been transported to site, a dedicated equipment construction camp and a laydown area (of approximately up to 3ha in extent) will be established. The equipment construction camp serves to confine activities and storage of equipment to one designated area and to limit the potential ecological impacts associated with this phase of the project. The laydown area will be used for the storage of the PV panels and the general placement/storage of construction equipment and other component required for the operations of the facility.

Erect PV Panels and Construct Substation and Invertors

The construction phase involves installation of the solar PV panels and the structural and electrical infrastructure to make the plant operational. In addition, preparation of the soil and improvement of the access roads would continue for most of the construction phase. For array installation, typically vertical support posts are driven into the ground. Depending on the results of the geotechnical report a different

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

foundation method, such as screw pile, helical pile, micro-pile or drilled post/pile could be used. The posts will hold the support structures (tables) on which PV arrays would be mounted. Brackets attach the PV modules to the tables. Trenches are dug for the underground AC and DC cabling and the foundations of the inverter enclosures and transformers are prepared. While cables are being laid and combiner boxes are being installed, the PV tables are erected. Wire harnesses connect the PV modules to the electrical collection systems. Underground cables and overhead circuits connect the Power Conversion Stations (PCS) to the on-site AC electrical infrastructure and ultimately the project's on-site substation.

Figure 2.3: Frame, structural details.

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

Establishment of Ancillary Infrastructure

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

Undertake Site Remediation

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

2.5.3 Operation Phase

Naledi PV is expected to be operational for a minimum of 20 years. The facility will, under normal operating conditions, operate continuously, 7 days a week.

Key elements of the Operation and Maintenance plan include monitoring and reporting the performance of the facility, conducting preventative and corrective maintenance, receiving visitors, and maintaining security of the project. The operation phase of Naledi PV will create a maximum of approximately 30 full-time employment opportunities. The number of skilled personnel during the operation phase will comprise

5%, semi-skilled 25% and low-skilled 70%. Employees that could be sourced from the local municipal pool include the less skilled and semi-skilled such as safety and security staff and certain maintenance crew. Highly skilled personnel may need to be recruited from outside the local area.

Water will be required for the operation phase of Naledi PV. Approximately 5 372m^3 of water per annum will be required for the operation of the solar PV facility. The water required will be sourced directly from the Kai !Garib Local Municipality (through a Service Level Agreement).

Other services required for the operation of Naledi PV include refuse material disposal and sanitation. No effluent is anticipated to be produced during the operation phase, except for normal sewage due to the presence of the operations staff. The sewage generated over this period will be collected and treated as per normal standards using a septic or conservancy tank. Should the local municipality not permit the use of the septic tank, sewage will be stored in the conservancy tank and collected either by a honey-sucker truck or by a service provider (contractor) for treatment at a licensed disposal site.

2.5.4 Decommissioning Phase

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

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

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

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

CHAPTER 3: CONSIDERATION OF ALTERNATIVES

This Chapter provides an overview of the various alternatives considered for Naledi PV as part of the BA Process.

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

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

Requirement	Relevant Section
(g) a motivation for the preferred site, activity and technology alternative;	A motivation for the preferred development area, activity and technology alternative is included in section 3.2, and 3.2.2.1.
(h)(i) details of all the alternatives considered;	The details of all alternatives considered are included in section 3.2.
(h)(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such.	A motivation for not considering any alternative development locations is included in section 3.2.2.1.
(h) (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity	A concluding statement indicating the preferred alternatives, and the preferred location of the activity is included in Chapter 10 of the Final BA Report.

3.2 Alternatives Considered during the BA Process

Appendix 1 of the EIA Regulations, 2014 (as amended), provide that a BA Report must contain a motivation for the preferred site (i.e. study and development area), activity and technology alternative. The identified study and development areas for Naledi PV is located within a REDZ area (also known as the Upington REDZ) which is a strategic area identified by the DEFF for the development of large-scale renewable energy projects. At least 13 solar PV and one CSP renewable energy facility have been approved by the DEA within and near the study area, with four being operational (i.e. Khi Solar One, Sirius Solar PV Project One, Dyasons Klip 1 and 2).

The study area under consideration for the development of Naledi PV was previously authorised for the development of the 150MW Kai !Garib CSP Facility[9], whose EA has been lapsed by the applicant (i.e. Kai Garib Solar (Pty) Ltd), considering the allocations made in terms of energy technology in the IRP (2019), which excludes the use and implementation of CSP facilities and includes the generation of 6000MW for solar PV technologies. As a result, the applicant lapsed the validity of the EA in order to make way for the use of the solar PV technology which has been given preference in terms of the IRP (2019). In addition, the proponent to the development of Naledi PV took into consideration a number of characteristics deemed

[9] DEA Reference No: 14/12/16/3/3/2/656

to be essential for the development of a competitive solar PV facility. The characteristics considered include the extent of land available, favourable solar radiation levels, lack of environmentally sensitive features, land availability of the area considered for development, availability and ease of site access, existing and proposed land use activities, grid connection infrastructure within the area and the ease of access to the infrastructure. The study and development areas and directly surrounding areas are considered to contain the necessary characteristics as identified by the developer for the proposed solar PV facility and provides opportunity for a development of this nature. This is supported by the Kai! Garib CSP Facility previously authorised within the area now proposed for the Naledi PV to be developed.

Taking the above into consideration, no alternative site has been assessed within this BA process for the development of Naledi PV and 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; and
» Fundamentally (totally) different alternatives to the project.

The following sections of this Chapter will further substantiate why an alternative site has not been assessed for the development of Naledi PV. The sections will further discuss the activity and technology alternatives assessed within the BA process for this development.

3.2.1 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 DMRE's current Integrated Resource Plan for Electricity 2010 – 2030 (IRP)[10], and will continue to be addressed as part of future revisions thereto. In this regard, the need for renewable energy power generation from solar energy has been identified as part of the technology mix for power generation in the country in the next 20 years. Therefore, fundamentally different alternatives to the proposed project are not considered within this BA process.

3.2.2 Consideration of Incrementally Different Alternatives

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

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

[10] 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.

The applicable alternatives are discussed under the respective sub-headings below and where no alternatives are applicable, a motivation has been included.

i. Property or Location Alternatives

The placement of a solar PV facility is also dependent on several factors including land suitability, climatic conditions (solar irradiation levels), topography, the location of the study area, availability of grid connection infrastructure, the extent of the study area and the need and desirability of the project (discussed in detail in Chapter 5 of the BA Report). Naledi PV (Pty) Ltd as the proponent, considers the preferred development placed within the study area as being highly favourable and suitable for the establishment of a solar PV facility due to the following site-specific favourable characteristics:

- **Land suitability:** The current land use of the development area is an important consideration for site selection in terms of limiting disruption to existing land use practices. The affected properties are currently used for renewable solar energy generation as the existing Khi Solar One facility is located on Portion 3 of the Farm McTaggarts Camp 453, to the south of the development area identified for the development of Naledi PV. In addition, the previously authorised Kai !Garib CSP Tower Facility[11] was proposed to be developed to the north of the Khi Solar One facility on Portion 3 of McTaggarts Camp 453, where Naledi PV is proposed. Sites that facilitate easy construction conditions (i.e. relatively flat topography, lack of major rock outcrops etc.) are also favoured during the site selection process and the proposed development area fits this criterion.

- **Solar resource**: The economic viability of a solar PV facility is directly dependent on the annual direct solar irradiation values of the area within which it will operate. The Global Horizontal Irradiation (GHI) for the study area is in the region of approximately 2278kWh/m^2/annum. The Northern Cape Province is considered to have the highest solar irradiation values of the country and therefore enables the development of solar energy projects and the successful operation thereof.

- **Topography**: The study area consists of extensive to irregular plains on a slightly sloping plateau sparsely vegetated with an average slope of between 0% and 3%. The development area of the project is situated between elevations 844m and 859m above sea level, with an average elevation of 851m. This area generally has a gradual south facing slope (1.2%). The flat topography of the area under investigation is considered as beneficial in terms of the construction activities that will be required.

[11] DEA Reference No: 14/12/16/3/3/2/656

» **Site extent:** The affected properties (i.e. Portion 3 of the Farm McTaggarts Camp 453 and Portion 12 a portion of Portion 3 of the Farm Klip Punt 452), known as the study area, is approximately 2 904.7665ha in extent, which is sufficient for the installation of a facility with a contracted capacity of up to 100MW and allowing for avoidance of environmental site sensitivities. A development area of ~330ha has been identified within the study area within which the solar PV facility will be sited. The development footprint of the facility, i.e. facility infrastructure, would occupy an area of ~230ha, which is equivalent to approximately 70% of the extent of the development area.

» **Site access**: Access to the study area and development area is provided via the existing Lutzputs gravel road (D3237) that is located to the east of the study area; and the Khi Solar One's access road that is located to the west of the study area. Both roads are linked to the N14 national road which is located to the south of the study area and the development area. The N14 national road links the town of Upington with other major towns in the Province, such as Keimoes, Kakamas and Springbok.

» **Grid access:** A key factor in the siting of any solar PV project is that the project must have a viable grid connection. The Upington Main Transmission Substation (MTS) is located approximately 7km south-east of the development area and is proposed as the preferred grid connection point for the facility. In terms of Eskom's 2018 – 2027 Transmission Development Plan (TDP), the document currently stipulates the following grid rollouts for this substation:

Project Name	*Capactity (kV)*	*Project Status*
2 x Upington – Aries	400	To be constructed
Upington – Niewehoop	400	To be constructed
Upington – Ferrum	400	To be constructed

Existing grid infrastructure (i.e. power lines and substations) within close proximity to Naledi PV provide an opportunity for the project to connect to the national grid with minimal new linear infrastructure (i.e. of less than 15km) required to be developed. In order to connect the project to the national grid through the use of the Upington MTS, a grid connection solution comprising specific grid connection infrastructure has been assessed within a separate BA process and will be required for the operation of the Naledi PV facility[12].

» **Geographic location**: The study area and development area are located within the Upington REDZ 7 which is a node identified by National Government for the development of renewable energy projects. Development of renewable energy projects within the area has been on-going with the following solar energy facilities located in close proximity to the development area: the operational Khi Solar One, Sirius Solar PV Project One and the Dyasons Klip 1 and 2 projects (refer to **Figure 3.1**). The development area is also adjacent to a cluster or node of other proposed renewable energy solar PV

[12] The grid connection solution to connect Naledi PV to the Upington MTS has been assessed within a separate BA process (DEA Ref: 14/12/16/3/3/1/2124). The grid connection will include a collector substation, with a switching station component and a 132kV single-circuit power line.

developments, which compliments existing and future land use activities in the area and is in line with the vision of National Government through the promulgation of the REDZ areas.

» **Landowner support:** The selection of a site where the landowner is supportive of the development of a renewable energy facility is essential for ensuring the success of the project. The affected properties, Portion 3 of the Farm McTaggarts Camp 453 and Portion 12 a portion of Portion 3 of the Farm Klip Punt 452, are currently owned by Khi CSP South Africa (Pty) Ltd who purchased the land for the development of Khi Solar One. Naledi PV (Pty) Ltd, the proponent for this application, has entered into a notarial lease agreement with the landowner Khi CSP South Africa (Pty) Ltd. The landowner is therefore in favour of the development and does not view the establishment of the solar PV facility as a conflict with the current land use practices on Portion 3 of the Farm McTaggarts Camp 453 and Portion 12 a portion of Portion 3 of the Farm Klip Punt 452.

Based on the above site-specific attributes, the proponent considers the development area located within the study area as highly preferred for the development of a solar PV facility, and expects that Naledi PV will be able to draw on synergies with existing and under construction projects within the vicinity of the study area. As a result, no location/property alternatives are proposed as part of this BA process.

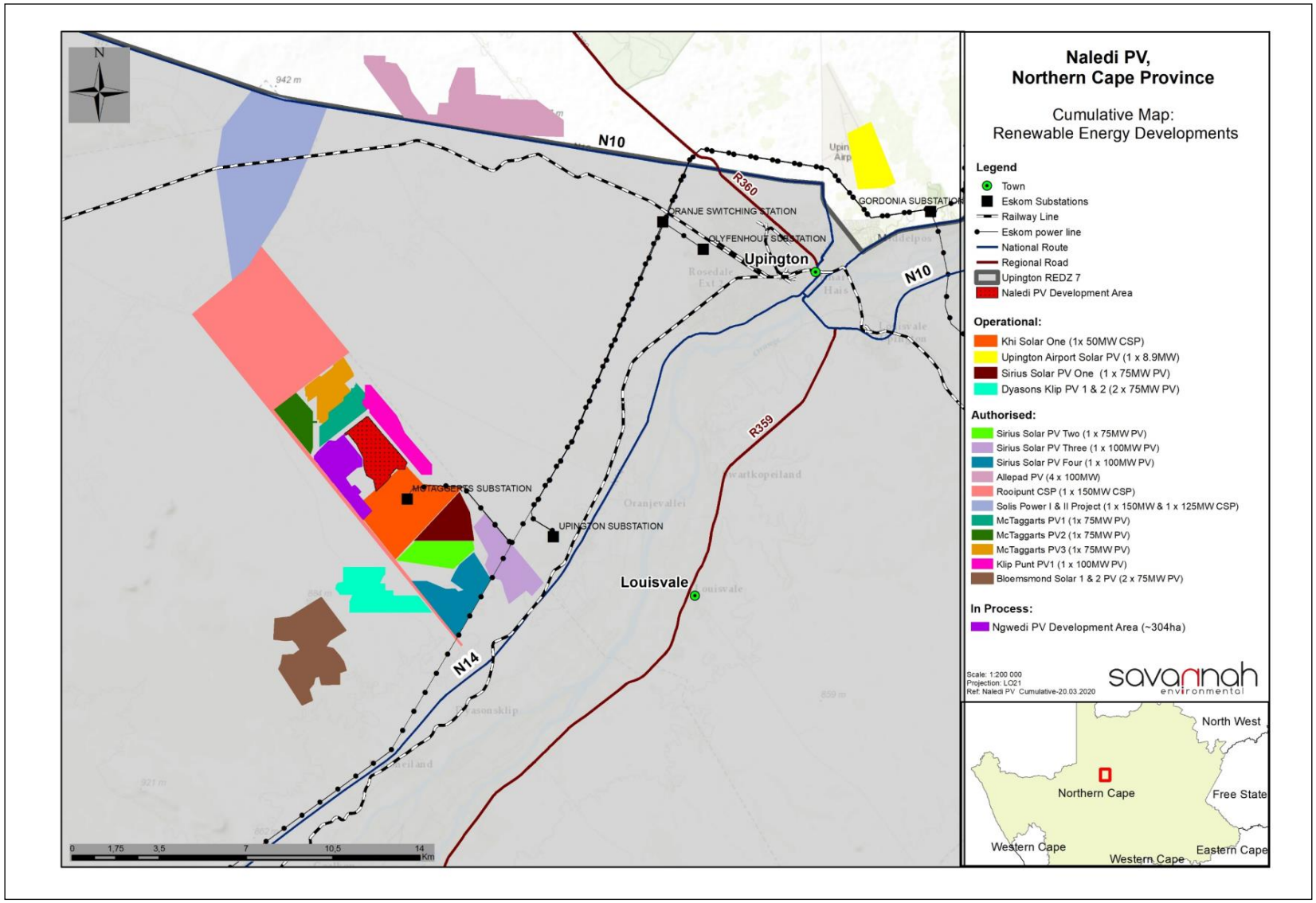

Figure 3.1: A Cumulative Map showing the location of other solar energy facilities in relation to Naledi PV, as well as the Upington REDZ area.

ii. Design and Layout Alternatives

Naledi PV will have a development footprint of approximately 230ha, to be located within the development area of approximately 330ha. Specialist field surveys and assessments were undertaken as part of the BA process in order to provide the proponent with site specific information regarding the study area and the development area considered for the development (refer to **Appendices D-K**). Prior to the finalisation of the layout assessed in this Final BA Report, the proponent undertook extensive consultations with ecological and freshwater specialists to delineate areas of environmental sensitivity within the study area in order ensure that the placement of the solar PV facility and the associated infrastructure does not have a significant and negative impact on the environment and is appropriately placed within the study area. Therefore, areas to be avoided by the development were identified, specifically relating to ecological and hydrological features and sensitivities present within the study area being considered. The identified sensitivities were utilised as a tool by the proponent to identify and locate the development area within the study area. This was undertaken with the aim of avoiding possible highly sensitivity areas within the study area so as to limit impacts associated with the development which would result in unacceptable loss.

As a result, the preferred development area (330ha) within the affected properties (i.e. 2 904.7665ha in extent) is considered as the most feasible and appropriate location for Naledi PV, based on the following considerations:

i) Through consultation with specialists, outside the BA process, the proponent was made aware of areas within the study area of a high ecological and hydrological sensitivity. The proponent acknowledged these sensitivities and has proposed the development area and the development footprint in areas within the study area that avoid high environmental sensitivities that were identified during this process;
ii) Naledi PV (Pty) Ltd, the proponent to this application for environmental authorisation has entered into a notarial lease agreement with the landowner Khi CSP South Africa (Pty) Ltd; and
iii) the development area is considered suitable for the development of a solar PV facility from a technical perspective to ensure the success of the development.

Two main access road alternatives are proposed by the proponent to provide access to the Naledi PV development area during the construction, operation and the decommissioning phase of the proposed development. These include the following:

» Alternative 1 (technically preferred): consists largely of the existing tarred main access road that provides access to the Khi Solar One facility. This road will have a width of 6m and will be 4.3km in length; and
» Alternative 2: routes from the junction of the N14 and the Lutzputs Roads towards the development area for Naledi PV. This road will have a width of 6m and will be 9.5km in length.

Considering the process undertaken above, including the consideration of the on-site sensitivities and their avoidance, a reduction in the on-ground impacts and the opportunity that the development area presents for the development of Naledi PV, no layout alternative is proposed for assessment.

3.2.3 Technology Alternatives

The Upington area has been identified for the development of solar energy renewable facilities, however, the area is not considered suitable for the development of wind energy projects due to the low average wind speeds.

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

Solar PV was determined as the most suitable option for further assessment. The Integrated Resource Plan (IRP) 2019, excludes the procurement of power from CSP facilities until 2030; whereas new additional capacity of approximately 6 000MW will be required from solar PV facilities. Therefore, PV technology was identified as being the preferred option for the study area and consists of a lower visual profile and limited water requirements when compared to the CSP technology option. The study area considered for the development of Naledi PV was previously authorised for the development of a CSP Facility; however, given the allocation of power from solar PV technologies in the IRP (2019), PV technology is considered as the most appropriate technology option. Furthermore, the development of Naledi PV in close proximity to Khi Solar One provides an opportunity to optimally use a site that is currently used for energy generation through making use of solar PV technology, but with reduced visual intrusion and/or impacts and reduced water use requirements.

Therefore, considering the above, no other technology alternatives are being assessed for the development of Naledi PV, and the development of solar PV on the site is considered as the best option for the area considering the current installed technology on the site, the ample solar resource available (proven by the already existing operational CSP facility) and the potential resource saving in terms of water requirements in an area experiencing extreme drought conditions.

When considering PV as a technology for the development of a solar facility, two types of panels could be installed, which 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 PV technologies available, which affect the potential for environmental impacts, relate to the extent of the facility, 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. However, both options are considered to be acceptable for implementation from an environmental perspective. The preference will therefore be determined on the basis of technical considerations and the site conditions.

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

3.2.4 The 'Do-Nothing' Alternative

The 'Do-Nothing' alternative is the option of not constructing Naledi PV. Should this alternative be selected, there would be no environmental impacts or benefits as a result of the construction and operation activities associated with a solar PV facility. The 'Do-Nothing' alternative has been assessed as part of the BA process (refer to **Chapter 8** and **Chapter 10** of this Final BA Report).

CHAPTER 4: POLICY AND LEGISLATIVE CONTEXT

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

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

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

Requirement	Relevant Section
(e) a description of the policy and legislative context within which the development is proposed including- (i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report. (ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments.	A description of the policy and legislative context within which Naledi PV is proposed is included in sections 4.3, 4.4, 4.5 and 4.6.

4.2 Strategic Electricity Planning in South Africa

The need to expand electricity generation capacity in South Africa is based on national policy and informed by on-going strategic planning undertaken by the Department of Mineral Resources and Energy (DMRE). The hierarchy of policy and planning documentation that support the development of renewable energy projects such as a solar energy facility is illustrated in **Figure 4.1**. These policies are discussed in more detail in the following sections, along with the provincial and local policies or plans that have relevance to the development of Naledi PV.

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

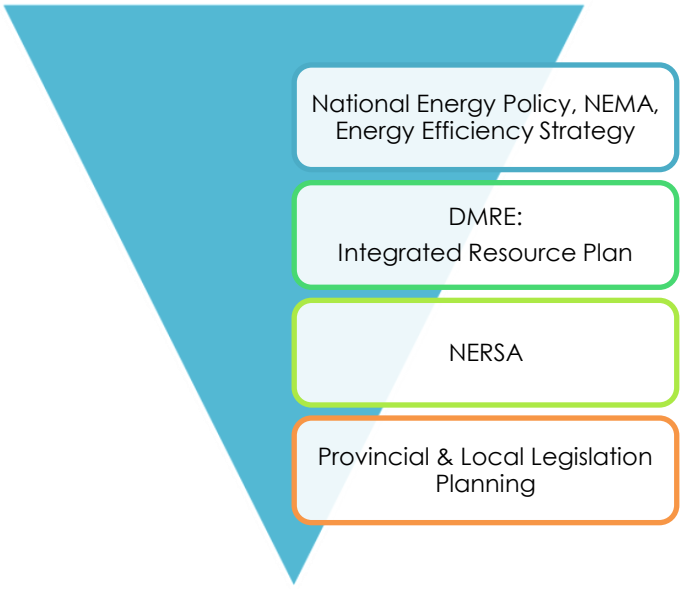

Figure 4.1: Hierarchy of electricity and planning documents

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

- **Department of Mineral Resources and Energy (DMRE):** This Department is responsible for policy relating to all energy forms and for compiling and approving the Integrated Resource Plan (IRP) for electricity. Furthermore, the Department is also responsible for granting approvals for the use of land which is contrary to the objects of the Mineral and Petroleum Resource Development Act (Act No. 28 of 2002) (MPRDA) in terms of Section 53 of the Act. Therefore, in terms of the Act, approval from the Minister is required to ensure that proposed activities do not sterilise mineral resources that may occur within the study area and development area.
- **National Energy Regulator of South Africa (NERSA):** NERSA is responsible for regulating all aspects of the electricity sector and will ultimately issue licenses for IPP projects to generate electricity.
- **Department of Environment, Forestry and Fisheries (DEFF)[13]:** This Department is responsible for environmental policy and is the controlling authority in terms of NEMA and the 2014 EIA Regulations (GN R326) as amended. DEA is the Competent Authority for this project (as per GNR 779 of 01 July 2016), and is charged with granting the EA for the project under consideration.
- **The South African Heritage Resources Agency (SAHRA):** SAHRA is a statutory organisation established under the National Heritage Resources Act (No. 25 of 1999) (NHRA), as the national administrative body responsible for the protection of South Africa's cultural heritage.
- **South African National Roads Agency Limited (SANRAL):** This Agency is responsible for the regulation and maintenance of all national road routes.
- **Department of Water and Sanitation[14]:** This Department is responsible for effective and efficient water resources management to ensure sustainable economic and social development. This Department is

[13] Previously known as the Department of Environmental Affairs (DEA).
[14] The Department of Water and Sanitation (DWS) is soon to become the Department of Human Settlements, Water and Sanitation.

also responsible for evaluating and issuing licenses pertaining to water use (i.e. Water Use Licenses (WUL) and General Authorisation).

» **The Department of Agriculture, Forestry and Fisheries (DAFF)[15]:** This Department is the custodian of South Africa's agricultural resources and is primarily responsible for the formulation and implementation of policies governing the agriculture sector. Furthermore, the Department is also responsible for issuing permits for the disturbance or destruction of protected tree species listed under Section 15 (1) of the National Forest Act (No. 84 of 1998) (NFA).

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

» **Provincial Government of the Northern Cape – Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEA, RD & LR)[16]:** This Department is the commenting authority for the BA process for the project and is responsible for issuing of other biodiversity and conservation-related permits.
» **Northern Cape Department of Transport, Safety and Liaison:** This Department provides effective co-ordination of crime prevention initiatives, provincial police oversight, traffic management and road safety towards a more secure environment.
» **Ngwao-Boswa Ya Kapa Bokone (NBKB):** This Department identifies, conserves and manages heritage resources throughout the Northern Cape Province.

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

4.3 National Policy

Further to the South African government's commitment in August 2011 to support the development of renewable energy capacity, the DMRE initiated the Renewable Energy Independent Power Producer Procurement (REIPPP) Programme to procure renewable energy from the private sector in a series of rounds. To date, the Department has procured 6 422MW of renewable energy capacity from 102 independent power producers (IPPs), with 3 876MW operational and made available to the grid[17]. National policies have to be considered for the construction and operation of the solar PV facility to ensure that the development is in line with the planning of the country.

[15] The Department of Agriculture, Forestry and Fisheries is soon to become the Department of Agriculture, Rural Development and Land Reform

[16] Previously known as the Department of Environment and Nature Conservation.

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

A brief review of the most relevant national policies is provided below in **Table 4.1**. The development of Naledi PV is considered to align with the aims of these policies, even if contributions to achieving the goals therein are only minor.

Table 4.1: Relevant national legislation and policies for Naledi PV

Relevant legislation or policy	Relevance to Naledi PV
Constitution of the Republic of South Africa, 1996	Section 24 of the Constitution pertains specifically to the environment. It states that Everyone has the right to an environment that is not harmful to their health or well-being, and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development. The Constitution outlines the need to promote social and economic development. Section 24 of the Constitution therefore requires that development be conducted in such a manner that it does not infringe on an individual's environmental rights, health, or well-being. This is especially significant for previously disadvantaged individuals who are most at risk to environmental impacts.
National Environmental Management Act (No. 107 of 1998) (NEMA)	This piece of legislation is South Africa's key piece of environmental legislation and sets the framework for environmental management in South Africa. NEMA is founded on the principle that everyone has the right to an environment that is not harmful to their health or well-being as contained within the Bill of Rights. The national environmental management principles state that the social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment. The need for responsible and informed decision-making by government on the acceptability of environmental impacts is therefore enshrined within NEMA.
White Paper on the Energy Policy of the Republic of South Africa (1998)	The White Paper on Energy Policy places emphasis on the expansion of energy supply options to enhance South Africa's energy security. This can be achieved through increased use of RE and encouraging new entries into the generation market. The policy states that the advantages of RE include, minimal environmental impacts during operation in comparison with traditional supply technologies, generally lower running costs, and high labour intensities. Disadvantages include, higher capital costs in some cases, lower energy densities, and lower levels of availability, depending on specific conditions, especially with sun and wind-based systems. Nonetheless, renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future.
White Paper on the Renewable Energy Policy of the Republic of South Africa (2003)	The White Paper on Renewable Energy Policy supplements Government's predominant policy on energy as set out in the White Paper on the Energy Policy of the Republic of South Africa (DME, 1998). The policy recognises the potential of RE and aims to create the necessary conditions for the development and commercial implementation of RE technologies. The White Paper on RE sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing RE in South Africa. The country relies heavily on coal to meet its energy needs due to its abundant, and fairly accessible

Relevant legislation or policy	Relevance to Naledi PV
	and affordable coal resources. However, massive RE resources that can be sustainable alternatives to fossil fuels, have so far remained largely untapped. The White Paper on Renewable Energy of 2003 set a target of 10 000GWh to be generated from RE by 2013 to be produced mainly from biomass, wind, solar and small-scale hydro. The target was subsequently reviewed in 2009 during the RE summit of 2009. The policy supports the investment in RE facilities as they contribute towards ensuring energy security through the diversification of energy supply, reducing GHG emissions and the promotion of RE sources.
National Energy Act (No. 34 of 2008)	The purpose of the National Energy Act (No. 34 of 2008) is to ensure that diverse energy resources are available, in sustainable quantities and at affordable prices, to the South African economy in support of economic growth and poverty alleviation, while taking environmental management requirements into account. In addition, the Act also provides for energy planning, and increased generation and consumption of Renewable Energies (REs). The Act provides the legal framework which supports the development of RE facilities for the greater environmental and social good and provides the backdrop against which South Africa's strategic planning regarding future electricity provision and supply takes place. It also provides the legal framework which supports the development of RE facilities for the greater environmental and social good.
The Electricity Regulation Act (No. of 2006)	The Electricity Regulation Act of 2006, replaced the Electricity Act (No. 41 of 1987), as amended, with the exception of Section 5B, which provides funds for the energy regulator for the purpose of regulating the electricity industry. The Act establishes a national regulatory framework for the electricity supply industry and introduces the National Energy Regulator (NERSA) as the custodian and enforcer of the National Electricity Regulatory Framework. The Act also provides for licences and registration as the manner in which the generation, transmission, distribution, trading, and import and export of electricity are regulated.
Integrated Energy Plan (IEP), 2015	The Integrated Energy Plan (IEP) (which was developed under the National Energy Act (No. 34 of 2008)), recognises that energy is essential to many human activities, and is critical to the social and economic development of a country. The purpose of the IEP is essentially to ensure the availability of energy resources, and access to energy services in an affordable and sustainable manner, while minimising associated adverse environmental impacts. Energy planning therefore needs to balance the need for continued economic growth with social needs, and the need to protect the natural environment.
Integrated Resource Plan for Electricity (IRP) 2010-2030 (2019)	The Integrated Resource Plan (IRP) for Electricity 2010 – 2030 is a subset of the IEP and constitutes South Africa's National electricity plan. The primary objective of the IRP is to determine the long-term electricity demand and detail how this demand should be met in terms of generating capacity, type, timing and cost. The IRP also serves as input to other planning functions, including amongst others, economic development and funding, and environmental and social policy formulation. On 27 August 2018, the then Minister of Energy published a draft IRP which was issued for public comment. The lengthy public participation and consultation process has culminated in the issue of the overdue IRP 2019 which updates the energy forecast from the current period to the year 2030. Since the promulgated IRP 2010, the following capacity developments have taken place:

Relevant legislation or policy	Relevance to Naledi PV
	» A total of 6 422MW has been procured thus far under the REIPPPP, with 3 876MW being currently operational and made available to the grid. In addition, IPPs have commissioned 1005MW from the two (2) Open Cycle Gas Turbines (OCGT) peaking plants; and » Under the Eskom Build Programme, 1 332MW has been procured from the Ingula Pumped Storage Project, 1 588MW and 800MW from the Medupi and Kusile power stations and 100MW from the Sere Wind Farm. Provision has been made for the following new capacity by 2030: » 1 500MW of coal; » 2 500MW of hydro; » 6 000MW of solar PV; » 14 400MW of wind; » 1 860Mw of nuclear; » 2 088MW of storage; » 3 000MW of gas/diesel; and » 4 000MW from other distributed generation, co-generation, biomass and landfill technologies. Based on the IRP 2019, 1 474MW has been installed for solar PV facilities, whereas, 814MW has already been procured. In addition, 1 000MW has been allocated for solar PV facilities from 2022 to 2030. This will bring the total installed capacity of solar PV facilities by 2030 to 8 288MW. Therefore, the development of the Naledi PV is supported by the IRP 2019.
National Development Plan 2030 (2012)	The National Development Plan (NDP) 2030 is a plan prepared by the National Planning Commission in consultation with the South African public which is aimed at eliminating poverty and reducing inequality by 2030. In terms of the Energy Sectors role in empowering South Africa, the NDP envisages that, by 2030, South Africa will have an energy sector that promotes: » Economic growth and development through adequate investment in energy infrastructure. The sector should provide reliable and efficient energy service at competitive rates, while supporting economic growth through job creation. » Social equity through expanded access to energy at affordable tariffs and through targeted, sustainable subsidies for needy households. » Environmental sustainability through efforts to reduce pollution and mitigate the effects of climate change. The NDP aims to provide a supportive environment for growth and development, while promoting a more labour-absorbing economy. The development of Naledi PV supports the NDP through the development of energy-generating infrastructure which will not lead to the generation of GHGs and will result in economic development and growth of the area surrounding the development area.
Strategic Integrated Projects (SIPs)	The Presidential Infrastructure Coordinating Commission (PICC) are integrating and phasing investment plans across 18 Strategic Integrated Projects (SIPs) which have 5 core functions, including to unlock opportunity, transform the economic landscape, create new jobs, strengthen the delivery of basic services and support the integration of African economies.

Relevant legislation or policy	Relevance to Naledi PV
	SIP 8 of the energy SIPs supports the development of RE projects as follows: 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) and supports bio-fuel production facilities. The development of Naledi PV is aligned with SIP 8 as it constitutes a green energy initiative that would contribute clean energy in accordance with the IRP 2010 – 2030.
National Climate Change Response Policy, 2011	The Conference of the Parties (COP) 21 was held in Paris from 30 November to 12 December 2015. From this conference, an agreement to tackle global warming was reached between 195 countries. This Agreement is open for signature and subject to ratification, acceptance or approval by States and regional economic integration organisations that are Parties to the Convention from 22 April 2016 to 21 April 2017. Thereafter, this Agreement shall be open for accession from the day following the date on which it is closed for signature. The agreement can only be sanctioned once it has been ratified by 55 countries, representing at least 55% of emissions. South Africa signed the Agreement in April 2016 and ratified the agreement on 01 November 2016. The Agreement was assented to by the National Council of Provinces on 27 October 2016, and the National Assembly on 1 November 2016. The Agreement was promulgated on 04 November 2016, thirty days after the date on which at least 55 Parties to the Convention, which account for at least 55% of the total global greenhouse gas emissions have deposited their instruments of ratification, acceptance, approval or accession with the Depositary. South Africa's National Climate Change Response Policy (NCCRP) establishes South Africa's approach to addressing climate change, including adaptation and mitigation responses. The NCCRP formalises Government's vision for a transition to a low carbon economy, through the adoption of the 'Peak, Plateau and Decline' (PPD) GHG emissions trajectory whereby South Africa's emissions should peak between 2020 and 2025, plateau for approximately a decade, and then decline in absolute terms thereafter, and based on this the country has pledged to reduce emissions by 34% and 42% below Business As Usual (BAU) emissions in 2020 and 2025, respectively. The policy provides support for Naledi PV, which will contribute to managing climate change impacts, supporting the emergency response capacity, as well as assist in reducing GHG emissions in a sustainable manner.
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. Naledi PV consists of a renewable energy generation facility and would not result in the generation or release of emissions during its operation.

4.4 Provincial Planning and Context

A brief review of the most relevant provincial policies is provided below in **Table 4.2**. The proposed development is considered to align with the aims of these policies, even if contributions to achieving the goals therein are only minor.

Table 4.2: Relevant provincial legislation and policies for Naledi PV

Relevant policy	Relevance to Naledi PV
Northern Cape Provincial Spatial Development Framework (PSDF) 2012	The Northern Cape Provincial Spatial Development Framework (PSDF) 2012 states that the overarching goal for the province is to enable sustainability through sustainable development. The province considers social and economic development as imperative in order to address the most significant challenge facing the Northern Cape, which is poverty. The PSDF identifies key sectoral strategies and plans which are considered to be the key components of the PSDF. Sectoral Strategy 19 refers to a provincial renewable energy strategy. Within the PSDF a policy has been included which states that renewable energy sources (including the utilisation of solar energy) are to comprise 25% of the province's energy generation capacity by 2020. The overall energy objective for the province also includes promoting the development of renewable energy supply schemes which are considered to be strategically important for increasing the diversity of domestic energy supply and avoiding energy imports, while also minimising the detrimental environmental impacts. The implementation of sustainable renewable energy is also to be promoted within the province through appropriate financial and fiscal instruments. The development of Naledi PV supports the overall energy objective of the province to have 25% of its energy from renewable energy sources.
Northern Cape Provincial Spatial Development Framework (PSDF) 2018 Review - Executive Summary	The review of the Northern Cape PSDF (2018) refers to infrastructure investment and that a balance must be maintained between investments aimed at meeting the social needs of communities and investment aimed at promoting economic development and job creation. The Spatial Development Strategy identified in the PSDF for basic infrastructure includes the achieving the provision of green infrastructure which includes renewable energy. As part of the Vision 2040 of the PSDF key opportunities are identified for the Province. The strengthening of the development triangle that is formed by the linking of Kimberley, Vryburg, Upington and De Aar. The development triangle sustains a diverse economy with strong mining, agricultural and renewable energy sectors. It is stated in the PSDF that a sustainable and viable economic network must be driven within the development triangle to improve the return of public investment in the Province. The development of Naledi PV will contribute to the economic network of the development triangle, albeit to a limited extent, specifically in terms of the renewable energy sector.
The Northern Cape Climate Change Response Strategy	The key aspects of the Northern Cape Climate Change Response Strategy (NCCCRS) Report are summarised in the MEC's (NCPG: Environment and Nature Conservation) 2011 budget speech: "*The Provincial Climate Change Response Strategy will be underpinned by specific critical sector climate change adaptation and mitigation strategies that include the Water, Agriculture and Human Health sectors as the 3 key Adaptation Sectors, the Industry and Transport alongside the Energy sector as the 3 key Mitigation Sectors with the Disaster Management, Natural Resources and Human Society, livelihoods and Services sectors as 3 remaining key. Sectors to ensure proactive long-term responses to the frequency and intensity of extreme weather events such as flooding and wildfire, with*

Relevant policy	Relevance to Naledi PV
	heightened requirements for effective disaster management". Key points from the MEC address include the NCPG's commitment to develop and implement policy in accordance with the National Green Paper for the National Climate Change Response Strategy (2010), and an acknowledgement of the NCP's extreme vulnerability to climate-change driven desertification. The development and promotion of a provincial green economy, including green jobs, and environmental learnership is regarded as an important provincial intervention in addressing climate change. The renewable energy sector, including solar and wind energy (but also biofuels and energy from waste), is explicitly indicated as an important element of the Provincial Climate Change Response Strategy. The MEC further indicated that the NCP was involved in the processing 7 wind energy facility and 11 solar energy facility EIA applications (March 2011)[18]. The development of Naledi PV will assist in achieving (although only to a limited extent) the promotion of the provincial green economy of the Northern Cape.

4.5 Local Policy and Planning Context

The local tiers of government within which Naledi PV is located are the Kai !Garib Local Municipality and the ZF Mgcawu District Municipality. The study area for Naledi PV also borders the Dawid Kruiper Local Municipality to the east, but the project does not affect this municipal area. The development instruments or policies at both the district and local level contain objectives which are in line with the development of Naledi PV. These include, economic growth, job creation, community upliftment and poverty alleviation.

Table 4.3: Relevant district and local legislation and policies for Naledi PV

Relevant policy	Relevance to Naledi PV
ZF Mgcawu District Municipality Draft Integrated Development Plan (IDP), 2018/2019 (2017-2022)	The vision of the ZF Mgcawu DM is "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 and development objectives have been identified for the ZF Mgcawu DM: » To monitor and determine the housing backlogs in the district as well as to eradicate sanitation & infrastructure backlogs » To assess and provide targeted support improving institutional capacity and service delivery capabilities of category B-municipalities » 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 » To promote safety of communities in the ZF Mgcawu District through the proactive prevention, mitigation, identification and management of fire and disaster risks » To facilitate the Development of Sustainable regional land use, economic, spatial and

[18] (www.info.gov.za/speech/DynamicAction?pageid=461&sid=22143&tid=45200).

Relevant policy	Relevance to Naledi PV
	environmental planning frameworks that will support and guide the development of a diversified, resilient and sustainable district economy » To market, develop and co-ordinate tourism in the ZF Mgcawu District » To assess and monitor the status of infrastructure needs and requirements of category B Municipalities » To ensure efficient business operations and to fulfil the assurance statutory requirements of the ZF Mgcawu District Municipality 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 its local content and local economic development requirements as prescribed under the REIPPP Programme will be supported through the proposed development. The development of Naledi PV supports the Draft Integrated Plan of the ZF Mgcawu District Municipality through the diversification of the economy within its jurisdiction. Economic activities within the jurisdiction of the municipality are associated with agriculture, therefore, the development of Naledi PV and other proposed solar PV facilities within its jurisdiction presents the municipality with an opportunity to fulfil the objective of a diversified and sustainable economy.
Kai !Garib Local Municipality Integrated Development Plan 2019/2020 (June 2019	There are six established IPP projects located within the municipality. These projects include Khi Solar One (which is located on the same property as Naledi PV), Aries Solar (Solar PV), Dyasons Klip 1 (Solar PV), Dyasons Klip 2 (Solar PV), Sirius Solar PV Project One (Solar PV) and the Neusberg Hydro Electric Project (Hydro). The Kai !Garib LM has identified that there is potential for further IPP projects to become operational in the LM, with several already in the planning stages. Kai !Garib LM is also a participant in the ZF Mgcawu Development Forum, an initiative coordinated by the Industrial Development Corporation (IDC) which aims to ensure that integrated development planning and implementation of regional projects take place. This includes the renewable energy and mining plants, together with other industry stakeholders such as agricultural, business and civil society stakeholders. Kai !Garib LM recognises the importance of participating in this forum to provide a platform for partnerships for regional socio-economic growth. The development of the Naledi PV means the Kai !Garib Local Municipality will add an additional IPP project within its jurisdiction. This will lead to an economic multiplier effect for the municipality and its residents which will fulfil the socio-economic objectives of the IDP such as creation of employment opportunities and economic growth.

4.6 International Policy and Planning Context

A brief review of the most relevant international policies relevant to the establishment of Naledi PV are provided below in **Table 4.4**. Naledi PV is considered to align with the aims of these policies, even if contributions to achieving the goals therein are only minor.

Table 4.4: International policies relevant to Naledi PV

Relevant policy	Relevance to Naledi PV
United Nations Framework Convention on Climate Change (UNFCCC) and Conference of the Party (COP)	Following COP24 held in Katowice, Poland, and Chile's announcement that they could not host the next COP, nearly 27 000 delegates met in Madrid, Spain for COP25 with the intention to finalise the 'rulebook' of the Paris Agreement. The Conference also intended to communicate to the global community that the efforts of the United Nations (UN) to curb climate change remained relevant and that the UN recognised the yawning gap between current progress and global goals to limit global warming. Talks between the Parties were unable to reach consensus in many areas, with a lot of the issues being postponed to the next COP in 2020 under 'Rule 16'of the UN climate process. Matters postponed included, Article 6, reporting requirements for transparency and common timeframes for climate pledges when countries are expected to raise the ambition of their efforts. The UN at COP25 expressed their dissatisfaction with the results of the Conference and that the global community lost out on an opportunity to show increased ambition on mitigation, adaptation and finance to tackle the climate crisis [19]. The policy provides support for Naledi PV which will contribute to managing climate change impacts, supporting the emergency response capacity, as well as assist in reducing GHG emissions in a sustainable manner.
The Equator Principles III (June 2013)	The Equator Principles (EPs) III constitute a financial industry benchmark used for determining, assessing, and managing project's environmental and social risks. The EPs are primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. The EPs are applicable to large infrastructure projects (such as Naledi PV) and apply globally to all industry sectors. Such an assessment should propose measures to minimise, mitigate, and offset adverse impacts in a manner relevant and appropriate to the nature and scale of Naledi PV. 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 IFC Performance Standards on Environmental and Social Sustainability, and Environmental Health and Safety (EHS) Guidelines. Naledi PV is currently being assessed in accordance with the requirements of the EIA Regulations, 2014 as amended (GN R326), published in terms of Section 24(5) of the National Environmental Management Act (No. 107 of 1998) (NEMA), which is South Africa's national legislation providing for the authorisation of certain controlled activities. Through this assessment, all potential social and environmental risks are identified and assessed, and appropriate mitigation measures proposed.

[19] https://www.carbonbrief.org/cop25-key-outcomes-agreed-at-the-un-climate-talks-in-madrid

Relevant policy	Relevance to Naledi PV
International Finance Corporation (IFC) Performance Standards and Environmental and Social Sustainability (January 2012)	The International Finance Corporation's (IFC) Performance Standards (PSs) on Environmental and Social Sustainability were developed by the IFC and were last updated on 1 January 2012. Performance Standard 1 requires that a process of environmental and social assessment be conducted, and an ESMS appropriate to the nature and scale of the project, and commensurate with the level of its environmental and social risks and impacts, be established and maintained. The above-mentioned standard is the overarching standard to which all the other standards relate. Performance Standard 2 through to 8 establish specific requirements to avoid, reduce, mitigate or compensate for impacts on people and the environment, and to improve conditions where appropriate. While all relevant social and environmental risks and potential impacts should be considered as part of the assessment, the standards 2 and 8 describe potential social and environmental impacts that require particular attention specifically within emerging markets. Where social or environmental impacts are anticipated, the developer is required to manage them through its ESMS consistent with Performance Standard 1. Given the nature of Naledi PV, it is anticipated (at this stage of the process) that Performance Standards 1, 2, 3, 4, 6, and 8 may be applicable to the project.

CHAPTER 5: NEED AND DESIRABILITY

Appendix 1 of the EIA Regulations, 2014 (as amended) requires the inclusion of a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location. This Chapter provides an overview of the anticipated suitability of Naledi PV being developed at the preferred location from an international, national, regional, and site-specific perspective. It also provides an overview of the need and desirability and perceived benefits of the project specifically.

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

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

Requirement	Relevant Section
3(f) a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location.	The need and desirability for the development of Naledi PV is included and discussed as a whole within this chapter. The need and desirability for the development of the solar PV facility has been considered from an international, national, regional and site-specific perspective.

5.2 Need and Desirability from an International Perspective

The need and desirability of Naledi PV, from an international perspective, can be described through the project's alignment with internationally recognised and adopted agreements, protocols and conventions. South Africa is a 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 global socio-economic challenges such as poverty, hunger, health, education, climate change, gender equality, water, sanitation, energy, urbanisation, environment and social justice. The SDGs consist of 17 global goals set by the United Nations. The 17 SDGs are characterised by 169 targets, and 304 indicators.

Goal 7 of the SDGs 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	7.A.1	Mobilised amount of United States dollars per year starting in 2020 accountable towards the $100

Targets		Indicators	
	technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.		billion commitment.
7.B	By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support.	7.B.1	Investments in energy efficiency as a percentage of GDP and the amount of foreign direct investment in financial transfer for infrastructure and technology to sustainable development services.

The development of Naledi PV would contribute positively towards Goal 7 of the SDGs 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 Independent Power Producer (IPP) announcements", Dr Tobias Bischof-Niemz and Ruan Fourie) which took into consideration the results of the cost prices bid successfully under the Department of Energy's Renewable Energy (RE) IPP and Coal Baseload IPP Procurement 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.

5.3 Need and Desirability from a National Perspective

5.3.1 Policy and Planning

Naledi PV is proposed in specific response to a National Government initiative, the 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 Naledi PV 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 consider South Africa's current energy production, projected future demands, and provides the necessary framework within which energy generation projects can be developed:

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

The abovementioned energy plans have been extensively researched and are updated on an ongoing basis to take into consideration changing scenarios, new information, developments in new technologies, and to reflect updated demands and requirements for energy production within the South African

context. These plans form the basis of South Africa's energy generation sector and dictate national priorities for energy production.

The IEP is intended to provide a roadmap of South Africa's future energy landscape and guide 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 mega joules per square meter [MJ/m²]) (Stassen, 1996), compared to about 3.6 kWh/m² in parts of the United States and about 2.5 kWh/m² in Europe and the United Kingdom. The total area of high radiation in South Africa amounts to approximately*
194 000 km², 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 30.2 MW, and just 1% of the high radiation area in the country being made available for solar power generation, the generation potential is approximately 64 GW. 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. 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.

Since the promulgated IRP 2010, the following capacity developments have taken place:

» A total of **6 422MW** under the REIPP Programme has been procured with **3 876MW** being operational and made available to the grid;
» **1 005MW** has been commissioned by IPPs from the two (2) Open Cycle Gas Turbine (OCGT) peaking plants; and
» Under the Eskom Build Programme, **1 332MW** has been commissioned from the Ingula Pump Storage Project in Kwa-Zulu Natal, **1 588MW** and **800MW** from the Medupi and Kusile power stations, whereas **100MW** has also been commissioned from the Sere Wind Farm.

In line with government policy to reduce greenhouse gas (GHG) emissions, the IRP uses the moderate decline constraint for GHG emissions. Although, this is subject to change following recent correspondence received from the DEFF 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 2010, the then 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 DMRE and a Power Purchase Agreement (PPA) with Eskom as the buyer. Provision has been made for new additional capacities by the IRP 2019 (refer to **Table 5.1**).

Table 5.1: Overview of the total installed capacity expected by 2030

IPP Procurement Programme	Technology	MW	Total
Renewables	Wind	17 742MW	31 320MW
	Solar CSP	600MW	
	Solar Photovoltaic	8 288MW	
	Hydro	4 600MW	
Coal	Coal	33 364MW	33 364MW
Nuclear	Nuclear	1 860MW	1 860MW
Gas & Diesel	Gas & Diesel	3 000MW	3 000MW
Other (Distributed Generation, CoGen, Biomass, Landfill)	Other (Distributed Generation, CoGen, Biomass, Landfill)	4 000MW	4 000MW

Renewable 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 REIPPP Programme, the DoE intends to secure 14 725MW of electricity from renewable energy generation facilities utilising either onshore wind, concentrated solar thermal, solar photovoltaic (PV), biomass, biogas, landfill gas, or hydro across a number of bidding windows, while simultaneously contributing towards socio-

economic development. A total of 1 474MW[20] of PV generated electricity has been awarded to preferred bidders across four (4) rounds of bidding to date, with 814MW still remaining to be allocated in subsequent bidding rounds. Preferred bidders identified under any IPP Procurement 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, IPP Procurement Programmes also contribute positively towards socio-economic development of a region, over and above job creation.

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

Naledi PV 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, Naledi PV would have reduced water requirements when compared with some other generation technologies in alignment with one of the vision 2030 themes of the then Department of Water and Sanitation's (now the Department of Human Settlements, Water and Sanitation) National Water Resource Strategy 2 (2013) (i.e. transitioning to a low carbon economy through stimulating renewable energy and retrofitting buildings).

5.3.2 Renewable Energy Development Zones (REDZ)

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

The solar photovoltaic (PV) and wind SEA was accordingly commissioned by the DEFF in support of SIP 8, which aims to facilitate the implementation of sustainable green energy initiatives. This SEA identifies areas where large-scale solar PV and wind energy facilities can be developed in terms of SIP 8 and in a manner that limits significant negative impacts on the environment, while yielding the highest possible socio-economic benefits to the country. These areas are referred to as Renewable Energy Development Zones (REDZ).

The procedure to be followed in applying for environmental authorisation for a large-scale project in a REDZ was formally gazetted on 16 February 2018 (in GN R113 and GN R114). The aim of the zones is to streamline the regulatory process, identifying geographical areas where wind and solar PV technologies

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

can be incentivised and where intense grid expansion can be directed. These REDZ will ensure a transition to a low carbon economy, accelerating infrastructure development and contributing to a more coherent and predictable regulatory framework.

As illustrated in **Figure 5.1**, the complete extent of the study area and development area of Naledi PV falls within the Upington REDZ, which was selected by the DEFF as an area highly suitable for the development of solar energy facilities given a range of factors considered, including environmental sensitivities. This alignment with the REDZ area provides further support for the selection of the specific site chosen for this project.

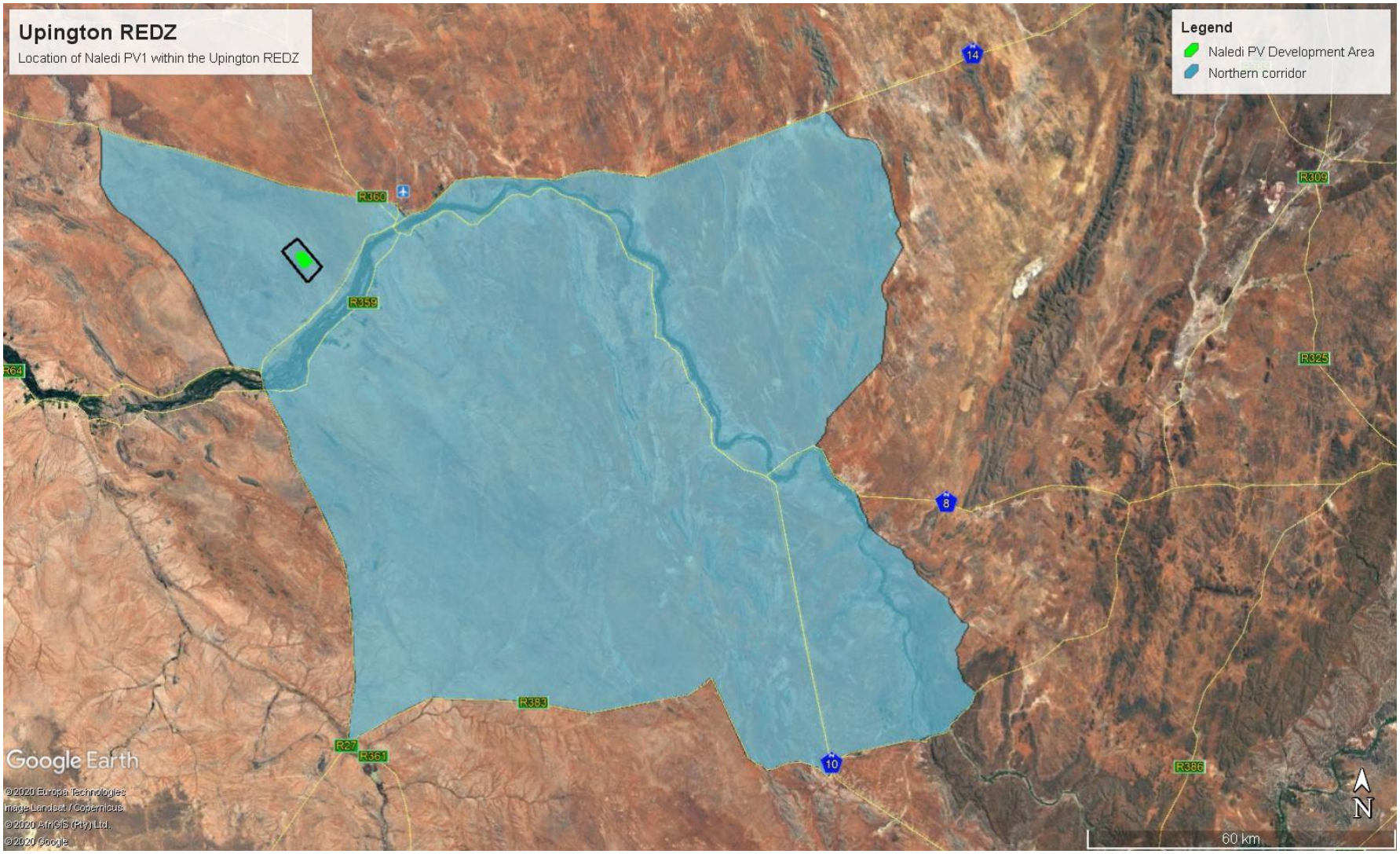

Figure 5.1: Naledi PV is located within the north-western corner of the Upington REDZ area (Zone 7), known as the Upington REDZ.

From a planning perspective, the proposed grid connection solution[21] is also considered to be appropriately located within the Northern corridor of the Strategic Transmission Corridors (refer to **Figure 5.2**).

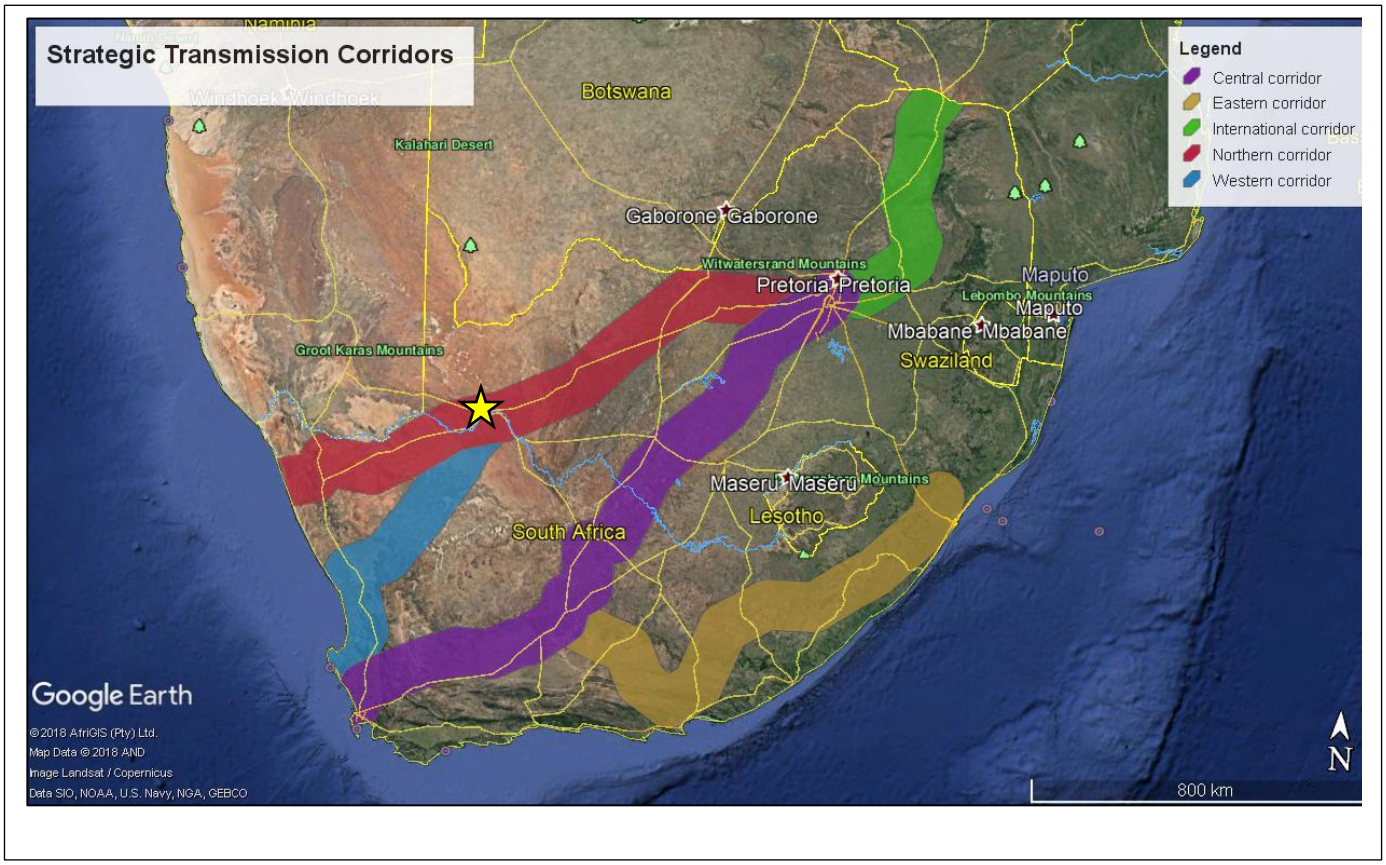

Figure 5.2: Strategic Power Corridors identified as the optimal locations where power infrastructure expansion is needed to enable the balancing of future demand and supply requirements, while minimising negative impacts to the environment. The location of the development area and study area is indicated with the Yellow Star.

5.4 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 (predominantly located in Mpumalanga and Limpopo), and only 0.9% (equivalent to 2 151GWh) was generated by solar (refer to **Figure 5.3**).

[21] The grid connection solution to connect Naledi PV to the Upington MTS has been assessed within a separate BA process.

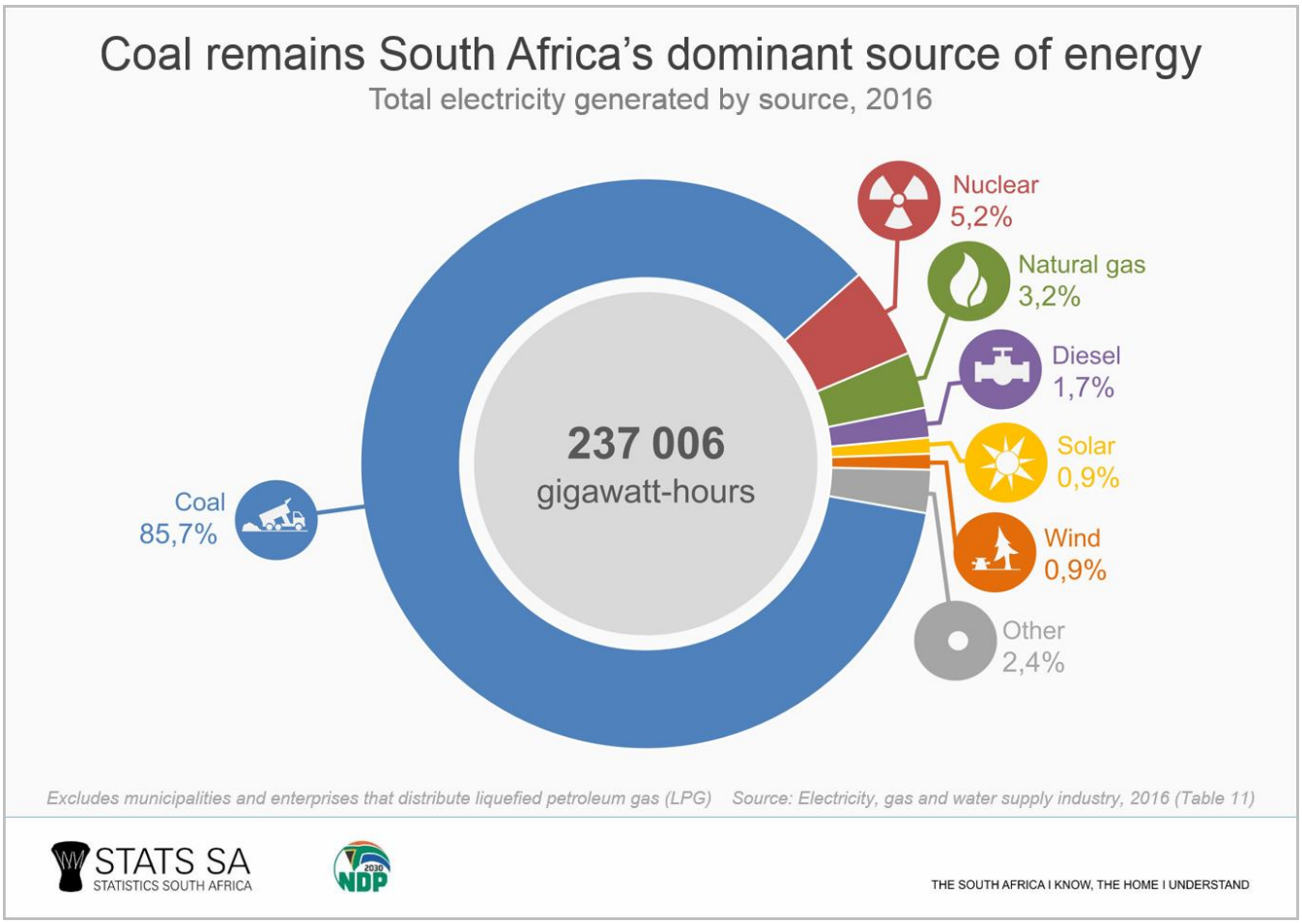

Figure 5.3: Overview of South Africa's electricity generation by source in 2016 (Source: StatsSA 2016 Electricity, gas and water supply industry).

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

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

The overarching objective for the solar energy facility is to maximise electricity production through exposure to the solar resource, while minimising infrastructure, operational and maintenance costs, as well as social and environmental impacts. From a regional site selection perspective, this region is considered to be preferred for solar energy development by virtue of its annual solar irradiation values. The GHI for the area derived from the World Bank Group's Global Solar Atlas is approximately 2264 kWh/m^2/annum, equivalent to the highest GHI values in the country (refer to **Figure 5.4**).

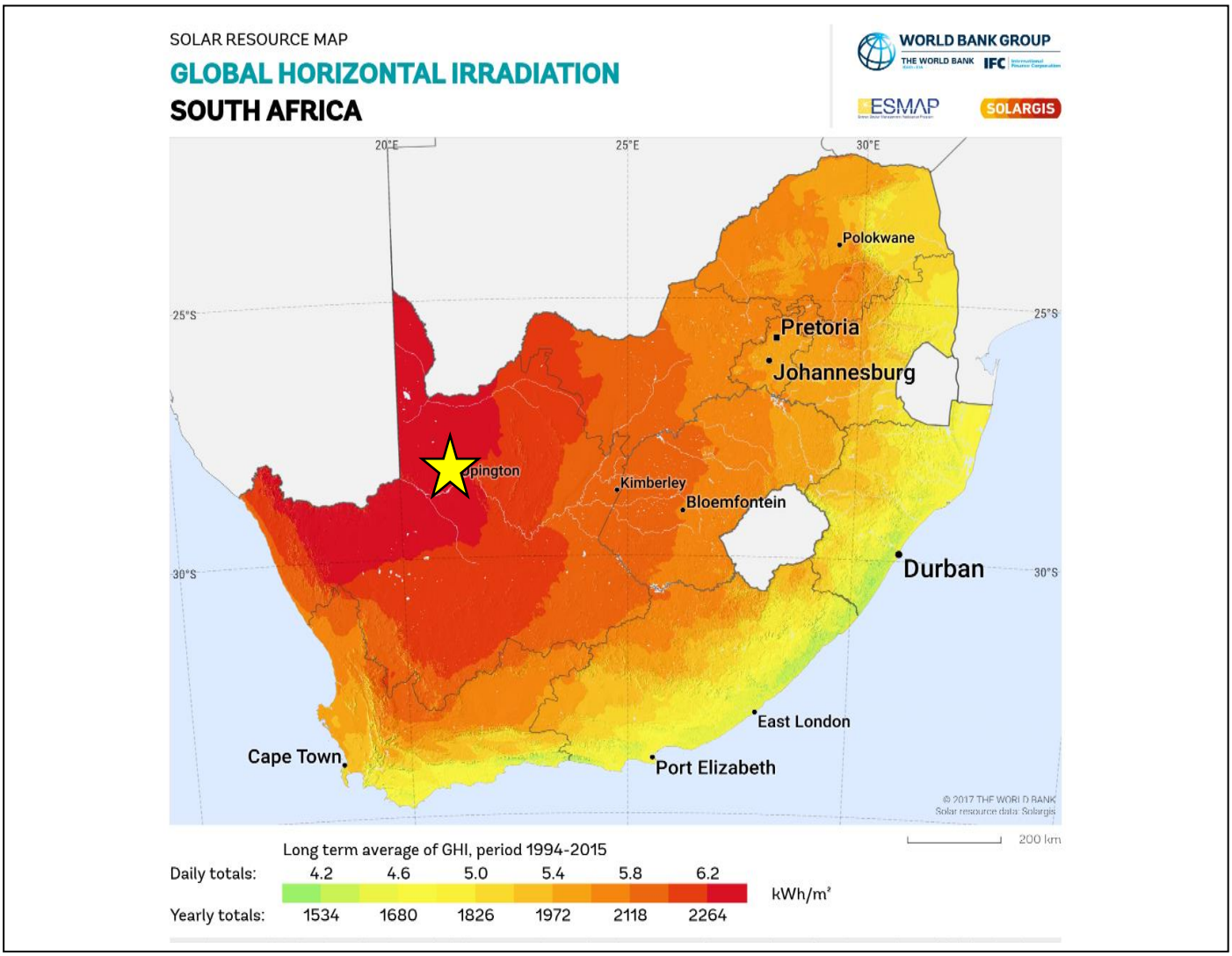

Figure 5.4: Solar irradiation map for South Africa, with the position of Naledi PV shown by the yellow star (Source: World Bank Groups Global Solar Atlas)

5.5 Receptiveness of the proposed development area for the establishment of Naledi PV

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 study area has specifically been identified by the proponent as being highly desirable from a technical perspective for the development of a solar PV facility due to the following site characteristics:

» **Solar resource**: The economic viability of a solar PV facility is directly dependent on the annual direct solar irradiation values. The Global Horizontal Irradiation (GHI) for the study area is in the region of approximately 2278kWh/m²/annum, which is considered favourable for the development of a solar PV facility.

» **Geographic location**: The study and development area is located within the Upington REDZ, which is a node identified by National Government for the development of renewable energy projects, with the

following operational solar energy facilities located in close proximity to the development area: Khi Solar One, Sirius Solar PV Project One, Dyasons Klip 1 and Dyasons Klip 2 solar PV projects. The development area is also adjacent to a cluster or node of proposed solar PV developments, which compliments existing and future land use activities in the Upington area and is in line with the vision of National Government through the promulgation of the REDZ areas. Therefore, the geographical location is considered as preferable and acceptable for the development of Naledi PV.

- **Topography**: The study area consists of extensive to irregular plains on a slightly sloping plateau sparsely vegetated with an average slope of between 0% and 3%. The development area of the project is situated between elevations 844m and 859m above sea level, with an average elevation of 851m. This area generally has a gradual south facing slope (1.2%). The low slope of the study area is preferable for the development of a solar PV facility as construction efforts and costs are minimised, and therefore the study area is considered to be preferable and acceptable for the development of Naledi PV.

- **Site extent and land availability:** The affected properties (i.e. Portion 3 of the Farm McTaggarts Camp 453 and Portion 12 a portion of Portion 3 of the Farm Klip Punt 452), known as the study area, is approximately 2 904.7665ha in extent, which is sufficient for the installation of a facility with a contracted capacity of up to 100MW and allowing for avoidance of environmental site sensitivities. A development area of ~330ha has been identified within the study area within which the solar PV facility will be sited. The development footprint of the facility, i.e. facility infrastructure, would occupy an area of ~230ha, which is equivalent to approximately 70% of the extent of the development area. The extent of land available for the construction and operation of Naledi PV, and the opportunity provided for the avoidance of environmental sensitivities contributes to the need and desirability of the development of Naledi PV in the proposed location. Furthermore, taking into consideration that the previously authorised Kai !Garib CSP Facility was authorised on the area where the development area for Naledi PV is located also adds to the desirability of the proposed development in the area.

- **Access to Road Infrastructure & Site access**: The proximity of the study area to the N14 national road decreases the impact on secondary roads from traffic during the construction and operation phases. As material and components would need to be transported to the development area during the construction phase, accessibility to the study area was a key factor in determining the viability of Naledi PV, particularly taking transportation costs (direct and indirect) into consideration and the impact of this development on the project economics and the ability to submit a competitive bid under the DMRE's REIPPP Programme. Access to the study area and development area is provided via the existing Lutzputs gravel road (D3237) that is located to the east of the study area; and the Khi Solar One facility's access road that is located to the west of the study area. Both roads are linked to the N14 national road which is located to the south of the study area and the development area. The N14 national road links the town of Upington with other major towns in the Province, such as Keimoes, Kakamas and Springbok.

- **Grid access:** A key factor in the siting of any solar PV project is that the project must have a viable grid connection. The Upington MTS is located approximately 7km south-east of the development area. In terms of Eskom's 2018 – 2027 Transmission Development Plan (TDP), the document currently stipulates the following grid rollouts for this substation which are yet to be constructed:

  - 2 x Upington - Aries 400kV lines
  - Upington - Niewehoop 400kV line

» Upington - Ferrum 400kV line

Existing grid infrastructure (i.e. power lines and substations) within close proximity of Naledi PV provide an opportunity for the project to connect to the national grid with minimal new linear infrastructure (i.e. of less than 15km) required to be developed. The grid connection point for Naledi PV will be the existing Upington MTS. In order to connect the project to the national grid at this point, a grid connection solution comprising a collector substation (with switching station components) and a new 132kV overhead power line has been assessed within a separate BA process and will be required for the operation of the Naledi PV facility. The principle to minimise associated infrastructure and the resulting impacts is also supported.

» **Land suitability and land use activities:** The current land use of the development area is an important consideration in site selection in terms of limiting disruption to existing land use practices. The land suitability and current land use activities also need to be considered in terms of the need and desirability of a development within the area proposed. The project study area is currently used for renewable energy generation. The development area for Naledi PV was previously authorised for the 150MW Kai !Garib CSP Facility which was proposed on the area where the development area for Naledi PV is proposed. In addition, the operational Khi Solar One facility is located within Portion 3 of McTaggarts Camp 453 to the south of the development area for Naledi PV.

The Upington area is known as an agricultural hub in the Province, however, certain areas have been severely affected and limited by the prevailing semi-arid to arid climatic conditions in the Province. Agricultural activities undertaken in the Upington area include dry fruit production (i.e. raisins) and wine farms and are restricted to the banks of the Orange River. The study area and development area identified for the development of Naledi PV are located too far away from the banks of the Orange River in order to derive benefit from the water resources. Current grazing activities will not be affected by the development of Naledi PV as these are outside the study area and development area. Therefore, considering the current activities undertaken in the study area and the development area, the development of the solar PV facility is considered to be suitable and will not be in contradiction to these activities.

In addition, other land use activities within the vicinity of the study area include renewable energy generation, particularly that of solar energy through the use of solar irradiation as a fuel resource. The following large-scale solar PV and CSP renewable energy projects are proposed and approved with four already operational (i.e. Khi Solar One, Sirius Solar PV Project One and Dyasons Klip 1 & 2).

Project Name	DEA Reference	Project Status
Klip Punt PV1	14/12/16/3/3/1/2110	Approved
McTaggarts PV1	14/12/16/3/3/1/2111	Approved
McTaggarts PV2	14/12/16/3/3/1/2112	Approved
McTaggarts PV3	14/12/16/3/3/1/2113	Approved
Sirius Solar PV Project Two	14/12/16/3/3/2/470	Approved
Sirius Solar PV Project Three	14/12/16/3/3/1/2704	Approved
Sirius Solar PV Project Four	14/12/16/3/3/1/2705	Approved
Rooipunt CSP	14/12/16/3/3/1/427	Approved
Solis Power 1 & II	14/12/20/16/3/3/3/82 14/12/16/3/3/2/621	Approved

Bloemsmond Solar 1 & 2	14/12/16/3/3/2/815 14/12/16/3/3/2/816	Approved
Bloemsmond Solar 3,4 & 5	14/12/16/3/2/2/2042 14/12/16/3/2/2/2044 14/12/16/3/2/2/2043	Approved
Ngwedi PV	TBA	Proposed

The approval, construction and operation of the above listed facilities provides an indication of the suitability and desirability of power generation through the use of solar power within the Upington area, as well as the surrounding areas of the study area and the study area itself.

From a land suitability perspective, sites that facilitate easy construction conditions, which include a relatively flat topography and the lack of major outcrops are predominantly preferred for development of solar PV facilities.

» **Agricultural potential:** The unfavourable climate of the Kalahari greatly reduces the agricultural potential of the Upington area and other surrounding towns, i.e. Keimoes. The area is known as an agricultural hub; however, the study area is located too far away from the Orange River and its fertile banks to ever be considered for high intensity grazing and/or cultivation practices. The potential agricultural capability of the study area is largely unsuitable for cultivation, based on the natural resources present, including the following limiting factors:

* Low annual rainfall, high evaporation and extreme temperatures which restrict dry land cultivation;
* The very shallow soil depth with its limited water holding capacity restricts root development; and
* Sparse land cover with large bare areas and poor grasses, which also lead to soil erosion as a result of sheet wash.

The development of Naledi PV will therefore not result in the loss of high agricultural areas and intensive agricultural land use activities and will provide a sufficient use of an area that cannot be intensely utilised for agriculture.

» **Landowner support:** The selection of a site where the landowner is supportive of the development of a renewable energy facility is essential for ensuring the success of the project. The affected properties, Portion 3 of the Farm McTaggarts Camp 453 and Portion 12 a portion of Portion 3 of the Farm Klip Punt 452, are currently owned by Khi CSP South Africa (Pty) Ltd who purchased the land for the development of Khi Solar One. Naledi PV (Pty) Ltd, the proponent for this application, has entered into a notarial lease agreement with the landowner Khi CSP South Africa (Pty) Ltd. The landowner is therefore in favour of the development and does not view the establishment of the solar PV facility as a confilct with the current land use practices on Portion 3 of the Farm McTaggarts Camp 453 and Portion 12 a portion of Portion 3 of the Farm Klip Punt 452.

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

considered as a need for further development of existing activities and desirable considering the characteristics of the area.

5.6 Benefits of Renewable Energy and the Need and Desirability

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

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

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

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

entirely, delayed, or a higher stage of load shedding prevented due to the contribution of renewable wind and PV projects[22].

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. The IRP 2019 gazetted by the Minister of Mineral Resources and Energy in October 2019, updating the energy forecast for South Africa from the current period until the year 2030. The IRP 2019 has made an allocation of 6000MW in addition to the already installed/committed capacity of 2 288MW from solar PV facilities which will be developed from 2022 – 2030.

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

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

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

inception, the REIPPP Programme has achieved carbon emission reductions[23] of 25.3 million tonnes of CO_2 (IPP Office, March 2018). The development of Naledi PV, 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.

[23] 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 BASIC ASSESSMENT PROCESS

In terms of the EIA Regulations of December 2014 (as amended in April 2017) published in terms of the NEMA (Act No. 107 of 1998) as amended, the construction and operation of Naledi PV is a listed activity requiring environmental authorisation. In terms of GN R114 of February 2018, the application for environmental authorisation is required to be supported by a BA process based on the location of the study area and the development area within the Upington REDZ.

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

Following the initiation of the Basic Assessment, South Africa was subject to the enforcement of Government Gazette 43096 which placed the country in a national state of disaster limiting the movement of people to curb the spread of the COVID-19 virus. Considering the limitations in place, a comprehensive consultation process was designed and implemented to cater for the undertaking of a full-scale, innovative public participation process which included I&APs, the competent authority, directly impacted landowners/occupiers, adjacent landowners/occupiers, relevant Organs of State departments, ward councillors and other key stakeholders, while remaining within the limits as stipulated by the National Government. This chapter serves to outline the process that was followed during the BA process.

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

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

Requirement	Relevant Section
3(d)(i) a description of the scope of the proposed activity, including all listed and specified activities triggered and being applied for.	All listed activities triggered as a result of the development of Naledi PV have been included in section 6.2, **Table 6.1**. The specific project activity relating to the relevant triggered listed activity has also been included in **Table 6.1**.
3(h)(ii) details of the public participation process undertaken in terms of Regulation 41 of the Regulations, including copies of the supporting documents and inputs.	A public participation plan was prepared and approved by the DEFF (**Appendix C1**). The details of the public participation process undertaken for Naledi PV have been included and described in section 6.3.2.
3(h)(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them.	All comments raised during the 30-day review and comment period of the BA Report and through on-going consultation with I&APs have been addressed and included in the Comments and Responses Report (**Appendix C9**).
3(h)(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and	The methodology used to assess the significance of the impacts of Naledi PV has been included in section 6.4.

risks associated with the alternatives.	
(o) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed.	The assumptions and limitations of the BA process being undertaken for Naledi PV is included in section 6.6.

6.2 Relevant legislative permitting requirements

The legislative permitting requirements applicable to Naledi PV, as identified at this stage in the process, are described in more detail under the respective sub-headings.

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

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

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

The BA process being conducted for Naledi PV was undertaken in accordance with Section 24(5) of the NEMA, which defines the procedure to be followed in applying for Environmental Authorisation, and required 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 were identified in terms of Section 24 of the NEMA which are likely to have a detrimental effect on the environment, and which may not commence without an EA from the competent authority, subject to the completion of an environmental assessment process (either a Basic Assessment (BA) or full Scoping and EIA).

As the proposed development is located within Zone 7 of the Renewable Energy Development Zones (REDZ) (also known as the Upington REDZ), one of the eight (8) designated REDZ areas, the EIA (Environmental Impact Assessment) process followed for Naledi PV was as per GN R114, as formally gazetted on 16 February 2018. Naledi PV was subject to a Basic Assessment process and not a full EIA process. As a result, a shortened timeframe of 57 days is required to process the application for environmental authorisation.

Table 6.1 details the listed activities in terms of the EIA Regulations, 2014 (as amended) that apply to Naledi PV, and for which an application for Environmental Authorisation has been submitted to the DEFF. The table also includes a description of the specific project activities that relate to the applicable listed activities.

Table 6.1: Listed activities as per the EIA regulations that are triggered by Naledi PV

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice):	Describe each listed activity as per project description
GN R327, 08 December 2014 (as amended on 07 April 2017)	11(i)	The development of facilities or infrastructure for the transmission and distribution of electricity - (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts. ***Naledi PV will require the construction and operation of a new 22kV or 33kV/132kV on-site facility substation to facilitate the connection of the facility to the national grid. The development area assessed for the siting of Naledi PV is located outside of an urban area.***
GN R327, 08 December 2014 (as amended on 07 April 2017)	12(ii)(a)(c)	The development of (ii) infrastructure or structures with a physical footprint of 100 square meters or more; where such development occurs (a) within a watercourse or (c) within 32 meters of a watercourse, measured from the edge of a watercourse. ***The development of Naledi PV will require the establishment of infrastructure with a physical footprint exceeding 100m² within a watercourse or within 32m of ephemeral watercourses identified within the development area.***
GN R327, 08 December 2014 (as amended on 07 April 2017)	14	The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic meters or more but not exceeding 500 cubic meters. ***The development and operation of Naledi PV will 80 cubic metres for the storage of dangerous goods, which will include flammable and combustible liquids such as oils associated with the on-site facility substation transformers, lubricants and solvents.***
GN R327, 08 December 2014 (as amended on 07 April 2017)	19	The infilling or depositing of any material of more than 10 cubic meters into, or the dredging, excavation, removal or moving of soil, sand shells, shell grit, pebbles or rock of more than 10 cubic meters from a watercourse. ***A part of the solar PV panel area of the Naledi PV development footprint is located within ephemeral watercourses. Therefore, during the construction phase, 10 cubic metres of rock will be removed from the watercourses for the development of Naledi PV and***

		associated infrastructure.
GN R327, 08 December 2014 (as amended on 07 April 2017)	28(ii)	Residential, mixed, retail, commercial, industrial, or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare. ***Naledi PV (considered to be an industrial development) will be constructed and operated on land previously used for agricultural purposes, mainly grazing. The development footprint considered for the establishment of Naledi PV is 230ha in extent and is located outside an urban area.***
GN R325, 08 December 2014 (as amended on 07 April 2017)	1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more. ***Naledi PV is a solar PV facility and will make use of solar energy as a renewable energy resource. The project will have a contracted capacity of up to 100MW.***
GN R325, 08 December 2014 (as amended on 07 April 2017)	15	The clearance of an area of 20 hectares or more of indigenous vegetation. ***The project will require the clearance of an area of up to 230ha (equivalent to the development footprint) of vegetation. The project is proposed on a property where the predominant land use is grazing and comprises of indigenous vegetation. The project would therefore result in the clearance of an area of indigenous vegetation greater than 20ha in extent.***

6.2.2 National Water Act (No. 36 of 1998) (NWA)

In accordance with the provisions of the National Water Act (No. 36 of 1998) (NWA), all water uses must be licensed with the Competent Authority (i.e. the Regional Department of Water and Sanitation[24]). Water use is defined broadly, and includes 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.

[24] The Department of Water and Sanitation (DWS) is soon to be called the Department of Human Settlements, Water and Sanitation.

Table 6.2 lists the possible Water Uses associated with the proposed project and identified in terms of the NWA which require licensing either in the form of a General Authorisation (GA), or in the form of a WUL. The table also includes a description of those project activities which relate to the applicable Water Uses.

***Table 6.2*:** List of Water Uses published under Section 21 of NWA, as amended.

Notice No.	Activity No.	Description of Water Use
NWA (No. 36 of 1998)	Section 21 (c)	Impeding or diverting the flow of water in a watercourse. ***The development area considered for the establishment of Naledi PV is associated with the presence of ephemeral watercourses. Activities pertaining to the establishment of the solar PV facility might encroach on watercourses which may lead to an impediment and diversion of the flow of water in the watercourses.***
	Section 21 (i)	Altering the bed, banks, course or characteristics of a watercourse. ***The development area considered for the establishment of Naledi PV is associated with the presence of ephemeral watercourses. Activities pertaining to the establishment of the solar PV facility might encroach on watercourses which may lead to the altering of the characteristics of the watercourses.***

In the event that the flow of water in the ephemeral watercourses is affected and the bed, banks or course characteristics are altered, an application would need to be made for a WUL in accordance with the requirements of the Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals (GN R267), or a GA registered in accordance with the requirements of Revision of General Authorisation. The process of applying for a WUL or GA registration will only be completed once a positive EA has been received and the project selected as a Preferred Bidder. This is in line with the requirements of the Department of Water and Sanitation.

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

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

Section 38: Heritage Resources Management

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

- *a. the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;*
- *b. the construction of a bridge or similar structure exceeding 50m in length;*
- *c. any development or other activity which will change the character of a site –*

i). exceeding 5 000m² in extent; or

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

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

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

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

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

6.3 Overview of the Basic Assessment Process for Naledi PV

Key tasks undertaken for the BA included:

- Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
- Submission of the completed Application for Environmental Authorisation to the competent authority (i.e. DEFF) in terms of Regulations 5 and 6 of the EIA Regulations, 2014 (GNR 326), as amended.
- Undertaking a public participation process in accordance with Chapter 6 of GNR326, and the Department of Environmental Affairs (2017), Public Participation guidelines in terms of NEMA EIA Regulations, Department of Environmental Affairs, Pretoria, South Africa (hereinafter referred to as "the Guidelines") in order to identify issues and concerns associated with the proposed project.
- Undertaking of independent specialist studies in accordance with Appendix 6 of the EIA Regulations, 2014 (GNR326), as amended[25].
- Preparation of a BA Report and EMPr in accordance with the requirements of Appendix 1 and Appendix 4 of GN R326.

[25] The independent specialist studies (**Appendix D-K**) have been undertaken in line with the requirements of Appendix 6 of the EIA Regulations, 2014 (as amended) as per the confirmation provided by the DEFF as part of the Pre-application Meeting (**Appendix B**) and as per the email correspondence and directions received by Savannah Environmental via email from the Department on 02 July 2020 (on **Appendix P**).

» 30-day public and authority review period of the BA Report.
» Compilation of a C&R report detailing the comments raised by I&APs, addressing these comments in detail and finalisation of the BA report.
» Submission of a final BA report to the DEFF for review and decision-making.

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

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

In terms of Government Notice 779 of 01 July 2016, the National Department of Environment, Forestry and Fisheries (DEFF) is the competent authority for all projects related to the IRP. As the project is located within the Northern Cape Province, the Northern Cape Department of Agriculture, Environmental Affairs, Rural Development & Land Reform (NC DAEA,RD & LR) is the commenting authority. Consultation with the regulating authorities (i.e. DEFF and DAEA, RD & LR) as well as with all other relevant Organs of State will continue throughout the BA process. To date, this consultation has included the following:

» Holding of a Pre-application Meeting with the DEFF on 17 June 2020 (via the Microsoft Teams Platform) during which the project details, progress and proposed Public Participation Plan was presented. The Public Participation Plan was approved following the pre-application meeting by the Case Officer (Mr Lunga Dlova) via email on 17 June 2020.
» Submission of the application form for Environmental Authorisation to the DEFF via the use of the DEFF Novell Filr System.
» Submission of the BA Report for review and comment by:
  * The competent and commenting authorities.
  * State departments that administer laws relating to a matter affecting the environment relevant to an application for Environmental Authorisation.
  * Organs of State which have jurisdiction in respect of the activity to which the application relates.

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

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

6.3.2. Public Participation Process

Public participation is an essential and regulatory requirement for an environmental authorisation process and is guided by Regulations 41 to 44 of the EIA Regulations 2014 (GN R326) (as amended). The purpose of public participation is clearly outlined in Regulation 40 of the EIA Regulations 2014 (GN R326) (as amended) and is being followed for this proposed project.

The Public Participation Process undertaken for the proposed development of Naledi PV considers the restrictions and limitations imposed by Government through section 27 (2) of the Disaster Management Act

(Act No. 57 of 2002) of 2002 and the Directions issued by the Minister of Environment, Forestry and Fisheries (DEFF) in terms of consultations with I&APs. A Public Participation Plan was prepared and submitted to the DEA on 17 June 2020, prior to the pre-application meeting. Approval of the Plan was provided by the DEFF Case Officer via email on 17 June 2020 following the pre-application meeting (**Appendix B**).

The alternative means of undertaking consultation have been designed and implemented by Savannah Environmental to ensure that I&APs are afforded sufficient opportunity to access project information and raise comments on the project through an interactive web-based platform (i.e. online stakeholder engagement platform) readily available and accessible to any person registering their interest in the project, and ensures that the public participation process is undertaken in line with Regulations 41 to 44 of the EIA Regulations, 2014 as amended. The Public Participation Plan (**Appendix C1**) considers the limitations applied by the Disaster Management Act Regulations prohibiting the gathering of people, as well as limitations which certain I&APs may have in terms of access to computers and internet as well as access to public spaces currently not open for operation that inhibits access to hard copy documentation. The online stakeholder engagement platform implemented by Savannah Environmental for the project allowed the EAP to visually present details regarding the project as well as consultation documentation, including project maps and plans, presentations and posters. The platform also contains the BA report available for review. The use of an online tool enables stakeholders and I&APs to explore the project-specific content in their own time, and still enables them to participate in a meaningful way in the consultation process. The online platform allows for instant feedback and comments to be submitted, in so doing saving time for the stakeholder and also giving the assurance that their comments have been submitted for inclusion in the project reporting.

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

During the BA process:

- provide an opportunity to submit comments regarding the project;
- assist in identifying reasonable and feasible alternatives;
- contribute relevant local information and knowledge to the environmental assessment;
- allow registered I&APs to verify that their comments have been recorded, considered and addressed, where applicable, in the environmental investigations;
- foster trust and co-operation;
- generate a sense of joint responsibility and ownership of the environment; and
- comment on the findings of the environmental assessments.

During the decision-making phase:

- to advise I&APs of the outcome of the competent authority's decision, and how and by when the decision can be appealed.

The public participation process therefore aims to ensure that:

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

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

- » Fix a notice board at a place conspicuous to the public at the boundary or on the fence of—
  - (i) the site where the activity to which the application relates is or is to be undertaken; and
  - (ii) any alternative site mentioned in the application;
- » Give written notice to:
  - (i) the owner or person in control of that land if the applicant is not the owner or person in control of the land;
  - (ii) the occupiers of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
  - (iii) owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
  - (iv) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;
  - (v) the municipality which has jurisdiction in the area;
  - (vi) any organ of state having jurisdiction in respect of any aspect of the activity; and
  - (vii) any other party as required by the competent authority.
- » Place an advertisement in one local newspaper.
- » Open and maintain a register of I&APs and Organs of State.
- » Release of a BA Report for a 30-day review and comment period.
- » Prepare a Comments and Responses (C&R) report which documents the comments received on the BA process and during the 30-day review period and the responses provided by the project team.

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

i. Stakeholder identification and register of I&APs	• Register as an I&AP on the online platfrom via completion of a form and provison of contact information, by responding to an advert, or sending a 'please call me' which will be responded to • State interest in the project • Receive all project related information via email
ii. Advertisments and notifications	• Advertisements, site notices and/or radio announcements and notifications provide information and details on where to access project information • Notifications regarding the EIA process and availability of project reports for public review to be sent via email, post or SMS notifications
iii. Public Involvement and consultation	• Distribution of a BID providing details on the project and how I&APs can become involved in the process • Submission of comments or queries via the online platform to the PP team • Virtual presentations (both English and Afrikaans) available via the online platform • Availability of project information via the online platform • An opportunity for I&APs and stakeholders to request virtual meetings with the project team
iv. Comment on the BA Report	• Availability of the project reports via the online platform for 30-day comment period • Submission of comments via the online platform, email or post to the PP team • Comments recorded and responded to, as part of the process
v. Identification and recording of comments	• Comments and Responses Report, including all comments received, and included within the final Report for decision-making

i. Stakeholder identification and Register of Interested and Affected Parties

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

I&APs were identified through a process of networking and referral, obtaining information from Savannah Environmental's existing stakeholder database, liaison with potentially affected parties in the greater surrounding area and a registration process involving the completion of a reply form. Key stakeholders and affected and surrounding landowners were identified and registered on the project database. Other stakeholders were required to formally register their interest in the project through either directly contacting the Savannah Environmental Public Participation team via phone, message (SMS and WhatsApp), email or fax, or registering their interest via the online stakeholder engagement platform. An initial list of key stakeholders identified and registered is listed in **Table 6.3**.

Table 6.3: Initial list of Stakeholders identified for the inclusion in the project database during the public participation process for Naledi PV

Organs of State
National Government Departments[26]
Department of Environment, Forestry and Fisheries
Department of Mineral Resources
Department of Energy
Department of Agriculture, Land Reform and Rural Development
Department of Water and Sanitation
Government Bodies and State-Owned Companies
Eskom Holdings SOC Limited
National Energy Regulator of South Africa (NERSA)
South African Civil Aviation Authority (CAA)
South African Heritage Resources Agency (SAHRA)
South African National Roads Agency Limited (SANRAL)
South African Radio Astronomy Observatory (SARAO)
Telkom SA SOC Limited

[26] These government departments are soon to be known as the Department of Environment, Forestry and Fisheries (DEFF), Department of Resources and Energy (DMRE), Department of Agriculture, Land Reform and Rural Development (DALRD) and the Department of Human Settlements, Water and Sanitation.

Transnet SA SOC Limited
Provincial Government Departments
Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform
Northern Cape Department of Roads and Public Works
Ngwao Boswa Kapa Bokone (NBKB) – provincial Heritage Authority
Local Government Departments
ZF Mgcawu District Municipality
Kai !Garib Local Municipality – including the Ward Councillor, ward committee members, community representative or local community forum members
Commenting Stakeholders
BirdLife South Africa
Endangered Wildlife Trust (EWT)
SENTECH
Wildlife and Environment Society of South Africa (WESSA)
Landowners
Affected landowners, tenants and occupiers
Neighbouring landowners, tenants and occupiers

As per Regulation 42 of the EIA Regulations, 2014 (as amended), all relevant stakeholder and I&AP information was recorded within a register of I&APs (refer to **Appendix C2** for a listing of the recorded parties). In addition to the above-mentioned EIA Regulations, point 4.1 of the Public Participation Guidelines was followed. The register of I&APs contains the names[27] of:

- all persons who requested to be registered on the database through the use of the online stakeholder engagement platform or in writing and disclosed their interest in the project;
- all Organs of State which hold jurisdiction in respect of the activity to which the application relates; and
- all persons who submitted written comments or attended virtual meetings and viewed the narrated presentations on the Savannah Environmental online platform during the public participation process.

I&APs were been encouraged to register their interest in the BA process from the onset of the project, and the identification and registration of I&APs was continuous for the duration of the BA process. The database of I&APs was updated throughout the BA process and acts as a record of the I&APs involved in the public participation process.

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

ii. Advertisements and Notifications

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

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

- Compilation of a background information document (BID) (refer to **Appendix C4**) providing technical and environmental details on the project and how to become involved in the BA process. The BID and the BA process notification letter announcing the BA process, notifying Organs of State, potentially affected and neighbouring landowners, as well as registered stakeholders/IAPs of Naledi PV, and providing background information of the project and inviting I&APs to register on the project's database were distributed via email on **03 July 2020**. The evidence of the distribution is contained in **Appendix C** of the BA Report. The BID is also available electronically on the Savannah Environmental website (www.savannahsa.com/public-documents/energy-generation/naledi-pv-and-ngwedi-pv/).
- Placement of site notices announcing the BA process at visible points along the boundary of the study area (i.e. the boundaries of the two affected properties), in accordance with the requirements of the

EIA Regulations on **23 June 2020**. Photographs and the GPS co-ordinates of the site notices are included in **Appendix C3** of the Final BA Report.

- Placement of an advertisement in the Gemsbok Newspaper on **08 July 2020** at the commencement of the 30-day review and comment period (**Appendix C3**). This advert:
  - announced the project and the associated BA process,
  - announced the availability of the BA report, the review period, and where it is accessible for review, and invited comment on the BA Report,
  - provided all relevant details to access the Savannah Environmental online stakeholder engagement platform.
- A copy of the newspaper advert as sent to the newspaper is included in **Appendix C3** of the BA Report. The newspaper advert tear sheet has been included in the Final BA Report in **Appendix C3.**
- A Radio Live Read by Radio Riverside (98.2FM) **08 July 2020** at the commencement of the 30-day review and comment period (**Appendix C3**). Further Radio Live Read segments were undertaken at Radio Riverside as a reminder of the availability of the BA report for review and comment on 13 July 2020, 20 July 2020, 27 July 2020, 03 August 2020 and 06 August 2020. Radio Riverside is the local radio station covering the study area.

  The BA Report was made available for review by I&APs for a 30-day review and comment period from **08 July 2020** to **07 August 2020.** An electronic version of the BA Report (CD and/or Dropbox access link) was circulated to Organs of State via courier and email at the commencement of the 30-day review period. The BA Report was also made available on the Savannah Environmental website (www.savannahsa.com/public-documents/energy-generation/naledi-pv-and-ngwedi-pv/). The evidence of distribution of the BA Report has been included in the Final BA Report.

iii. Public Involvement and Consultation

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

Table 6.4: Public involvement for Naledi PV

Activity	Date
Placement of site notices.	23 June 2020
Distribution of the BID, process notification letters and stakeholder reply form announcing the BA process and inviting I&APs to register on the project database. The BID and electronic reply form was also made available on the online stakeholder engagement platform.	03 July 2020
Advertising of the availability of the BA Report for a 30-day review and comment period in Gemsbok Newspaper, including details on how to access the BA Report via the online stakeholder engagement platform.	08 July 2020
Radio Live Read by the Radio Riverside (98.2FM) advertising the availability of the BA Report for a 30-day review and comment period, and the details of how to get involved and how contact with Savannah Environmental can be	08 July 2020 13 July 2020 20 July 2020

made.	27 July 2020 03 August 2020 06 August 2020
Distribution of notification letters announcing the availability of the BA Report for a 30-day review and comment period. These letters were distributed to Organs of State, Government Departments, Ward Councillors, landowners within the surrounding area (including neighbouring landowners), registered I&APs and key stakeholder groups.	08 July 2020
30-day review and comment period of the BA Report.	08 July 2020 – 07 August 2020
Virtual meetings through the use of virtual platforms as determined through discussions with the relevant stakeholder group: » Landowners » Authorities and key stakeholders (including Organs of State, local municipality and official representatives of community-based organisations. Where an I&AP did not have access to a computer and/or internet to participate in a virtual meeting telephonic discussions (including WhatsApp video calls) were set-up and minuted for inclusion. The preferred language of the I&AP was considered when setting up these discussions.	21 July 2020, 9AM with officials of the Kai !Garib Local Municipality and at 11AM with Ward Councillors. Landowners indicated to the project team that a meeting was not required. Proof of correspondence has been included as **Appendix C6** of the final BA Report. Meeting minutes from the Focus Group Meetings held have been included in **Appendix C8** of the final BA Report.
On-going consultation (i.e. telephone liaison; e-mail communication) with all I&APs.	Throughout BA process

iv. Registered I&APs entitled to Comment on the BA Report

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

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

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

(2) Where a person desires but is unable to access written comments as contemplated in subregulation (1) due to –
(a) A lack of skills to read or write;
(b) Disability; or
(c) Any other disadvantage;
Reasonable alternative methods of recording comments must be provided for.

I&APs registered on the database were notified by means of a notification letter of the release of the BA Report for a 30-day review and comment period, invited to provide comment on the BA Report, and informed of the manner in which, and timeframe within which such comment must be made. The BA Report was made available in soft copies to I&APs due to restrictions and limitations on public spaces during the national state of

disaster related to COVID-19. No hard copies of the BA Report were made available for review and comment.

The BA Report was also made available on the Savannah Environmental website (i.e. online stakeholder engagement platform) (www.savannahsa.com/public-documents/energy-generation/naledi-pv-and-ngwedi-pv/). The notification was distributed at the commencement of the 30-day review and comment period, on **08 July 2020**. Where I&APs were not able to provide written comments (including SMS and WhatsApp), other means of consultation, such telephonic discussions were used to provide the I&APs with a platform to verbally raise their concerns and comments on the proposed development. Submission of comments was enabled through the use of the Savannah Environmental online stakeholder engagement platform.

All comments raised as part of the discussions and written comments submitted during the 30-day review and comment period have been recorded and included in **Appendix C9** of the Final BA Report.

v. Identification and Recording of Comments

Comments raised by I&APs over the duration of the BA process have been collated into a Comments and Responses Report (C&RR) which is included in **Appendix C9** of the Final BA Report. This included comments raised through the use of the Savannah Environmental online stakeholder engagement platform. The C&RR includes detailed responses from members of the EIA project team and/or the Developer to the issues and comments raised during the public participation process. Meeting notes of all the telephonic discussions and virtual meetings conducted during the 30-day review and comment period of the BA Report have been included in **Appendix C8**.

The table below provide a summary of the main issues and comments raised by Organs of State and I&APs during the 30-day review and comment period of the BA Report.

Summary of comments raised by Organs of State and Interested and Affected Parties	**Summary of response from EAP**
The DWS Regional Office indicated that it had jurisdiction for the processing of the WULA for the project.	It was confirmed that the DWS Regional Office was the correct office for the processing of the WULA, however and the information was forwarded to the Developer on 17 August 2020.
The DEFF requested that it must be ensure that all listed activities applied for are relevant to the project and can be linked to the development activity or infrastructure as described in the project description.	It was confirmed that all the listed activities applied for are project-specific and can be linked with the project description of Naledi PV.
The DEFF requested that the Lease Agreement from the landowner, Khi CSP South Africa (Pty) Ltd be submitted to the Department with this Final BA Report.	A copy of the Lease Agreement from the landowner Khi CSP South Africa (Pty) Ltd has been included in the Final BA Report as **Appendix P.**
The DEFF acknowledged the approach of the project team for not undertaking the Electro Magnetic Interference (EMI) and Radio Frequency Interference (RFI)	The project team sought written comments from SARAO, which includes the office of the Square Kilometre Array (SKA). The comments have been included in **Appendix C5**

specialist studies as part of the basic assessment and requested that comments from the Square Kilometre Array (SKA) office be obtained.	of the Final BA Report. The response from SKA indicated that the development of Ngwedi PV presents a medium risk in terms of electromagnetic interference to the SKA Radio Telescope, but the need for the implementation of RFI control measures would only be required to be implemented once the full details of the electrical equipment for the proposed development is available.
The DEFF indicated that an EMPr for the on-site substation be submitted in accordance with Regulation 19 (4) of the EIA Regulations. 2014.	The Generic EMPr for the on-site facility substation of Naledi PV has been included as **Appendix N** to the Naledi PV facility EMPr (**Appendix N** of the Final BA Report).
The DEFF: Biodiversity Directorate indicated that a Search and Rescue Plan for the identified species of conservation concern must be submitted as part of the Final BA Report.	A Plant and Rescue Protection Plan is included as **Appendix D** of the EMPr (**Appendix M** of the final BA Report) in the Final BA Report
SAHRA indicated that there were no objections to proposed development, as well as the recommendations of the specialists were supported and must be adhered to by the Developer. In addition, SAHRA indicated should any evidence of archaeological material or unmarked human remains be identified during the project lifecycle of Ngwedi PV, the APM and BGG units should be contacted immediately.	The EMPr (**Appendix M** of the Final BA Report) in Objective 9 of the Construction Phase EMPr (Chapter 6 of the EMPr) includes impact management actions for the APM and BGG units to be contacted immediately by the Developer and Environmental Officer (EO) during the project life cycle of Naledi PV should unmarked human graves / remains or archaeological objects be uncovered.
The Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform indicated that there were numerous developments proposed in the Gordonia region within the vicinity of Ngwedi PV and these developments were located within the Bushmanland Arid Grassland and Kalahari Karroid Shrubland vegetation types. As a result, the Department indicated although the vegetation units had a conservation status of 'Least Threatened' with approximately 99.4% of their extents still remaining, there were major changes within the vegetation as a result of other land uses such as agriculture (i.e. overgrazing, viticulture, etc.) and renewable energy.	The EAP confirmed that the development footprint of Naledi PV falls largely within the Kalahari Karroid Shrubland vegetation as illustrated by **Figure 2** of the Ecological Impact Assessment (**Appendix D** of the Final BA Report) and that the affected vegetation types were associated with a 'Least Threatened' status by the National List of Threatened Terrestrial Ecosystems, 2011. The location of the solar PV facility within a least threatened vegetation type was a factor taken into consideration by the Developer during the site selection process of Naledi PV within the Upington REDZ. Given the extents of the vegetation units still intact, and the development footprint of the solar PV facility, the findings of the Ecological Impact Assessment (**Appendix D** of the Final BA Report) indicate that the development of the solar PV facility within these vegetation types is acceptable.
The Department noted that as per the findings of the Ecological Impact Assessment (**Appendix D** of the Final BA Report) indicated that there will be on listed plant species *Vachellia erioloba* and *Boscia albitrunca*, yet there will be an impacted on *Boscia foetida* species as a result of development.	The EMPr (**Appendix M** of the Final BA Report) in Objective 2 of the Design and Planning Phase EMPr (Chapter 5 of the EMPr) requires the Developer to obtain permits from the NC DAEA, RD & LR for the removal and translocation of *Boscia foetida subsp. foetida* species within the development footprint of Naledi PV.
The ZFM Integrated Community Trust Committee indicated that as the community within the vicinity of the development footprint of Ngwedi PV, the Developer would need to engage relevant community structures	It was indicated that the project is still undergoing the environmental permitting process and once it has been awarded preferred bidder status by the DMRE under the REIPPP Programme, the Developer will be in a position to

regarding the employment and business opportunities associated with the development of the solar PV facility.	engage with the community through a Community Liaison Officer (CLO) regarding the socio-economic challenges and the opportunities the development of Naledi PV can present for members of the community.

6.4 Assessment of Issues Identified through the BA Process

Issues identified as requiring investigation, as well as the specialist consultants involved in the assessment of these impacts are indicated in **Table 6.5** below.

Table 6.5: Specialist consultants appointed to evaluate the potential impacts associated with Naledi PV

Specialist Name	Specialist Company	Specialist Area of Expertise	Appendices
Simon Todd	3Foxes Biodiversity Consulting (Pty) Ltd	Ecology Impact Assessment	Appendix D
Eric Hermann	3Foxes Biodiversity Consulting (Pty) Ltd	Avifauna Impact Assessment	Appendix E
Brian Colloty	EnviroSci (Pty) Ltd	Aquatic Impact Assessment	Appendix F
Marinè Pienaar	TerraAfrica (Pty) Ltd	Soils and Agricultural Potential Impact Assessment	Appendix F
Jenna Lavin	CTS Heritage (Pty) Ltd	Heritage Impact Assessment (including archaeology and palaeontology)	Appendix G
Jon Marshall	Environmental Planning and Design (Pty) Ltd	Visual Impact Assessment	Appendix H
Lisa Opperman and Neville Bews	Savannah Environmental (Pty) Ltd and Neville Bews and Associates	Social Impact Assessment	Appendix I
Iris Wink	JG Afrika	Traffic Impact Assessment	Appendix J

Specialist studies considered direct and indirect environmental impacts associated with the development of all components of Naledi PV. Issues were assessed in terms of the following criteria:

- The **nature**, a description of what causes the effect, what will be affected, and how it will be affected;
- The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high);
- The **duration**, wherein it is indicated whether:
  - The lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  - The lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  - Medium-term (5–15 years) – assigned a score of 3;
  - Long term (> 15 years) - assigned a score of 4;
  - Permanent - assigned a score of 5.
- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
  - 0 is small and will have no effect on the environment;
  - 2 is minor and will not result in an impact on processes;

  - 4 is low and will cause a slight impact on processes;
  - 6 is moderate and will result in processes continuing but in a modified way;
  - 8 is high (processes are altered to the extent that they temporarily cease);
  - 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability of occurrence**, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:
  - Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
  - Assigned a score of 2 is improbable (some possibility, but low likelihood);
  - Assigned a score of 3 is probable (distinct possibility);
  - 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 proponent has the responsibility to avoid or minimise impacts and plan for their management (in terms of the EIA Regulations, 2014 (as amended)), the mitigation of significant impacts is discussed. An assessment of impacts with mitigation is made in order to demonstrate the effectiveness of the proposed mitigation measures. An Environmental Management Programme (EMPr) that includes all the mitigation measures recommended by the specialists for the management of significant impacts is included as **Appendix M**.

6.5 Outcomes of the DEA Web-Based Screening Tool

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

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

Table 6.6: Sensitivity ratings from the DEA's web-based online Screening Tool associated with the development of Naledi PV

Specialist Assessment	Sensitivity Rating as per the Screening Tool (relating the to need for the study)	Project Team Response
Agricultural Impact Assessment	Low	The findings of a Soils, Land Use and Agriculture Impact Assessment indicate that the development area under consideration for the development of Naledi PV is associated with a low agricultural potential. The Soils, Land Use and Agriculture Impact Assessment is included in this Final BA Report as **Appendix G**.
Landscape/Visual Impact Assessment	Very High	Due to the Very High sensitivity rating of the landscape/visual theme, a Visual Impact Assessment has been undertaken for Naledi PV and is included in this Final BA Report as **Appendix I.**
Archaeological and Cultural Heritage Impact Assessment	Medium	A Heritage Impact Assessment (which covers both archaeological and cultural aspects of the study area and the development area) has been undertaken for Naledi PV and is included in this Final BA Report as **Appendix H**.
Palaeontology Impact Assessment	Medium	The Heritage Impact Assessment (included as **Appendix H**) of the Final BA Report includes an assessment of palaeontological resources within the study area and development area.
Terrestrial Biodiversity Impact Assessment	Low	An Ecological Impact Assessment (including flora and fauna) has been undertaken for the Naledi PV and is included as **Appendix D** of the Final BA Report.
Aquatic Biodiversity Impact Assessment	Low	An Aquatic Impact Assessment has been undertaken for the Naledi PV and is included as **Appendix F** of the Final BA Report.
Avian Impact Assessment	Screening Report did not include a rating for this theme; however, the specialist assessment was identified based on the technology proposed.	An Avifauna Impact Assessment Report has been undertaken for the Naledi PV and included as **Appendix E** of the Final BA Report.

Civil Aviation Assessment	Low	The proposed development is located 23km to the south-west of the Upington International Airport. The Civil Aviation Authority will be consulted throughout the BA process.
Defence Assessment	Medium	The proposed study area and development area is not located within the vicinity of any military bases. The nearest military base is the 8 South African Infrantry Battalion (Mechanized Infrantry) which is located outside the town of Upington near the Upington International Airport.
RFI Assessment	Medium	The development area under consideration for the development of Naledi PV, is outside the radius of the Karoo Central Astronomy Advantage Area declared in terms of the Astronomy Geographic Advantage Act (Act No. 21 of 2007) of 2007. The South African Radio Astronomy Observatory (SARAO) was consulted during the 30-day review and comment period of the BA Report to provide written comments on the proposed development. Comments received from SARAO (including the office of the South African Square Kilometre Array (SKA)) have been included in **Appendix C7** of Final BA Report.
Geotechnical Assessment	Screening Report did not include a rating for this theme; however, the specialist assessment was identified as required prior to commencement of the activity.	A Geotechnical Assessment of the development area will be undertaken by the proponent after the project has been granted EA by the Competent Authority and the project has been awarded preferred bidder status under the DMRE's REIPPP Programme.
Socio-Economic Assessment	Screening Report did not include a rating for this theme; however, the specialist assessment was identified.	A Social Impact Assessment has been undertaken and is included in the Final BA Report as **Appendix J**.
Plant Species Assessment	Medium	An Ecological Impact Assessment (including flora and fauna) has been undertaken for the Naledi PV and is included as **Appendix D** of the Final BA Report.
Animal Species Assessment	Low	

6.6 Assumptions and Limitations of the BA Process

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

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

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

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

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

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

Table 6.7 provides an outline of the legislative permitting requirements applicable to Naledi PV as identified at this stage in the project process.

Table 6.7: Applicable Legislation, Policies and/or Guidelines associated with the development of Naledi PV

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

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

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

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

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.		Regulations (GN R668). This will be determined as part of the final walk through survey once the final location of the development footprint and its associated infrastructure within the development area has been determined.
National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)	Section 53 of NEM:BA provides for the MEC / Minister to identify any process or activity in such a listed ecosystem as a threatening process. Three government notices have been published in terms of Section 56(1) of NEM:BA as follows: » Commencement of TOPS Regulations, 2007 (GNR 150). » Lists of critically endangered, vulnerable and protected species (GNR 151). » TOPS Regulations (GNR 152). It provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), and vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (NEM:BA: National list of ecosystems that are threatened and in need of protection, (Government Gazette 37596,	DEFF Northern Cape DAEA, RD & LR	Under NEM:BA, a permit would be required for any activity that is of a nature that may negatively impact on the survival of a listed protected species. Two (2) listed terrestrial mammals may occur within the development area; these include the Near-Threatened Brown Hyaena (*Hyaena brunnea*) and the Black Footed Cat (*Felis nigripes*). It is possible that both species may occur within the development area, however, it is even more likely that the Brown Hyaena is present as this species is often purposefully persecuted in farming areas.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	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).	DEFF Northern Cape DAEA, RD & LR	The development area is associated with minor *Prosopsis glandulosa* invasions particularly around watering points, but in general, there are a few invasive alien plant species present across most of the study area. The *Prosopsis glandulosa* is a Category 3 Listed Invasive Species in the Northern Cape Province in terms of the NEMBA: Alien and Invasive Species List, 2016 (GN R864 of 2016).
Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA)	Section 05 of CARA provides for the prohibition of the spreading of weeds. Regulation 15 of GN R1048 published under CARA provides for the classification of categories of weeds and invader plants, and restrictions in terms of where these species may occur. Regulation 15E of GN R1048 published under CARA provides requirement and methods to implement control measures for different categories of alien and invasive plant species.	Department of Agriculture, Land Reform and Rural Development (DALRD)	CARA will find application throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies need to be developed and implemented. In addition, a weed control and management plan must be implemented. In terms of Regulation 15E (GN R1048) where Category 1, 2 or 3 plants occur a land user is required to control such plants by means of one or more of the following methods: » Uprooting, felling, cutting or burning. » Treatment with a weed killer that is registered for use in connection with such plants in accordance with the directions for the use of such a weed killer.

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

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			Two (2) NFA-listed tree species occur within the development area; these include the *Vachellia erioloba* and *Boscia albitrunca.* These species are associated mainly with the larger drainage lines traversing the development area and very few if any individuals of these species would be impacted by the proposed development of Naledi PV. Only a limited population of these species will be impacted by the development of Naledi PV. Therefore, permits are required from DALRD prior to site clearance during the construction phase.
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	DEFF	While no permitting or licensing requirements arise from this legislation, this Act will be applicable during the construction and operation of Naledi PV, in terms of the preparation and maintenance of firebreaks, and the need to provide appropriate equipment and trained personnel for firefighting purposes.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	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.		
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 –	DEFF – Hazardous Waste Northern Cape DAEA, RD & LR – general waste	No waste listed activities are triggered by Naledi PV, therefore, no Waste Management License is required to be obtained. General and hazardous waste handling, storage and disposal will be required during construction and

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	» Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. In terms of the Regulations published in terms of NEM:WA (GNR 912), a BA or EIA is required to be undertaken for identified listed activities. Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that: » The containers in which any waste is stored, are intact and not corroded or in » Any other way rendered unlit for the safe storage of waste. » 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.		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.
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	South African National Roads Agency (SANRAL) – national roads Northern Cape Department of Transport, Safety and Liaison	An abnormal load / vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits required for vehicles carrying abnormally heavy or abnormally dimensioned loads. Transport vehicles exceeding the dimensional limitations (length) of 22m. Depending on the trailer configuration and height when loaded, some of the on-site substation components may not meet

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	damaging effect on road pavements, bridges, and culverts. The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.		specified dimensional limitations (height and width) which will require a permit.
	Provincial Policies / Legislation		
Northern Cape Nature Conservation Act (Act No. 9 of 2009)	This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project: » Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property; » Aquatic habitats may not be destroyed or damaged; » The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species; The Act provides lists of protected species for the	Northern Cape DAEA, RD & LR	A collection/destruction permit must be obtained from the Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform for the removal of any protected plant or animal species found on site. Species of conservation concern that may be present within the development area include, *Adenium oleifolium, Aloe claviflora* and *Hoodia gordonii*, however none of these species were identified by the specialist within the development area. However, should these species be confirmed within the development area during any phase of the proposed development, permits will be required from the Northern Cape Department of Agriculture, Environmental Affairs, Rural

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	Province.		Development and Land Reform.

6.7.1 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 6.8** is taken from the best practise guidelines and provides a summary of the recommended assessment regimes in relation to proposed solar energy technology, project size, and likely risk).

Table 6.8: Recommended avian assessment regimes in relation to proposed solar energy technology, project size, and known impact risks.

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

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

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

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

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

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

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

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

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

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

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

The Naledi PV study area, including the development area, has been classified as a Regime 2 site, as the area has been defined as a medium sensitive area in terms of the BirdLife South Africa Guidelines. The development area considered for the development of Naledi PV is located adjacent to the operational Khi Solar One; therefore, there already is an impact on birds in the area. Seasonal monitoring over two monitoring periods (that is, a five-day field survey in October 2018 and another four-day field survey in April 2019) were completed and have informed the findings of the Avifauna Impact Assessment.

6.7.2 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 and Safety
  - Community Health and Safety

6.7.3 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:

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 the development have been identified and assessed as part of the detailed independent specialist studies undertaken as part of the BA 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 Naledi PV and attached as **Appendix M** to this Final BA Report.

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:
Naledi PV would require approximately 12 250m³ of water during the 12 -18-month construction period, and approximately 5 372m³ of water per year over the 20-year operational lifespan. The water required will be sourced directly from the Kai !Garib Local Municipality following a Service Level Agreement between the municipality and the proponent.

The recommendation that measures with which to minimise the project's water requirements must be investigated by the proponent are included in the EMPr (**Appendix M** of the Final BA Report).

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:
Naledi PV is proposed on Portion 3 of the Farm McTaggarts Camp 453 and Portion 12, Portion of Portion 3 of Klip Punt 452. As the landowner is also the proponent no land acquisition will be required. No involuntary land acquisition or resettlement is required or will take place as a result of the project.

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 Naledi PV have been assessed as part of the Visual Impact Assessment specialist study (**Appendix I**) conducted as part of the BA 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 M** to this Final BA Report.

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

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 Naledi PV have been assessed as part of the Heritage Impact Assessment (refer to **Appendix H**) conducted as part of the BA process, which includes the consideration of heritage, archaeological, and palaeontological resources. Measures 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 M** to this Final BA Report.

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. On-site access tracks should be permeable and developed to minimise disturbance to sensitive environmental features. 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:
The project development area can be readily accessed via the national route (N14) which is located 8km to the south of the study area and development area. The N14 national route provides access to the area from Upington, Kakamas, Keimoes and Johannesburg. The most appropriate access route will be utilised for the solar PV facility. Two (2) alternative main access roads have been proposed to access the facility development area. Access will be required from the new and existing roads for construction purposes (and limited access for maintenance during the operation phase). The facility

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 PV facility. Some of the components (i.e. on-site substation) 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 the Act.

A Traffic Impact Assessment has been undertaken for Naledi PV and is included as **Appendix K** of the Final BA Report.

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. The EMPr is included as **Appendix M** of the Final BA Report.

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 EIA Regulations, 2014 (GN R326) was conducted as part of the BA process undertaken for the project. The Public Participation Process included consultation with key authorities, affected and surrounding landowners, local communities, and other relevant stakeholders.

Consultation between surrounding communities and the Developer would also need to be undertaken during the planning and design phase of the proposed development.

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 BA 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 M** to Final this BA Report. The EMPr is comprehensive for the nature and extent of the planned project.

CHAPTER 7: DESCRIPTION OF THE RECEIVING ENVIRONMENT

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

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

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

Requirement	Relevant Section
(h)(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	The environmental attributes associated with the development of Naledi PV are included within this chapter. The environmental attributes that are assessed within this chapter include the following:
	» The regional setting of Naledi PV is described in section 7.2.
	» The climatic conditions of Upington and the study area are included in section 7.3.
	» Biophysical characteristics of the development area, study area and the surrounding areas are described in section 7.3 and section 7.4. These include landscape features such as, geology, soil and land types and biodiversity (i.e. ecology ((including fauna & flora)) and avifauna) of the area to be affected by the development of Naledi PV.
	» Heritage resources, including the archaeology and palaeontology of the study area and development area are described in section 7.5.
	» The visual quality of the affected area surrounding Naledi PV is described in section 7.6
	» Social characteristics of the area surrounding Naledi PV is described in section 7.7.
	» A description of the site accessibility of the study area and the surrounding areas is included in section 7.8.

A more detailed description of each aspect of the affected environment is included in the specialist reports contained within **Appendix D – K**.

7.2 Regional Setting

The Northern Cape Province is located in the north-western extent (**Figure 7.1**) 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 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 (i.e. South Africa) and Namibia.

The Northern Cape is rich in minerals including alluvial diamonds, iron ore, asbestos, manganese, fluorspar, semi-precious stones and marble. The mining sector in the province is the largest contributor of the provincial Gross Domestic Product (GDP) and of a great importance to South Africa as it produces ~37% of the country's diamonds, 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. The sector is also experiencing significant growth in value-added activities, including game-farming, while food production and processing for the local and export markets is also growing significantly (PGDS, July 2011). Furthermore, approximately 96% of the land in the province is used for livestock and game farming, while only approximately 2% is used for crop farming, mainly under irrigation in the Orange River Valley and the Vaalharts Irrigation Scheme.

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 province 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. In addition, the province 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). In addition, the Augrabies National Park, a major tourist destination in the Province, is located 120km east of Upington near the town of Kakamas.

The Northern Cape is made up of five (5) district municipalities, namely Francis Baard, John Taolo Gaetsewe, Namakwa, Pixley ka Seme and ZF Mgcawu (refer to **Figure 7.2**).

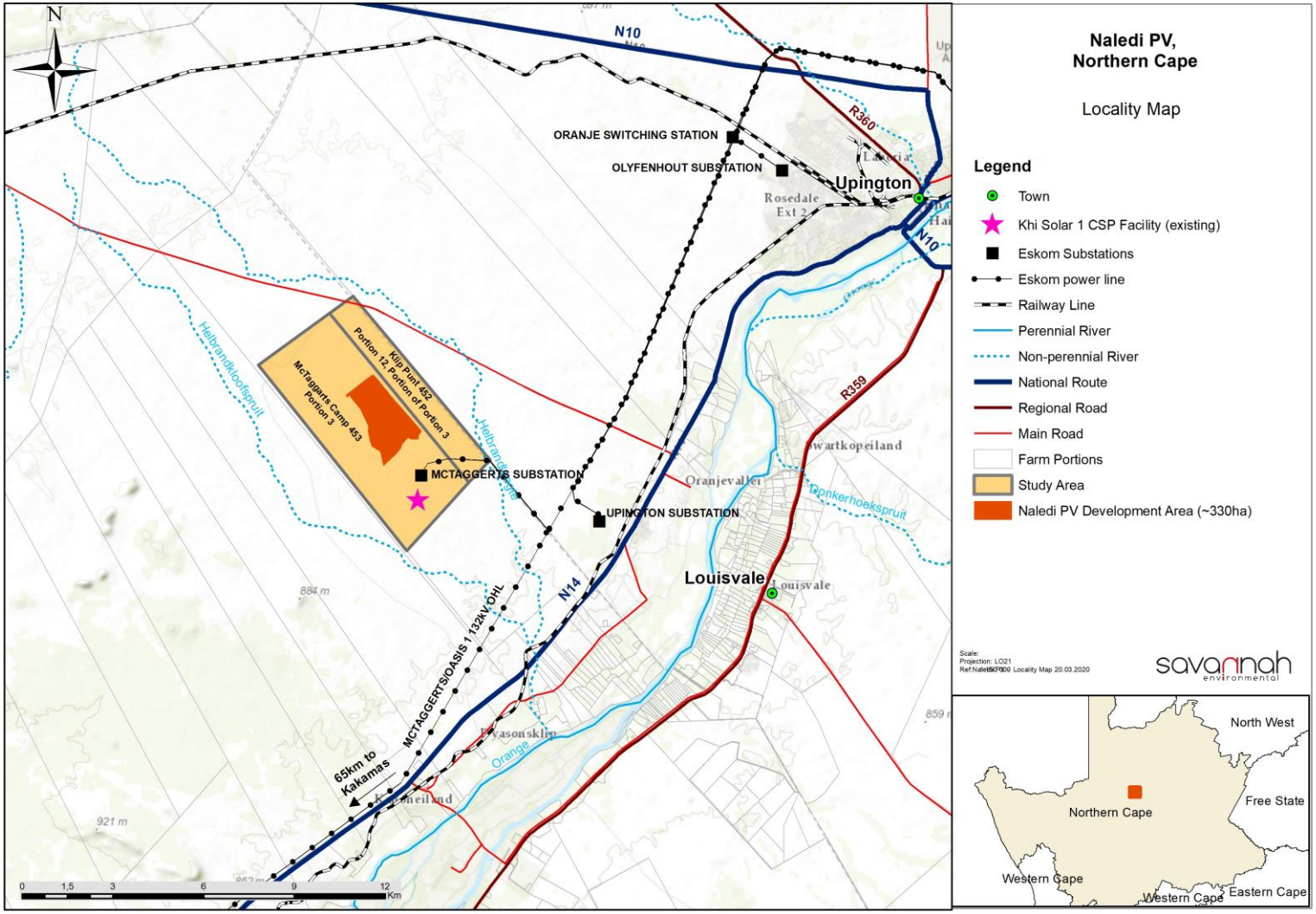

Figure 7.1: A locality map indicating the location of the study area for Naledi PV and its regional context.

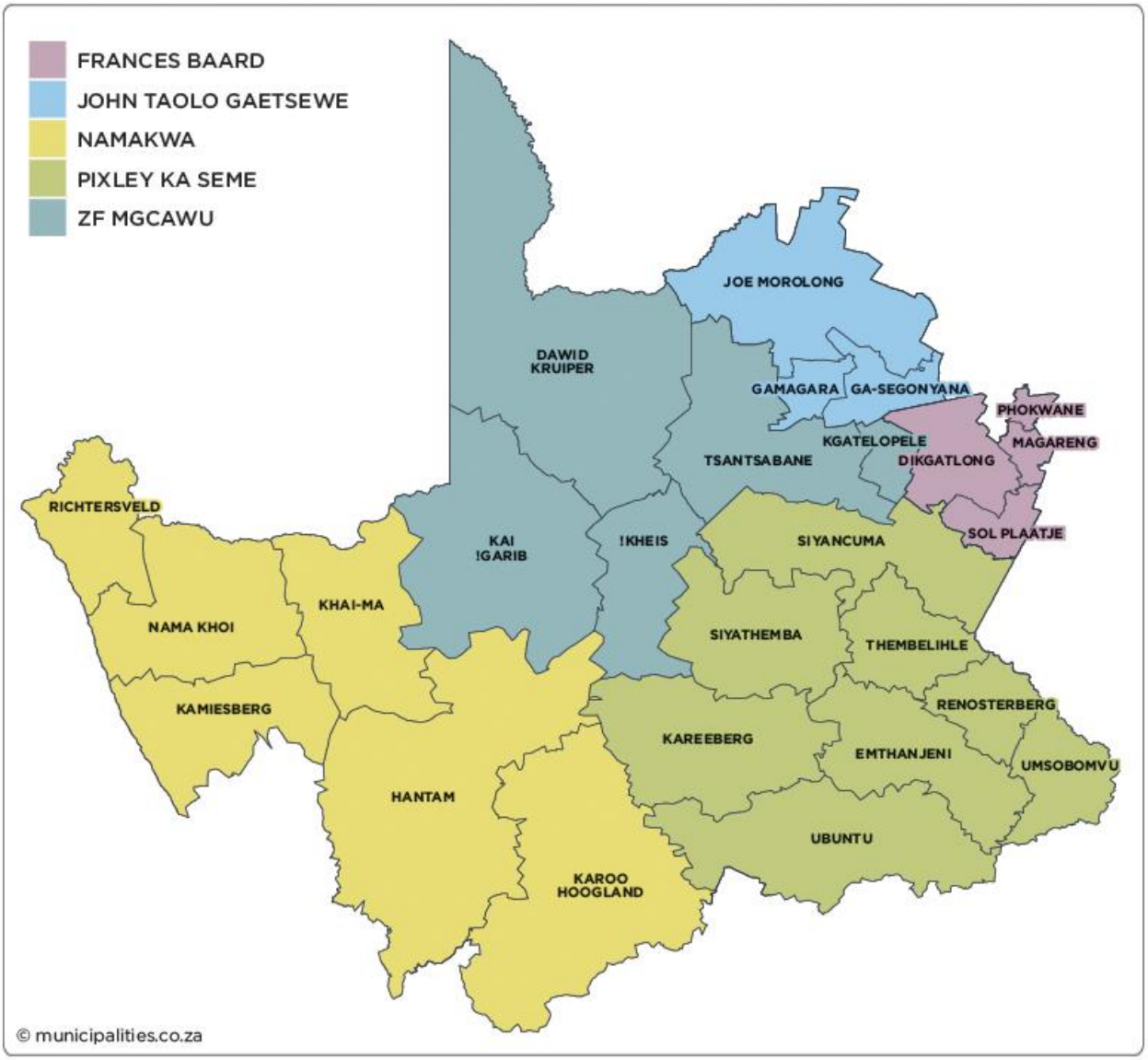

Figure 7.2: District municipalities of the Northern Cape Province (Source: Municipalities of South Africa)

The ZF Mgcawu District Municipality[28] (DM) is situated in the north-central extent of the 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 of 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.

[28] Previously known as the Siyanda District Municipality

The ZF Mgcawu DM includes the town of Upington, which is the capital of the DM, and where the DM's seat of government is located. The town is also the largest town in the DM and is located on the banks of the Orange River. Upington is also the centre of the karakul sheep and dried-fruit industries and is the most northerly winemaking region in South Africa. 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 activities within the DM include agriculture, mining, and tourism.

The ZF Mgcawu DM comprises five (5) local municipalities (LMs), namely Dawid Kruiper, Kai !Garib, Tsantsabane, Kheis and Kgatelopele (refer to **Figure 7.3**).

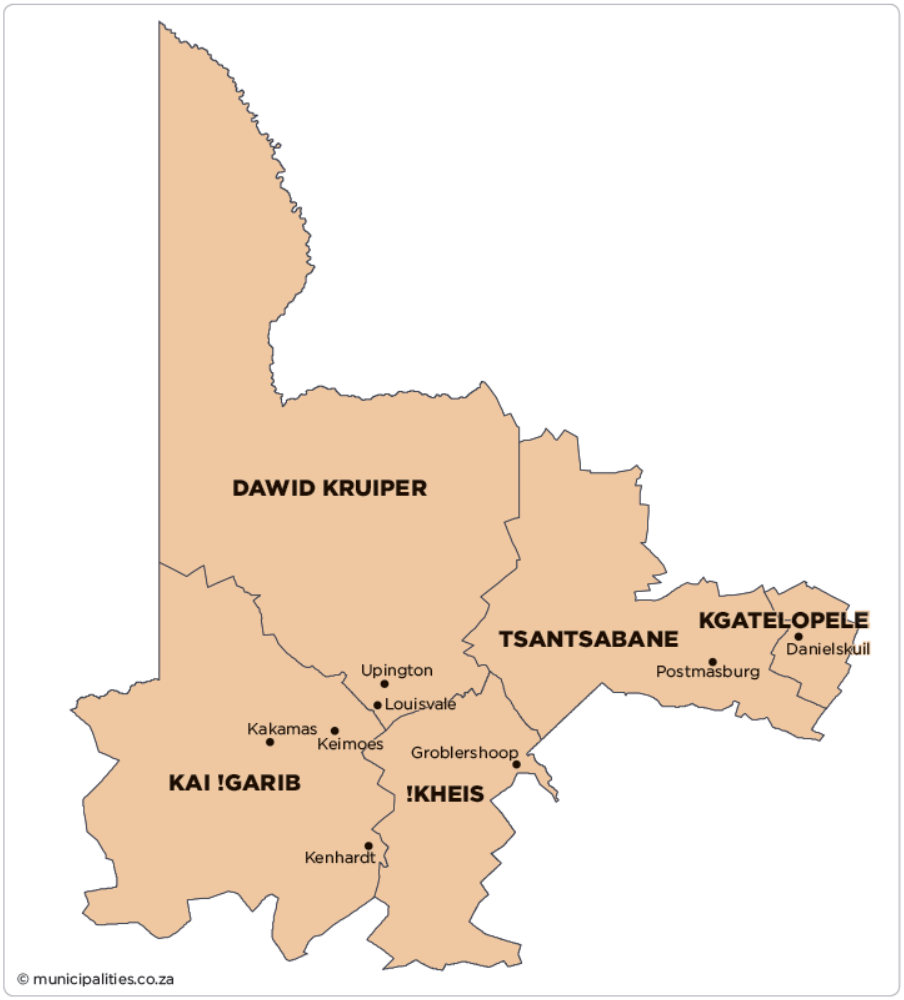

Figure 7.3: Local Municipalities of the ZF Mgcawu DM (Source: Municipalities of South Africa)

7.3 Local Setting: Location and Description of the Study Area and Development Area

Study Area and Development Area

The study area of Naledi PV is 2 904.77ha in extent and comprises of two (2) properties, namely Portion 3 of the Farm McTaggarts Camp 453 and Portion 12 a portion of Portion 3 of the Farm Klip Punt 452, which are currently used for renewable energy generation and grazing. The entire extent of the development area of Naledi PV is located within these farm portions, an area of 330ha in extent. The development area will

accommodate the layout proposed for the facility, which is anticipated to occupy an area not exceeding 230ha. The study area is located within the Kai !Garib LM and borders the Dawid Kruiper LM to the east.

The Kai !Garib LM is a Category B[29] municipality and is situated along the Orange River within the ZF Mgcawu DM. It is bordered by the Dawid Kruiper LM in the east and Namibia in the north-west. The Kai !Garib LM is the second-largest of the five (5) LMs, with an extent of 26 377km^2, accounting for a quarter of the DMs geographical area[30]. The key towns within the LM include Eksteenskuil, Kakamas, Keimoes and Kenhardt. The agriculture sector with 52%, is the biggest contributor of the LM's GDP and of great importance to the economy of the ZF Mgcawu DM. The government and services sector contributes 16%, the wholesale and retail trade sector 11%, the financial services sector 7.6% and the manufacturing sector 5%.

The majority of the area within which the study area is located is sparsely populated and consists of an undulating landscape of wide-open expanses. The local population is primarily concentrated in the town of Upington and smaller towns / settlements along the Orange River. In addition, the area surrounding the study area is characterised as a semi-arid desert region and vegetation cover is restricted to low shrublands, described as the Kalahari Karroid Shrubland and the Gordonia Duneveld. Vineyards and cotton field plantations are found along the banks of the Orange River located to the south of the study area which flows towards Keimoes, Kakamas and other towns in the Northern Cape Province. Furthermore, the towns of Upington, Keimoes and Kakamas, and the study area for Naledi PV are characterised by some of the highest levels of solar irradiation in the country; therefore making the area an ideal location for solar energy production. As such, Upington and the study area for Naledi PV fall within the Northern Cape Solar Corridor and the Upington Renewable Energy Development Zone (REDZ) as identified by the DEA.

The Upington REDZ (also referred to as, 'Zone 7') has been specifically identified as an area where large-scale solar PV facilities can be developed in terms of the Strategic Integrated Project (SIP) 8. The REDZ area in this region, stretches from the 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 study area for Naledi PV is located along the northern boundary of the Upington REDZ.

The study area is also located adjacent to the Lutzputs gravel and the N14 national roads which routes along the eastern and southern boundaries of the study area. The Lutzputs Road provides direct access to the study area; whereas, the N14 national road links the town of Upington with the towns of Kuruman, Kathu, Keimoes, Kakamas, Pofadder, Aggeneys, Springbok and Johannesburg. Upington is the nearest town to the study area and is located approximately 20km to the north-east of the area.

[29] A municipality that shares municipal executive and legislative authority in its area with a District Municipality within whose area it falls: https://www.brandsouthafrica.com/governance/government/south-african-local-and-municipal-governments

[30] https://municipalities.co.za/overview/1183/kai-garib-local-municipality

Development Area

The entire extent of the development area of Naledi PV is located within Portion 3 of the Farm McTaggarts Camp 453 and Portion 12 a portion of Portion 3 of the Farm Klip Punt 452. The area is 330ha in extent and will accommodate the layout proposed for the facility, which is anticipated to occupy an area not exceeding 230ha. Settlement areas located in the vicinity of the development area include, Kalksloot/Ses Brugge, Klippunt, Dyasons Klip Settlement, Oranjevallei, Louisvale and Kanoneiland. These communities are regarded as low-income earning communities with low cost and informal housing. The residents of the communities are primarily employed by the local agricultural sector in the area, particularly viticulture and fruit farms and associated agro-processing facilities.

Land uses within the vicinity of the development area include the operational Khi Solar One (as illustrated in **Figure 7.4**) which is located directly to the south of the development area on Portion 3 of the Farm McTaggarts Camp 453. Within the north-western corner of the property, the remains of old Tungsten mining activities and limited mining infrastructure are present, which as a result has led to the degradation of the natural environment.

Major grid connection infrastructure available in the vicinity of the development area include, the McTaggerts Substation (for Khi Solar One), the Sirius One Substation (for Sirius PV Project One), Dyasons Klip 1 & 2 Substation (for Dyasons Klip 1 & 2) and the Upington Main Transmission Substation (MTS) located approximately 10km to the south-east of the development area and adjacent to the N14 national road and the McTaggerts/Oasis 1 132kV power line.

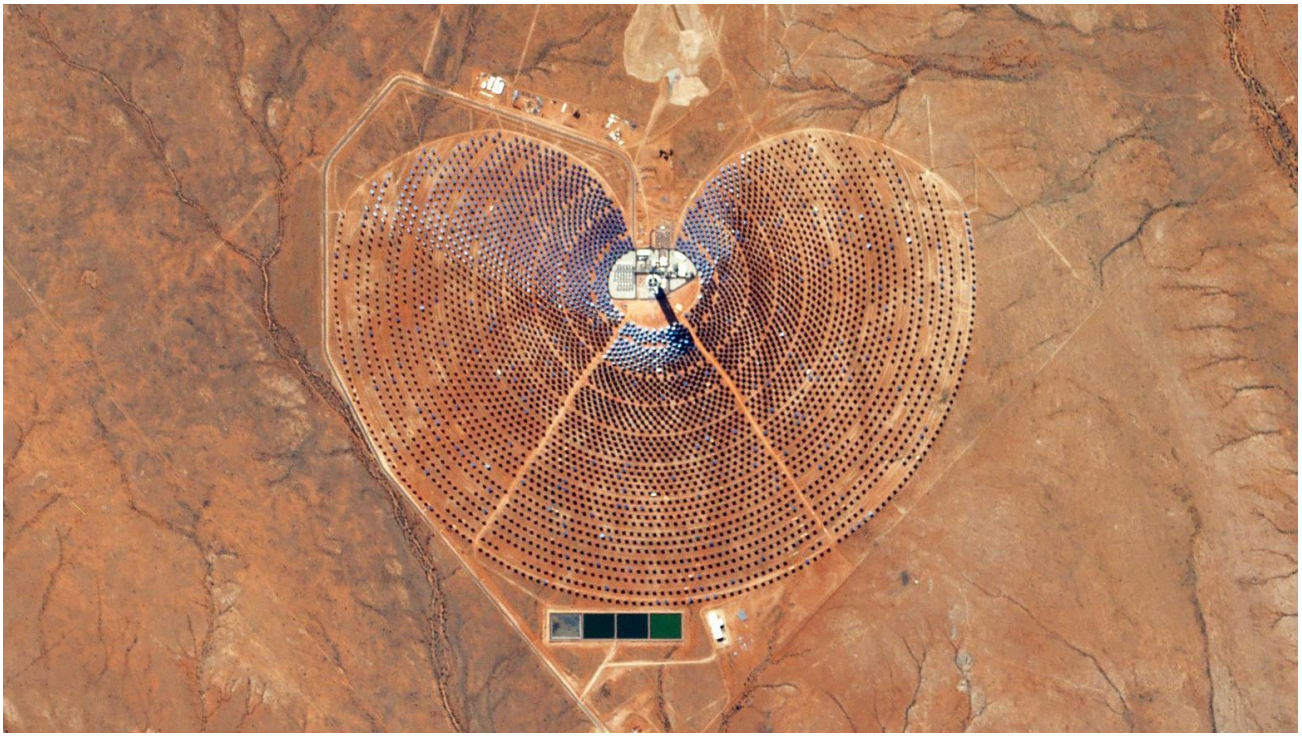

Figure 7.4: An aerial view of the operational Khi Solar One facility located in the southern corner of Portion 3 of the Farm McTaggarts Camp No. 453 (source: https://www.dlr.de/content/en/images/2017/1/solar-power-plant-khi-solar-one-in-south-africa_25397.html).

i. Climatic Conditions

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 (as illustrated in **Figure 7.5** and **Table 7.1**). 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.

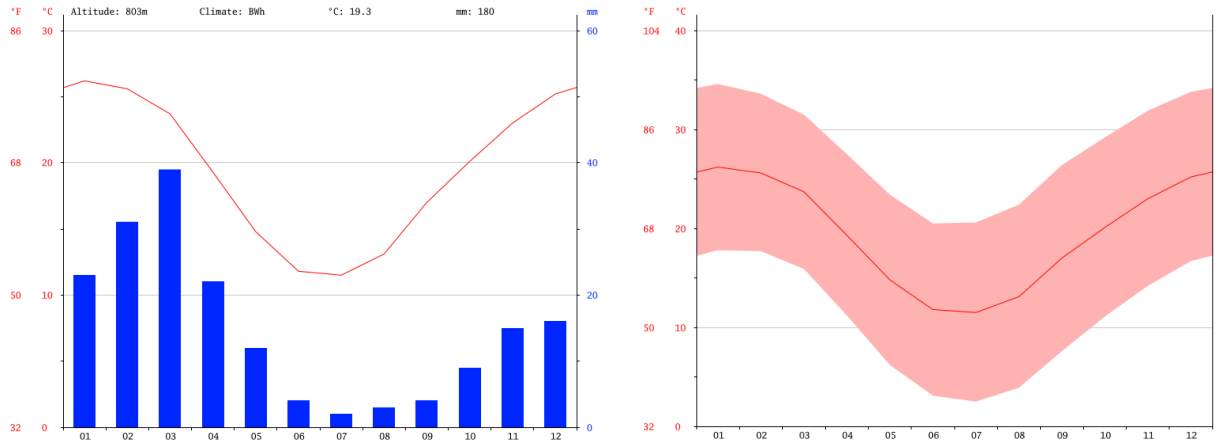

Figure 7.5: Climate and Temperature graphs for Upington, Northern Cape Province (Source: en.climate-data.org).

Table 7.1: 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

The suitability of a 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 Global Horizontal Irradiance (GHI) for the Northern Cape Province varies between 2 045 and 2 377kWh/m^2/annum, which is present within the higher end of the spectrum. The irradiation received in Upington and the location of the study area for Naledi PV is

approximately 2 278kWh/m²/annum which is the highest in South Africa, and comparable on a global scale (refer to **Figure 7.6**).

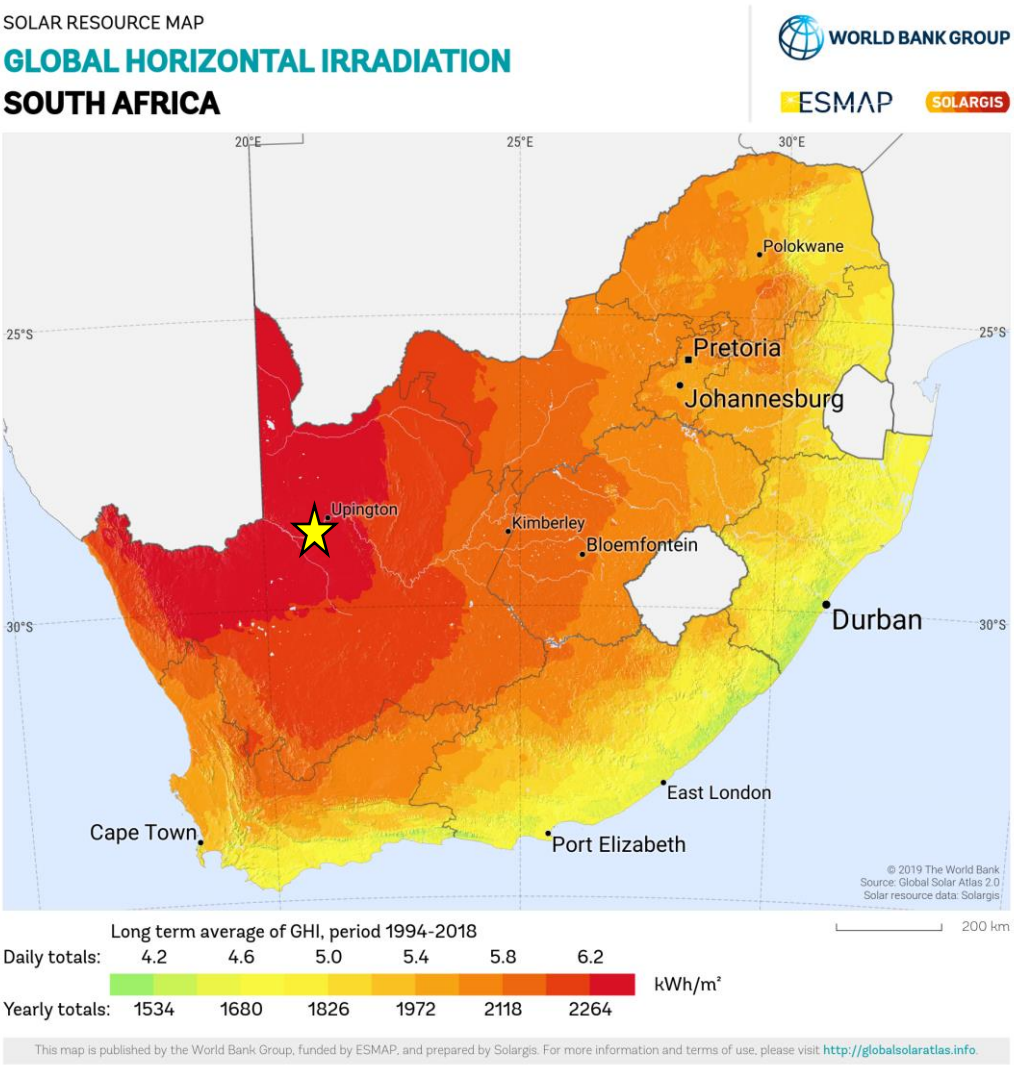

Figure 7.6: GHI map for South Africa (Source: World Bank Group Solar Map). The development area for Naledi PV is shown by the yellow star on the map.

ii. Landscape Features

The topography within the vicinity of the development area is relatively homogenous and is described predominantly as lowlands with hills and dune hills to the north. Relatively prominent small hills occur towards the west and south-west of the development area.

The terrain surrounding the affected properties, Portion 3 of the Farm McTaggarts Camp 453 and Portion 12 a portion of Portion 3 of the Farm Klip Punt 452, is generally flat and sloping towards the Orange River Valley which forms a distinct hydrological feature in the region.

Although the region surrounding the development area is generally flat, a degree of relief is provided by minor ridgelines that form a historic dune field that runs in a general north-west to south-east direction at

regular intervals. These minor ridgelines appear as a series of waves in the arid landscape of the study area. In addition, these ridgelines rise between 3-5m above the valley floor of the Orange River Valley.

iii. Geology

The Namaqua sector of the Namaqua-Natal Metamorphic Province is the geological setting of the region around Upington, including the study area and development area. The Province consists of igneous and metamorphic rocks that were formed or metamorphosed during the Namaqua Orogeny ca. 1 200 – 1 000 million years ago. The Namaqua-Natal Province is bounded by shear zones and has been divided into numerous tectonostratigraphic terranes (with have also been intruded by ultramafic-mafic intrusions) based on common rock names.

The development area of Naledi PV falls within the Areachap Terrane and is bounded to the north-east by the Brakbosch-Trooilaspan Shear Zone and to the south-west by the Boven Rugzeer Shear Zone. The area surrounding the development area is associated with scattered outcrops of the Louisvale Granites, Gneisses of the Bethesda and Toeslaan formations. Overlying these ancient rocks are much younger sediments of the Tertiary and Quatenary age, in particular calcretes that indicate drying out of the surface with alluvial and aeolian sands of the Gordonia Formation. The development area identified for the development of Naledi PV overlies the above mentioned lithologies (refer to **Figure 7.7**).

iv. Soil and Land Types

A land type is defined as an area with a uniform terrain type, macroclimate and broad soil pattern. The entire development area for Naledi PV consists of two land types, Ae10 and Ag1 (refer to **Figure 7.8)**:

- **Ae10:** this land type consists of a mixture of shallow Mispah soils as well as shallow red apedal soil profiles underlain by limestone (either soft or hard pan carbonate horizons). This land type is underlain by migmatites, gneisses and ultra-metamorphic rocks of the Namaqua-Natal Metamorphic Province and dominated by flat plains and depression areas where water can accumulate following rainfall events (**Figure 7.7**). The entire extent of the development area of Naledi PV as well as a large section of the Main Access Road Alternative 2 is located within this land type.
- **Ag1:** this land type is dominated by very shallow soil profiles and includes Mispah soils, as well as forms where shallow red apedal or yellow-brown apedal soil is underlain either by rock or a carbonate horizon. The underlying geology of this land type is granite, migmatite and gneiss of the Namaqualand Metamorphic Complex.

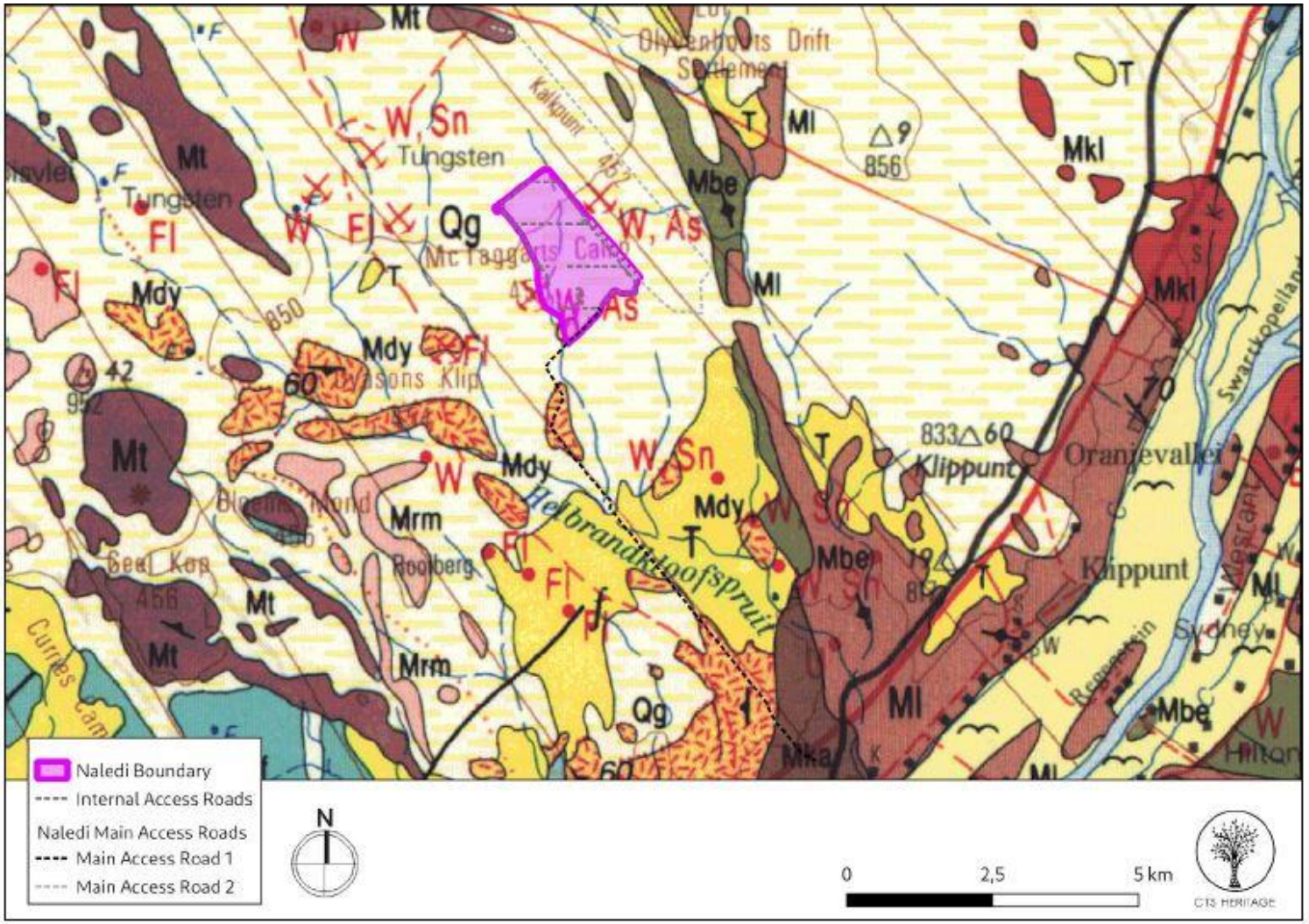

Figure 7.7: Extract from the 1:250 000 Geological Map of South Africa: Council of GeoScience Map 2820 Zoomed in for Naledi PV development area. (Qg: Gordonia Formation Mbe: Bethesda Formation; Mj: Jannelsepan Formation; Mkn: Keimoes Formation; and Ms: Straussburg Granite).

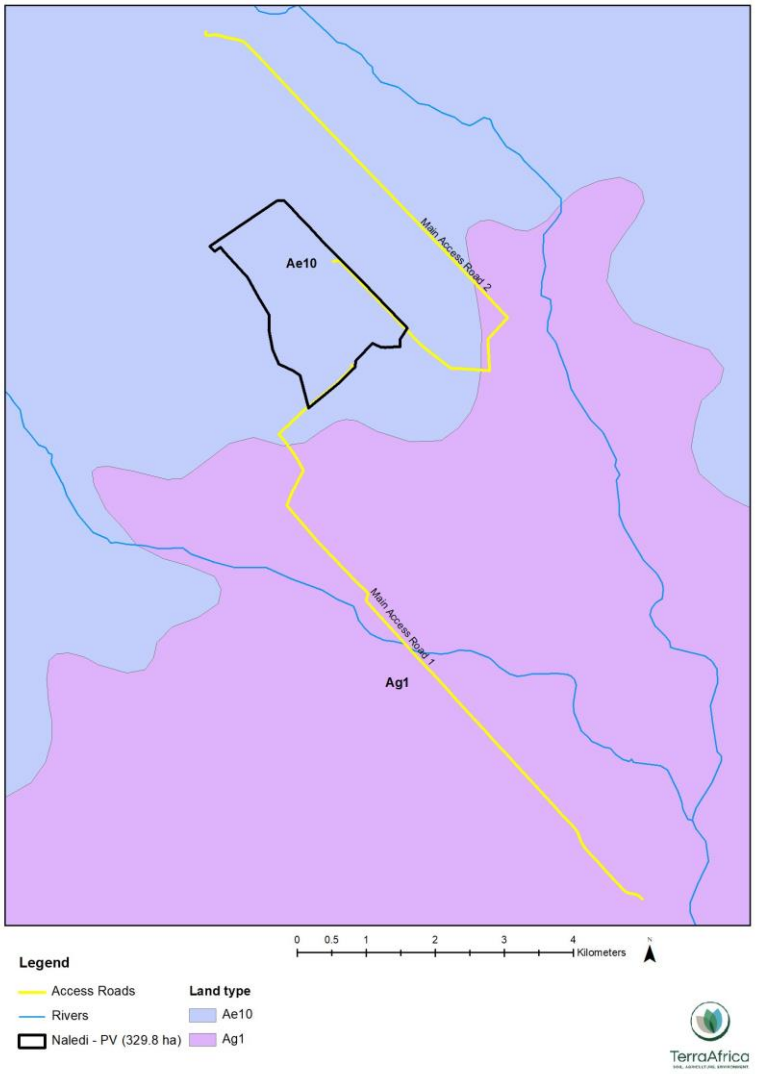

Figure 7.8: Land Type Map of the Naledi PV development area.

v. Agricultural Potential & Land Capability

Following the low and erratic rainfall patterns of the surrounding area within which the entire extent of the Naledi PV development area falls, the area has limited to no suitability for rainfed crop production. The most suitable agricultural activities in the region include either livestock farming at a low density or irrigated crop production using water abstracted from the Orange River. Furthermore, no irrigated land is present within the Naledi PV development area. In addition, the grazing capacity of the surrounding area within which the development area for Naledi PV falls, has a grazing capacity that ranges between 28 and 32ha/LSU. When converted to small stock units, the area has a grazing capacity of between 7 and 8ha/SSU. Furthermore, the development area for Naledi PV is associated with a very low-low land capability class.

vi. Hydrology and Surface Water

The Naledi PV development area falls within the D73F Catchment Area associated with the Helbrandleegte and Helbrandkloofspruit alluvial systems located in the Nama-Karoo ecoregion. These mainstem catchment systems are short tributaries of the Orange River (located ~10km south of the development area) and are largely ephemeral.

There are two mainstem non-perennial (or ephemeral) watercourses, the Helbrandkloofspruit and the Helbrandleegte that run to the north-east and south of the development area respectively before they flow into the Orange River Valley. Furthermore, there are other minor ephemeral watercourses that flow into the Orange River intermittently. As these watercourses flow from the undulating plain into the shallow river valley, they have created larger and slightly deeper valleys which are obvious along the N14 national road towards Keimoes.

Two (2) small depression/wetlands are located within the study area and development area (refer to **Figure 7.9**) and another within 500m of the development area. The affected depression/wetland feature is 2110m^2 in extent and contains little in terms of obligate or important aquatic habitat. The riparian vegetation within the vicinity of these features is mainly terrestrial in nature. Eighteen (18) woody plant species were found associated with the riparian and pan systems within the development area. Although none of these species are regarded as wetland species, they do however show a preference for areas exposed to run-off. The species identified within the study area are dominated by *Vachellia erioloba, Vachellia haematoxylon, Boscia foetida* and *Euclea pseudebenus*, which are all protected under the National Forest Act of (Act 84 of 1998) 1998.

In terms of the National Freshwater Ecosystems Priority Areas (NFEPA) Assessment, all the freshwater features within the study area have been assigned a condition score of AB (Nel *et al.,* 2011). The AB score indicates that the features are largely intact and are of biological significance; however, the freshwater systems in the development area are ephemeral and only carry water for a limited period. The freshwater systems observed in the development area do not support any wide riparian zones and the vegetation associated with watercourses in the area is between 0.5 and 14m wide and are mostly terrestrial.

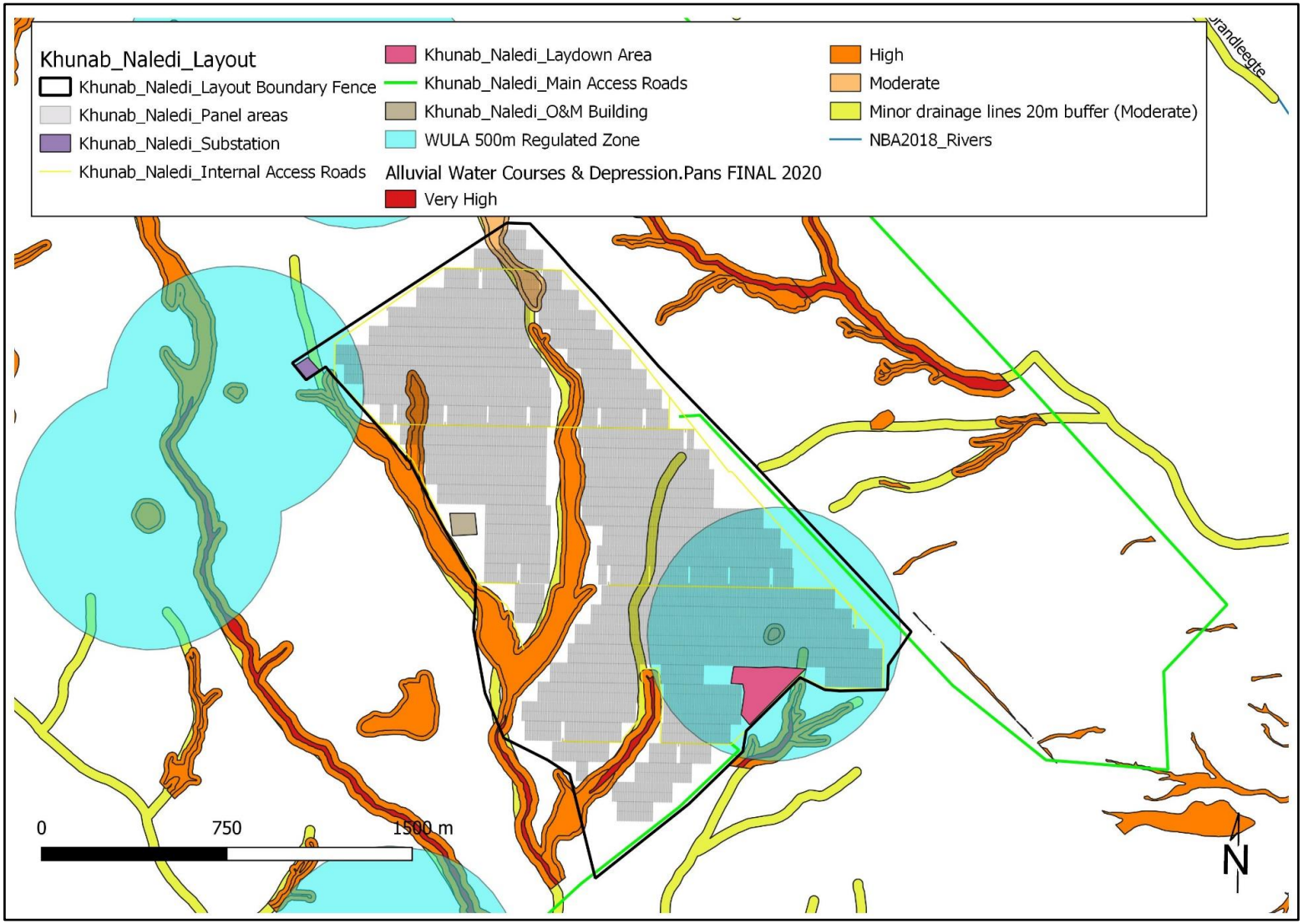

Figure 7.9: A map showing the aquatic features identified within the development area for Naledi PV.

7.4. Ecological Profile of the Study Area and Development Area

Broad-Scale Vegetation Patterns

According to the National Vegetation Map (Mucina & Rutherford, 2006), the study area consists of two (2) vegetation types, the Kalahari Shrubland and the Bushmanland Arid Grassland (refer to **Figure 7.10**). The entire extent of the development area for Naledi PV is located within the Kalahari Karroid Shrubland vegetation type.

Both the Kalahari Karroid Shrubland and Bushmanland Arid Grassland are classified as Least Threatened with more than 99% of their original extent still intact. Both vegetation types are considered Hardly Protected within formal conservation areas. Mucina & Rutherford (2006), list 6 endemic species for Bushmanland Arid Grassland, while no vegetation-type endemic species are known from Kalahari Karroid Shrubland. The biogeographically important and endemic species known from these vegetation types tend to be widespread within the vegetation type itself. The Bushmanland Arid Grassland vegetation type, which occurs, in the southern portion of Portion 3 of the Farm McTaggarts Camp 453, is widely distributed and is among the most extensive vegetation types in South Africa; whereas the Kalahari Karroid Shrubland is less extensive, but represents a transitional vegetation type between the northern Nama Karoo and the Kalahari (Savannah) vegetation types.

Species commonly observed within the areas of Kalahari Karroid Shrubland 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 sandier. Species of conservation concern that may be present include, *Adenium oleifolium*, *Aloe claviflora* and *Hoodia gordonii*, although none of these species were observed within the development area of Naledi PV.

The current veld condition of the development area can be considered to be fair, although there are some areas that have suffered some degradation in the past, the vegetation cover and composition can be considered typical for the areas surrounding the study area and development area. There are some localised areas of a *Prosopsis glandulosa* invasion within the development area, usually around watering points, but in general, there are a few alien plant species present across most of the area and it can be considered to be largely intact and in moderate condition.

i. Listed Plant Species

Two (2) protected tree species listed under the National Forest Act (Act No. 85 of 1998) (NFA) of 1998, as amended, occur within the development area and include, *Vachellia (Acacia) erioloba* and *Boscia albitrunca*. Both of these species are associated mostly with the larger drainage features present within the development area.

In addition, the provincially protected *Boscia foetida subsp. foetida* is also confirmed present within the study area and is fairly widespread across the area, at a moderate density. The density of the species within the development area is not significant.

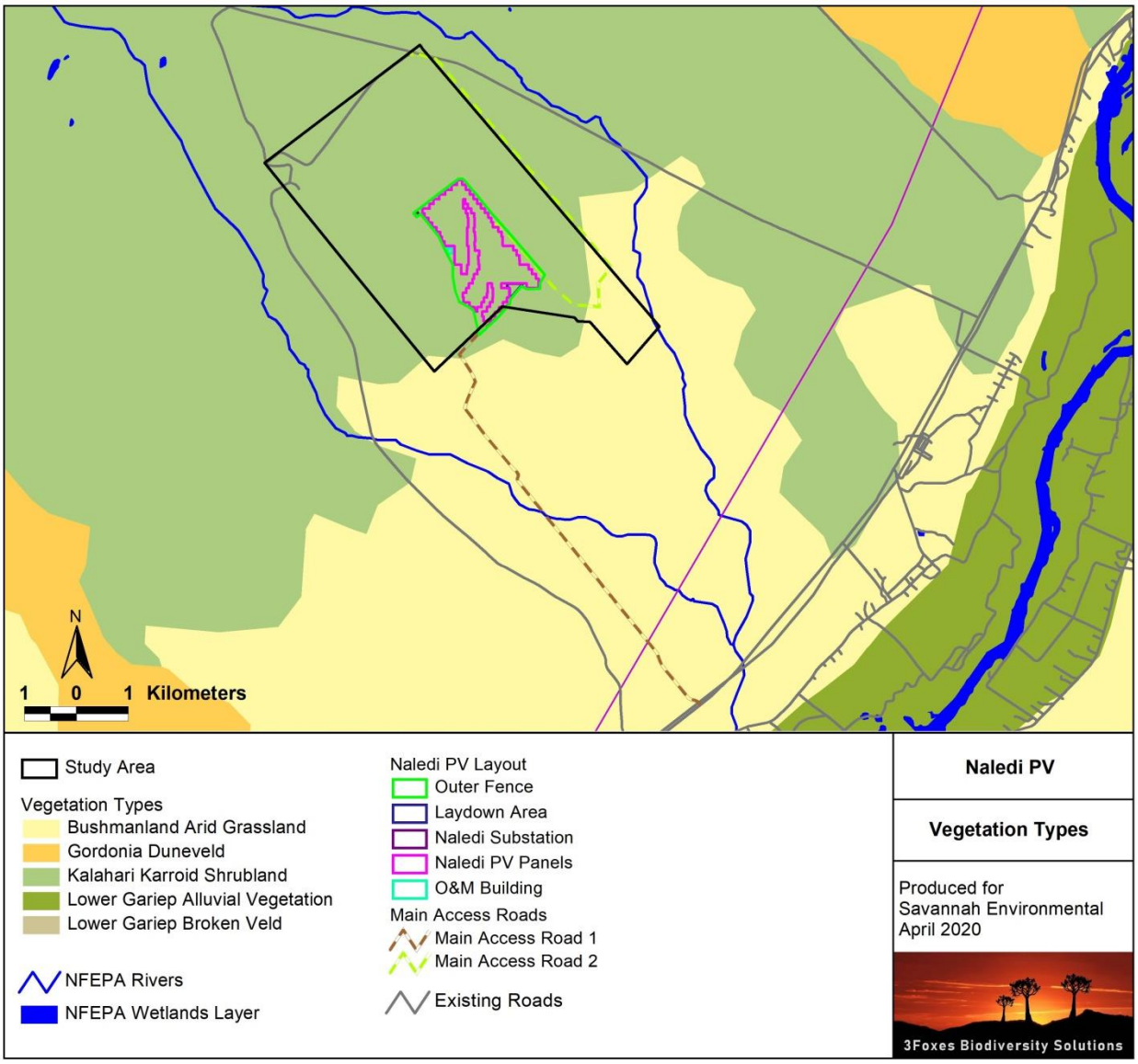

Figure 7.10: A broad-scale overview of the vegetation in and around the study area and development area for Naledi PV. The Vegetation Map is an extract of the National Vegetation Map (Mucina and Rutherford, 2006 and 2016) and includes drainage features delineated by the National Freshwater Ecosystem Priority Areas (NFEPA) Assessment (Net *et al.*, 2011).

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

An extract of the Northern Cape Critical Biodiversity Areas (CBAs) map for the study area and the development area is depicted in **Figure 7.11** below. The entire extent of development area lies within an area classified as Other Natural Areas (ONA). The drainage features (i.e. Helbrandleegte and Helbrandklofspruit) adjacent to the development area, to the east, west and south-east are classified as ecological support areas (ESAs); the development area for Naledi PV avoids these drainage features. There are no CBAs located within the development area of Naledi PV, therefore no CBAs will be affected by the project. In addition, the development area does not fall within an area identified as a priority area for future conservation expansion under the Northern Cape Protected Area Expansion Strategy).

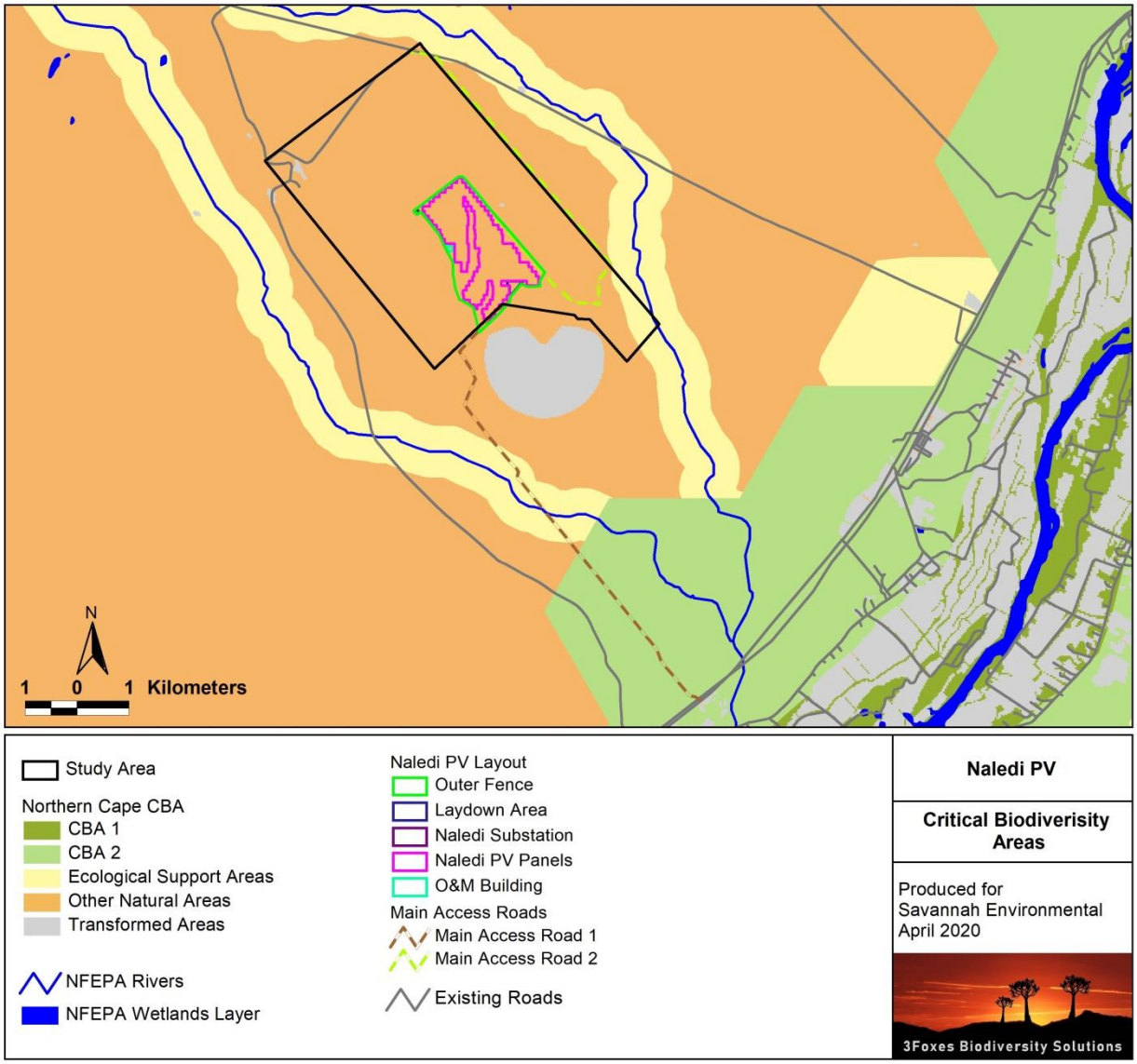

Figure 7.11: An extract of the Northern Cape CBA Map for the study area and the development area, showing that there are no CBAs in close proximity to the Naledi PV development area.

Faunal Communities

i. Mammals

The study area falls within the distribution range of 46 terrestrial mammals, indicating that the mammalian diversity of the area is of moderate potential. The variety of habitat present within the development area is fairly low and the overall mammalian diversity is expected to be lower than that of the surrounding area. The lack of rocky hills or outcrops within the development area precludes a variety of species from the area. However, terrestrial mammal species that can be confirmed present within the development area, based on field observations or are known from adjacent sites within the vicinity of Naledi PV include, the Black-backed Jackal, African Wild Cat, Cape Fox , South African Ground Squirrel, Springhare, Steenbok, Springbok, Gemsbok, Cape Porcupine, Yellow Mongoose, Cape Hare and the Aardvark. Species such as the Cape Clawless Otter and Water Mongoose may also occasionally be present in the rainy season.

During the rainy season, these species apparently make forays from the Orange River to visit some of the larger pans of the surrounding area. For such species, drainage features represent important movement corridors.

Two Red-listed terrestrial mammal species which may occur within the study area include, the Near Threatened Brown Hyaena (*Hyaena brunnea)* and the Vulnerable Black-footed Cat *(Felis nigripes)*. While it is possible that both species may occur within the study area, it is unlikely that the Brown Hyaena is present as this species is often purposely or inadvertently persecuted within farming areas. These two species have a wide national distribution.

ii. Reptiles

According to the South Africa Reptile Conservation Assessment (SARCA) Database, 39 reptile species are known from the surrounding area suggesting that reptile diversity within the study area is likely to be moderate to low. Furthermore, as there are no significant rocky outcrops within the development area, only species associated with sandy substrates or trees are likely to be present. Species observed within the development area and the vicinity include, the Namaqua Mountain Gecko (*Pachydactylus montanus)*, Ground Agama (*Agama aculeata)*, Spotted Sand Lizard (*Pedioplanis lineoocellata)* and the Spotted Desert Lizard *(Meroles suborbitalis)*. No reptile species of conservation concern are known from the surrounding area and there appears not to be any broad habitats within the area which would be of a high significance for reptiles.

iii. Amphibians

The study area lies within the distribution range of 10 amphibian species. The only listed species which may occur within the area is the Giant Bullfrog (*Pyxicephalus adspersus)* which is listed as Near Threatened. No suitable breeding sites were observed in or near the development area of Naledi PV, therefore it is not likely that this species is present. Furthermore, as there are no natural perennial watercourses within the study area and development area, it is likely that amphibian abundance is generally low and will be restricted to those species which are relatively independent of water such as the Karoo Toad *(Vandjjkophrynus gariepensis)*.

iv. Avifauna

Approximately 150 avian species are known to occur within the broader study area and the surrounding area. A total of 68 species were recorded within the study area and development area during the two seasonal field site surveys undertaken in late summer (9-12 April 2019) and spring (4-8 October 2019) respectively. Eight (8) of these species are listed as Threatened and four (4) are considered as Near-Threatened, whereas seven (7) are considered as endemic avian species of South Africa and another twelve (12) as biome-restricted avian species.

The bird assemblage recorded within the study area 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 68 avifauna species are anticipated to occur within the study area and development area of Naledi PV. Of the 68 species recorded, 56 of them were detected during walking

transects, with 44 and 40 species recorded during the spring and the late summer avifauna surveys. Small passerines make up 64% of the species detected, compared to non-passerines with 20%.

Species with a high abundance which exhibited the most stable trends between the two seasons of field surveys include the Spike-heeled Lark (*Chersomanes albofasciata)*, Sabota Lark (*Calendulauda sabota)* and the Chat Flycatcher (*Bradornis infuscatus)*. In addition, less abundant species with stable trends include the Yellow Canary (*Crithagra flaviventris)*, Southern Fiscal (*Lanius collaris)*, Bokmakierie (*Telophorus zeylonus)* and the Dusky Sunbird (*Cinnyris fuscus)*. Primarily resident species which showed high and unexpected variable detections between the two seasons include the Eastern Clapper Lark (*Mirafra fasciolata)* and the Rufous-eared Warbler *(Malcorus pectoralis)*. The most common non-passerine, the Northern Black Korhaan *(Afrotis afraoides)* also exhibited variable detections between the two seasons. The variable detections between the two seasons are mostly likely due to reduced vocalisations in late Summer, compared to Spring when most species begin to breed.

The majority of the seven (7) near-endemic species can be considered as being scarce within the area and include, the Karoo Thrush, Fiscal Flycatcher, Fairy Flycatcher, Sickle-winged Chat, the nomadic Black-headed Canary (0%), and the Jackal Buzzard (0%). Only the highly nomadic Black-eared Sparrowlark has been recorded with a fair reporting rate (33%), although only one sighting was made during the late Summer field survey. However, the Karoo Thrush and the Fiscal Flycatcher are both common in the nearby habitats associated with the Orange River such as the riverine thickets.

Seven (7) of the twelve (12) biome-restricted species known from the area were recorded during the field surveys including the Sociable Weaver, Karoo Korhaan, Kalahari Scrub Robin, Black-eared Sparrowlark, Stark's Lark, Tractrac Chat and the Karoo Chat. Sociable weavers were fairly common, with their large communal nests located on man-made structures along the western boundary of the study area and in large *Acacia erioloba* trees located to the south.

Avifaunal microhabitats from the study area, including the development area, can be distinguished, namely the plains microhabitat associated with the Kalahari Karroid Shrubland and the small drainage features that traverse the study area. The differences in species composition between the avifaunal micro-habitats were subtle. The drainage features and pan support denser vegetation in comparison to the plain's habitat (refer to **Figure 7.12** and **13**). Therefore, the drainage features were characterised by higher occurrences of species preferring a woodier habitat such as the Mousebirds, Scrub Robin, Dusky Sunbird, Black-chested Prinia and the Acacia Pied Barbet. In contrast, numerous lark species recorded within the study area were generally associated with the more sparsely open plains. In general, other species such as the Chat Flycatcher, Southern Fiscal, Ant-eating Chat and the Yellow Canary are more cosmopolitan in their use of the habitats.

Five (5) of the eight (8) threatened species known from the study area were recorded during the field survey and two (2) of the four (4) Near-Threatened species. The most important from the red-listed species in the area is the Critically Endangered White-backed Vulture. The study area is currently partly being used for livestock grazing; therefore, the vultures may occasionally be passing in the area during foraging forays. Although, there are no breeding or nesting sites for this species nearby, due to the absence of large *Acacia erioloba* trees, the White-backed Vulture is still considered as an occasional visitor to the area, corroborated by its infrequent presence in the area based on SABAP records. Furthermore, the Martial Eagle was also recorded in the area on two occasions, perched on utility poles proximal to the study area.

This species probably breeds on large pylons within the vicinity of the study area; therefore, it is not possible that the martial eagles are a resident. However, there are no suitable nesting sites within the study area and development area of Naledi PV for these species.

The two (2) Near-Threatened species that were recorded during the field surveys include the Karoo Korhaan and the Kori Bustard. The Karoo Korhaan was recorded along the eastern boundary of the study area where the gravel plains habitat dominates, and which is also their preferred habitat. It was not encountered within the development area for Naledi PV; that being ~500m west of the near Karoo Korhaan sighting. A Lanner Falcon was also observed on a pylon a few kilometres south of the study area; therefore, this species may occasionally frequent the area during hunting forays. It is also suspected that a pair of Secretary Birds nest in the vicinity of the study area, however, during the site surveys no sightings were made. The Secretary Birds are known to have bred in the past within the vicinity of Khi Solar One prior to its construction. All other red-listed species within the area have low SABAP2 reporting rates and these include, the Black Stork, Pallid Harrier and the Abdim's Stork. The populations of these species within the local area are moderate to low as they appear to be occasional visitors based on their low reporting rates in the area. The study area and surrounds do not provide a suitable breeding or feeding habitat for these species. The stork species, in particular, frequent the riparian habitat near the Orange River.

In general, the majority of the avifauna of the surrounding environment appears fairly similar to that found across the Kalahari and the Nama-Karoo bioregions in the Northern Cape Province. There is an absence of communal or solitary roosting and nesting sites for red-listed species within the study area. A number of species do occur in the area primarily for foraging and large tracks of suitable habitat remain within the surrounding environment, particularly to the north of the broader study area.

Species which clearly use the surrounding environment as part of their foraging ranges include the White-backed Vulture, Lappet-faced Vulture, Martial Eagle, Tawny Eagle, Lanner Falcon and the Secretary Bird. Two (2) Near-Threatened species, namely, the Karoo Korhaan and the Kori Bustard are strictly ground-dwelling foragers and while they occur in the area, they also have very wide national ranges.

Figure 7.12: Views of the plain's habitat of the Kalahari Karroid Shrubland along the eastern boundary of the study area

Figure 7.13: Views of an ephemeral drainage feature within the study area for Naledi PV, showing the denser and taller shrubs that are associated with drainage features.

7.5. Heritage Resources, including archaeology and palaeontology

7.5.1 Archaeology and the Built Environment

The greater Upington area has a rich historical and archaeological past, which includes Stone Age artefacts of varying significance. In terms of study area for Naledi PV, no significant heritage resources were identified (**Figure 7.14**). Stone Age occurrences were identified, and these consist of isolated finds and low-density ex-situ surface scatters containing predominantly Middle Stone Age (MSA) material with a few incidences of Early and Later Stone Age (LSA) lithics. The majority of the raw material utilised for the lithics found is made from the Banded Iron Formation (BIF) and Quartzite.

Several occurrences of archaeological surface material dating to the 19th and early 20th century were recorded. These include two (2) Martini-Henry bullet casings dating between 1870 and the turn of the century. The area around the development area is well known for the conflict between the British forces and the Koranna people who lived on the Orange River islands. The region was also actively monitored by the Cape Colonial Police as from the 1890s and during the military operation of the Anglo Boer War (1899 – 1902). The spent cartridges are of little scientific value; therefore, they are without context and only a small sample was identified. Furthermore, no formal or informal graves were identified within the development area of Naledi PV.

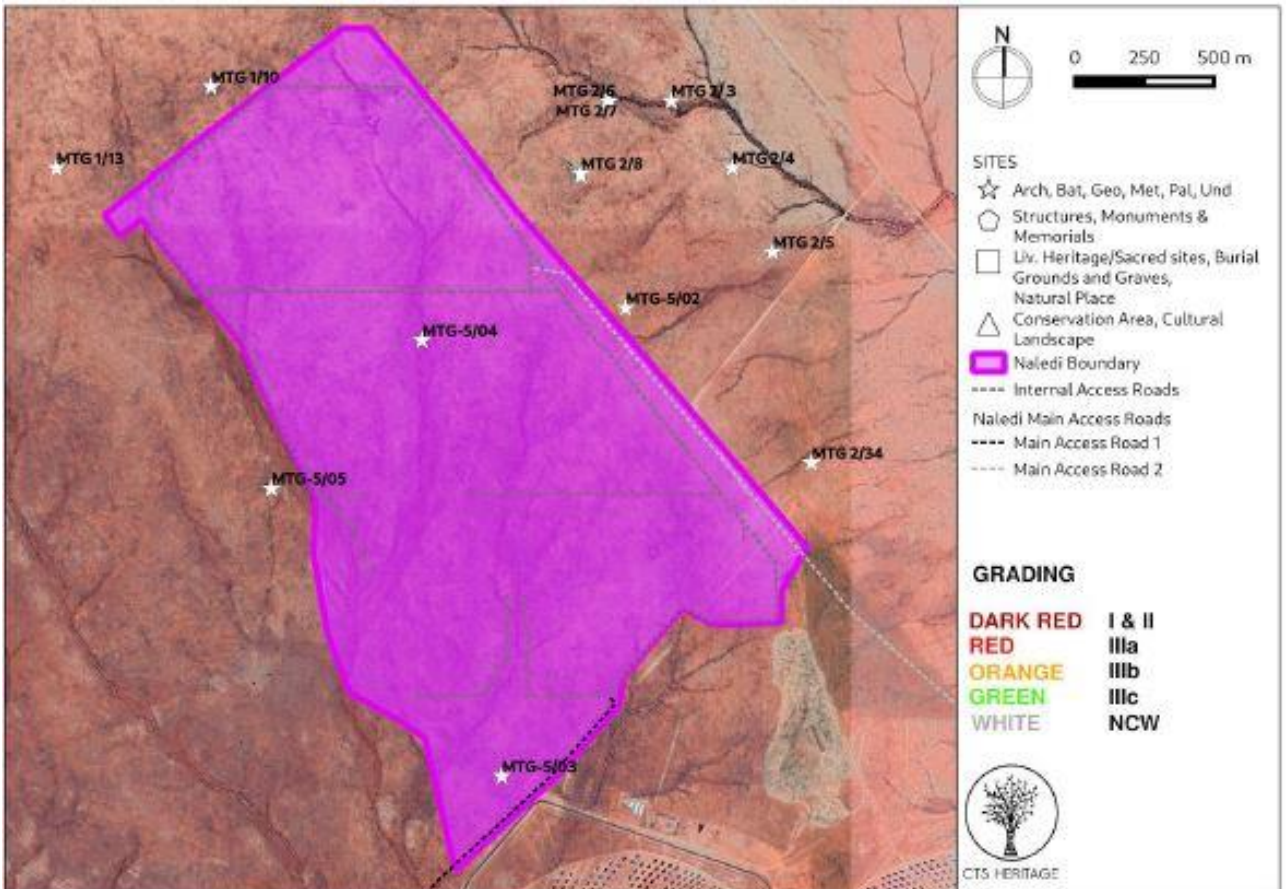

Figure 7.14: A map illustrating the heritage sites identified within the study area and development area of Naledi PV.

7.5.2 Palaeontology

According to the SAHRIS Palaeosensitivity Map (refer to **Figure 7.15**), the study area is underlain by the Gordonia Formation, the Bethesda Formation, the Janneslpan Formation, the Keimoes Formation and the Straussburg Granite. The majority of these lithologies are igneous or metamorphic rocks, which renders them unfossiliferous. The alluvial and aeolian sands of the Gordonia Formation have been transported; therefore, these are unlikely to preserve any fossil heritage. There is a small probability of finding fossils, provided palaeo-channels and rivers are present, however, none of these palaeo-features are present within the vicinity of the study area and development area for Naledi PV, and as a result the probability of finding fossils is low.

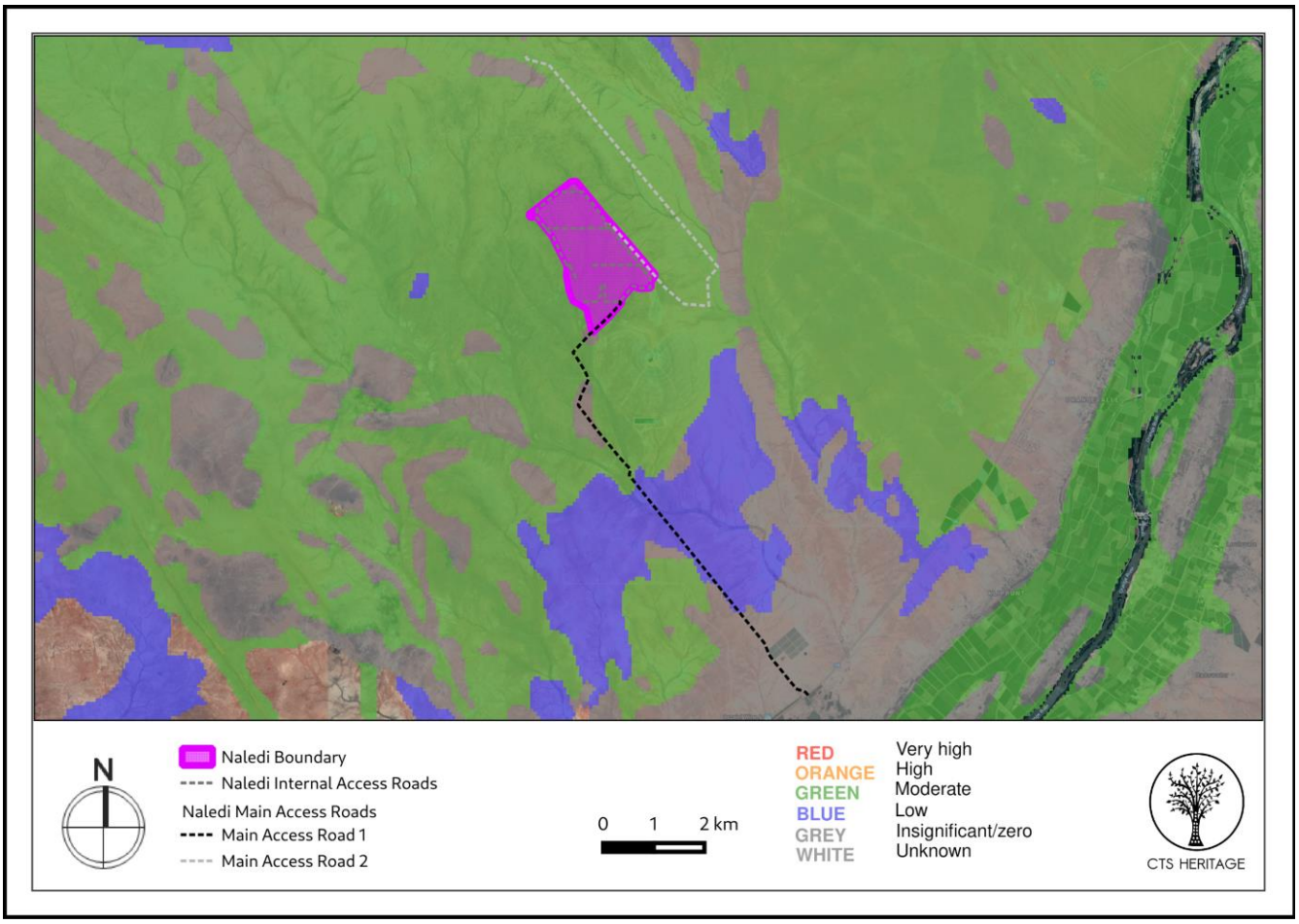

Figure 7.15: A palaeosensitivity map illustrating the location of the Naledi PV PV development area.

7.6. Visual Quality

The study area for Naledi PV is generally flat, consisting of valley depressions that are obvious along the N14 national road towards Keimoes. Whilst the area surrounding the study area is relatively flat, a degree of relief is provided by the minor ridgelines that form a dune field that runs in a general north-west and south-east direction at regular intervals. From the air, these ridgelines appear as a series of waves in the arid landscape. These ridgelines rise between 3 and 5m above the valley floor and are likely to have a visual influence by providing a degree of screening of the proposed development. To the south, south-west and south-east of the development area, numerous solar renewable energy developments and their associated grid connection solutions (i.e. collector substations and power lines) have been developed and are currently operational within the vicinity of the Naledi PV study area. These include, Khi Solar One, Sirius Solar PV Project One and Dyasons Klip 1 & 2. The development more obvious within the landscape is the Khi Solar One, which consists of a ~160m high Solar Tower, that is visible over a distance of 51km and is located within Portion 3 of the Farm McTaggarts Camp 453.

Three (3) types of visual receptors have been identified for the development of Naledi PV. The low number of the receptors is a result of the development being viewed in the context of the existing solar energy facility, Khi Solar One, which consists of the solar tower and is located within Portion 3 of the Farm McTaggarts Camp 453. The types of visual receptors identified include the following:

» Area Receptors
Area receptors include minor urban settlement areas identified and located within the Orange River Corridor Landscape Character Area (LCA). The majority of the settlement areas relate to the agricultural use of the River. Furthermore, it is also likely that the residents of these settlements are predominantly focused on agriculture-based economic activities, and due to these settlements being located near the banks of the Orange River, it is therefore a possibility that views of Naledi PV will be difficult, particularly from the northern banks of the River. Furthermore, it is also likely that the vegetation within the River Valley and the presence of the existing infrastructure (i.e. Solar Tower of Khi Solar One) will help screen views of the proposed development that may be possible from the Valley.

» Linear Receptors
Linear receptors or infrastructure running adjacent to study area include the N14 national road, the R359, the Lutzputs Road and the Upington-Kakamas Spur Railway. The N14 national and the R359 regional roads have substantial tourism significance; particularly the N14 national road, as it links the town of Upington with Kakamas, which is where the Augrabies National Park (a major tourist destination in the Province) is located. The Lutzputs Road is unsurfaced and runs approximately 3.2km to the north-east of the study area. This road is likely used by local residents in the area whereas the Upington-Kakamas Spur Railway is used for the transportation of goods.

» Point Receptors
Point receptors in the vicinity of the study area include individual homesteads that are located within the Orange River and the Plateau LCA. Based on previous field observations by the specialist, it is unlikely that the homesteads located on the northern sections of the Orange River will have any views of Naledi PV. It is, therefore, possible that homesteads located on the higher sections on the southern bank of the Orange River could have views of the proposed development. These, however, will be distant views, which will be softened by the extensive riparian vegetation present along the banks of the Orange River.

7.7 Social Profile

The social profile provides an indication of the specific social aspects within the area which will be relevant to the development of the Naledi PV, and which may be affected with the development of the proposed project.

Within the vicinity of the development area for Naledi PV, no sensitive social receptors are located. Social receptors that could possibly be affected by the development are local travellers making use of the Lutzputs Road located to the east and north-east of the development area. Other social receptors from the area are located to the south-east of the development area and include travellers making use of the N14 national road, the settlements of Kalksloot/Ses Brugge, Klippunt, Oranjevallei, and Dyasons Klip, as well as, agricultural activities undertaken along the banks of the Orange River. As a result of the presence of other renewable energy projects being undertaken in the vicinity of the social receptors, the development of Naledi PV will, therefore, not introduce solar energy to the area or an additional land use.

Table 7.2 provides a baseline summary of the social profile of the Kai !Garib LM within which Naledi PV is proposed. The data presented in this section of the BA Report has been derived from the 2011 Census, the Local Government Handbook South Africa 2019, the Northern Cape Provincial Spatial Development Framework (PSDF) and the ZF Mgcawu DM and Kai !Garib IDPs.

Table 7.2: **Baseline description of the social characteristics of the area proposed for Naledi PV**

Location characteristics
» Naledi PV is proposed within the Northern Cape Province, which is South Africa's largest, but least populated Province.
» The project is proposed within the Kai !Garib LM and the ZF Mgcawu DM. The study area for Naledi PV borders the Dawid Kruiper LM to the east.
» The Kai !Garib LM is approximately 26 377km² in extent, equivalent to approximately one quarter (25.7%) of the ZF Mgcawu DM.
Population characteristics
» Between 2001 and 2011 the Kai !Garib LM experienced a population growth rate of 1.2% per year.
» The Kai !Garib LM is male dominated, with males comprising approximately 52.0% of the LM population. The ZF Mgcawu DM is also male dominated, with males comprising approximately 50.8% of the DM population.
» Coloured people comprise the predominant population within the Kai !Garib LM and ZF Mgcawu DM.
» The Kai !Garib LM, ZF Mgcawu DM, and Northern Cape provincial, and South African national population age structures are all youth dominated. A considerable proportion of the respective populations therefore comprise individuals within the economically active population between the ages of 15 and 64 years of age
Economic, education and household characteristics
» The Kai !Garib LM has a dependency ratio of 29.5, which is lower than the ZF Mgcawu DM (33.6), Northern Cape Province (35.8), and South Africa (34.5).
» Education levels within the Kai !Garib LM are low with approximately 70.6% of the population aged 20 years and older who have received some form of schooling not having completed Grade 12 / Matric. This implies 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 Kai !Garib LM (6.7%) is lower than that of the ZF Mgcawu DM (11.3%), and the percentage of economically inactive individuals within the Kai !Garib LM (31.3%) is also lower than that of the ZF Mgcawu DM (38.3%).
» Household income levels within the Kai !Garib LM are very low, with approximately 84% 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 main economic sectors within the Kai !Garib LM include agriculture (51.8%), community and government services (15.9%), wholesale and retail trade (11.3%), finance services (7.6%), and manufacturing (5.1%).
» As of 2011 there were a total of 22 260 households within the Kai !Garib LM. This is equivalent to 32.9% of the total number of households within the ZF Mgcawu DM (67 468), and 7.1% of the total number of households within Northern Cape Province (313 402).
» The majority of households (56.3%) within the Kai !Garib LM comprise formal brick dwellings, while 1.7% comprise traditional dwellings, 4.3% comprise informal dwellings not in a backyard, and 0.4% comprise informal dwellings in a back yard.
Services
» The Kai !Garib LM is poorly serviced in terms of public sector health facilities with one hospital located in Kakamas, and a number of clinics, satellite clinics, mobile facilities and community health centres throughout the LM.
» The majority of households within the Kai !Garib LM are adequately serviced with regards to water, sanitation, electricity, and refuse removal, however there is significant room for improvement in terms of service deliver within the LM, with the LM often exhibiting lower levels of service provision than that of the ZF Mgcawu DM, Northern

Cape Province, and South Africa as a whole.

7.8 Site Accessibility

The N14 national road is one of the major road infrastructure present within the vicinity of the study area for Naledi PV. The road is a single carriage way, with one lane per direction running in an east-west direction, linking the towns of Kakamas, Keimoes, Upington with major towns and cities in South Africa, such as Springbok and Johannesburg and is therefore a major route for tourism in the region and Province. Secondary/regional road infrastructure present within the vicinity of the study area and development area of Naledi PV include the existing and gravel Lutzputs Road and the tarred access road to the Khi Solar One facility. Both these roads come off the N14 at different sections of the road. The Lutzputs Road runs along the eastern boundary of the study area in a north-westerly direction towards the settlement of Lutzputs. The Lutzputs Road is approximately 8-10m wide generally; however, at the junction with the N14, the road is 6m wide and crosses the Spur Railway Line located 370m from the junction.

A 6m wide main access road will be constructed during the construction phase of the proposed development to provide access to the development area and footprint of Naledi PV.

CHAPTER 8: ASSESSMENT OF POTENTIAL 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 Naledi PV 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 area of 330ha in extent. Naledi PV will comprise the following key infrastructure and components:

- Fixed-tilt or tracking solar PV panels with a maximum height of 3.5m;
- Centralised inverter stations or string inverters;
- A permanent laydown area;
- Cabling between the panels, to be laid underground where practical;
- A 22kV or 33kV/132kV on-site facility substation of up to 1ha in extent to facilitate the connection between the solar PV facility and the electricity grid;
- An access road to the development area with a maximum width of 6m;
- Internal access roads within the PV panel array area with a maximum width of 5m; and
- Operation and Maintenance buildings including a gate and security building, control centre, offices, warehouses, a workshop and visitors centre.

The full extent of the study area was considered through the BA process by the independent specialists and the EAP. On-site sensitivities were identified through the review of existing information, desk-top evaluations and field surveys. A development footprint for the PV facility within the development area was proposed by the proponent through consideration of the sensitive environmental features and areas identified following the commencement of the BA process. A layout for Naledi PV was designed within the development area and avoids very high environmentally sensitive areas not considered to be suitable for development or infringement (refer to **Figure 8.1** and **Figure 8.2**). In addition, the layout of Naledi PV is considered as least intrusive on the very high sensitive features and most suitable for development within the area surrounding the study area.

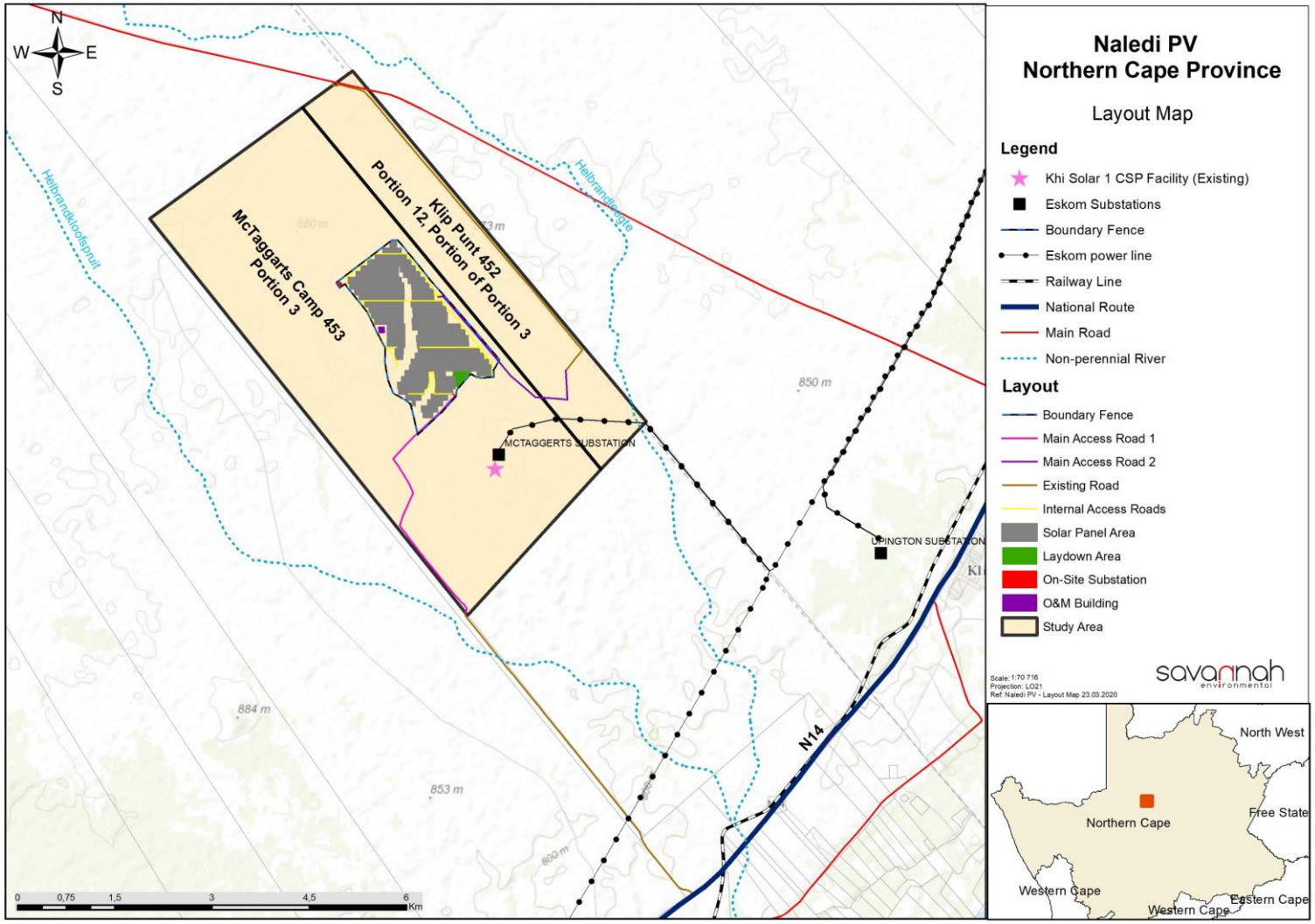

Figure 8.1: Map illustrating the Naledi PV development area (including layout) located within the study area.

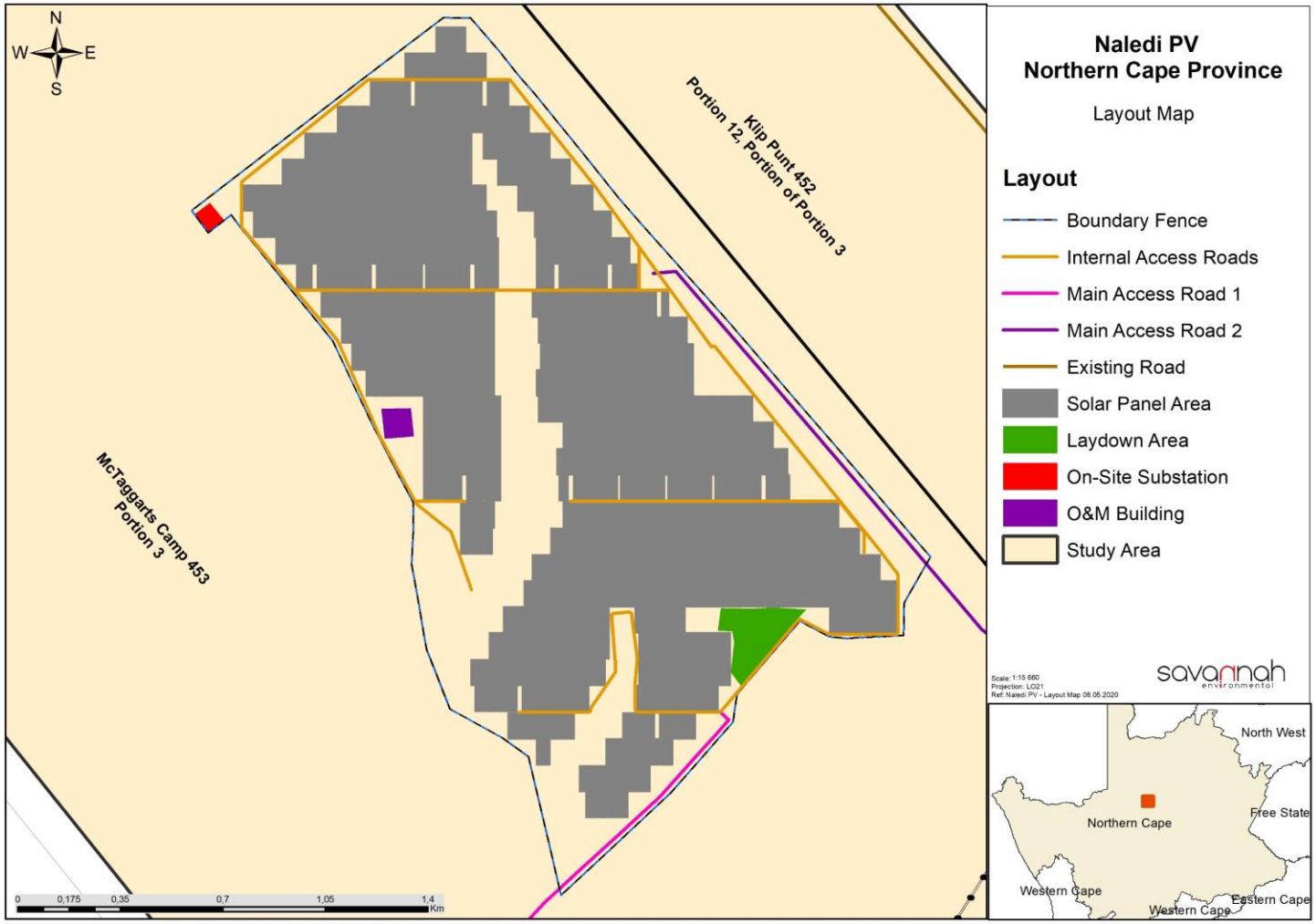

Figure 8.2: A layout map of Naledi PV showing the development footprint of the facility within the development area

The proposed development of Naledi PV will comprise the following phases:

» *Pre-Construction and Construction* – will include pre-construction surveys; site preparation; establishment of access roads; a permanent laydown area 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 Naledi PV is estimated at 12 – 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 (assessed as part of a separate Application for Environmental Authorisation). The operation phase of Naledi PV is expected to be approximately 20 years (with maintenance).

» *Decommissioning* – depending on the economic viability of the solar 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 PV facility and the on-site substation, clearance of the relevant infrastructure at the PV panel area, and the on-site facility substation and rehabilitation. Note that impacts associated with decommissioning are expected to be similar to those associated with construction activities; however, in certain instances decommissioning impacts have been considered separately.

Environmental impacts associated with the pre-construction, construction (and decommissioning) of Naledi PV will include, among others, habitat loss (for fauna and avifauna species); impacts on vegetation and protected plant species and habitat degradation as a result of erosion and alien plant species invasion; a reduced ability to meet conservation obligations and targets; and impacts on broad-scale biological resources; a loss of the major riparian systems and an impact on riparian systems through the possible increase in surface water run-off on riparian form and function. In addition, impacts anticipated for the operation phase of the solar PV facility, among others include, visual impacts, particularly, from the security lighting of the facility on night-time observers.

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

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

Requirement	Relevant Section
3(h)(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts (aa) can be reversed, (bb) may cause irreplaceable loss of resources, and (cc) can be avoided, managed or mitigated.	The impacts and risks associated with the development of Naledi PV including the nature, significance, consequence, extent, duration and probability of the impacts and the degree to which the impact can be reversed and cause an irreplaceable loss of resources are included in 8.3.3, 8.4.3, 8.5.3, 8.6.3, 8.7.3, 8.8.3, 8.9.3 and 8.10.3.
3(h)(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic,	The positive and negative impacts associated with the development of Naledi PV are included in sections 8.3.2, 8.4.2, 8.5.2, 8.6.2, 8.7.2, 8.8.2. 8.9.2 and 8.10.2.

Requirement	Relevant Section
heritage and cultural aspects	
3(h)(viii) the possible mitigation measures that could be applied and the level of residual risk.	The mitigation measures that can be applied to the impacts associated with Naledi PV are included in sections 8.3.3, 8.4.3, 8.5.3, 8.6.3, 8.7.3, 8.8.3, 8.9.3 and 8.10.3.
3(i) a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.	A description of all environmental impacts identified for Naledi PV during the BA process, and the extent to which the impact significance can be reduced through the implementation of the recommended mitigation measures provided by the specialists are included in sections 8.3.3, 8.4.3, 8.5.3, 8.6.3, 8.7.3, 8.8.3, 8.9.3 and 8.10.3.
3(j) an assessment of each identified potentially significant impact and risk, including (i) cumulative impacts, (ii) the nature, significance and consequences of the impact and risk, (iii) the extent and duration of the impact and risk, (iv) the probability of the impact and risk occurring, (v) the degree to which the impact and risk can be reversed, (vi) the degree to which the impact and risk may cause irreplaceable loss of resources and, (vii) the degree to which the impact and risk can be avoided, managed or mitigated.	An assessment of each impact associated with the development of Naledi PV, including the nature and significance, the extent and duration, the probability, the reversibility, and the potential loss of irreplaceable resources, as well as the degree to which the significance of the impacts can be mitigated are included in sections 8.3.3, 8.4.3, 8.5.3, 8.6.3, 8.7.3, 8.8.3, 8.9.3 and 8.10.3.
3(m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management outcomes for the development for inclusion in the EMPr.	Mitigation measures recommended by the various specialists for the reduction of the impact significance are included in sections 8.3.3, 8.4.3, 8.5.3, 8.6.3, 8.7.3, 8.8.3, 8.9.3 and 8.10.3.

8.2. Quantification of Areas of Disturbance within the Development Area

Site-specific impacts associated with the construction and operation of Naledi PV predominantly relate to site clearance activities that could impact protected and listed plant species (i.e. *Vachellia erioloba*); cause an increased risk of soil erosion as a result of the loss of vegetation cover; a loss of the major riparian system and an impact on riparian systems through the possible increase in surface water run-off on riparian form and function. In order to quantitively assess the impacts associated with the development of Naledi PV, it is necessary to consider the extent of the identified development area (i.e. 330ha) and the extent of the development footprint (i.e. 230ha) to be affected by the pre-construction and construction activities of the proposed solar PV facility.

8.3. Assessment of Impacts on Ecology (Fauna and Flora)

The development and operation of Naledi PV will have an impact on the ecological resources identified within the development area. These resources include vegetation, protected and listed plant species; fauna; habitat; conservation and broad-scale ecological processes.

A summary of the ecological impacts identified and the significance thereof for the proposed development are included below. Refer to **Appendix D** for more detail.

8.3.1 Results of the Ecological Impact Assessment

The vegetation within the study area and development area is relatively homogenous and there are no areas of open veld that are considered to be of a high sensitivity. The major feature of the study area are the numerous drainage features and the minor washes present (refer to **Figure 8.3**). The larger drainage features, with a significant woody component are considered to be of a very high sensitivity, while the less developed drainage features and wash areas are considered to be of a high sensitivity. The major drainage features (associated with a very high sensitivity) are considered unsuitable for development and while it would be necessary for roads to occasionally traverse these features, which is considered acceptable, there should not be any PV panels in these areas. The washes and the pans (within and outside the development area) are considered to be of a high to medium sensitivity depending on their extent and degree of vegetation development. The layout proposed for the development of Naledi PV does infringe on these high and medium sensitivity features (i.e. washes and the pan); however, some limited development in these high sensitivity areas is considered acceptable. The general surrounding vegetation of the open plain's habitat is of a low sensitivity.

Due to the presence of several washes within the development area of Naledi PV, the actual footprint of the PV panel area in certain instances has been designed to minimise impacts on these areas and avoids the major portions of these wash areas; however, the layout does infringe on certain washes located within the PV panel area, which could not be avoided due to technical constraints and will be lost to the development (refer to **Figure 8.3**). As a result, the development footprint (i.e. facility layout) of Naledi PV is considered acceptable and no fatal flaws from an ecological perspective are expected to occur.

A sensitivity map illustrating sensitive ecological features identified for the development area of Naledi PV is included in **Figure 8.3** below.

8.3.2 Description of Ecological Impacts

The following ecological impacts have been identified for the development of Naledi PV:

Impacts on vegetation and protected plant species

Several protected plant species in terms of the National Forest Act (Act No. 84 of 1998) of 1998 (i.e. *Vachellia erioloba,* and *Boscia albitrunca*) and the Northern Cape Nature Conservation Act (Act No. 9 of 2009) of 2009 (i.e. *Boscia foetida subsp. foetida*), occur within the development area; however, their density is low and would not be impacted by the development of the solar PV facility. Site clearance activities during the construction phase will lead to the loss of habitat within the development area and development footprint.

Direct faunal impacts

Increased levels of intrusion (i.e. noise, human presence, etc.), pollution and disturbance during the construction phase will be detrimental to fauna. Sensitive and shy fauna will move away from the development area during the construction phase as a result of noise and human activities present. Slow

moving faunal species would not be able to avoid construction activities and might be killed as a result. Therefore, some impact on fauna is likely to occur during the construction and operation phases of Naledi PV.

Habitat degradation due to erosion and alien plant invasion

Disturbance within the development footprint during the construction phase will leave the area vulnerable to erosion and alien plant invasion which will lead to the degradation of the local environment. Although, the disturbance will mainly be created during the construction phase of Naledi PV, the major impacts will manifest during the operation phase of the solar PV facility.

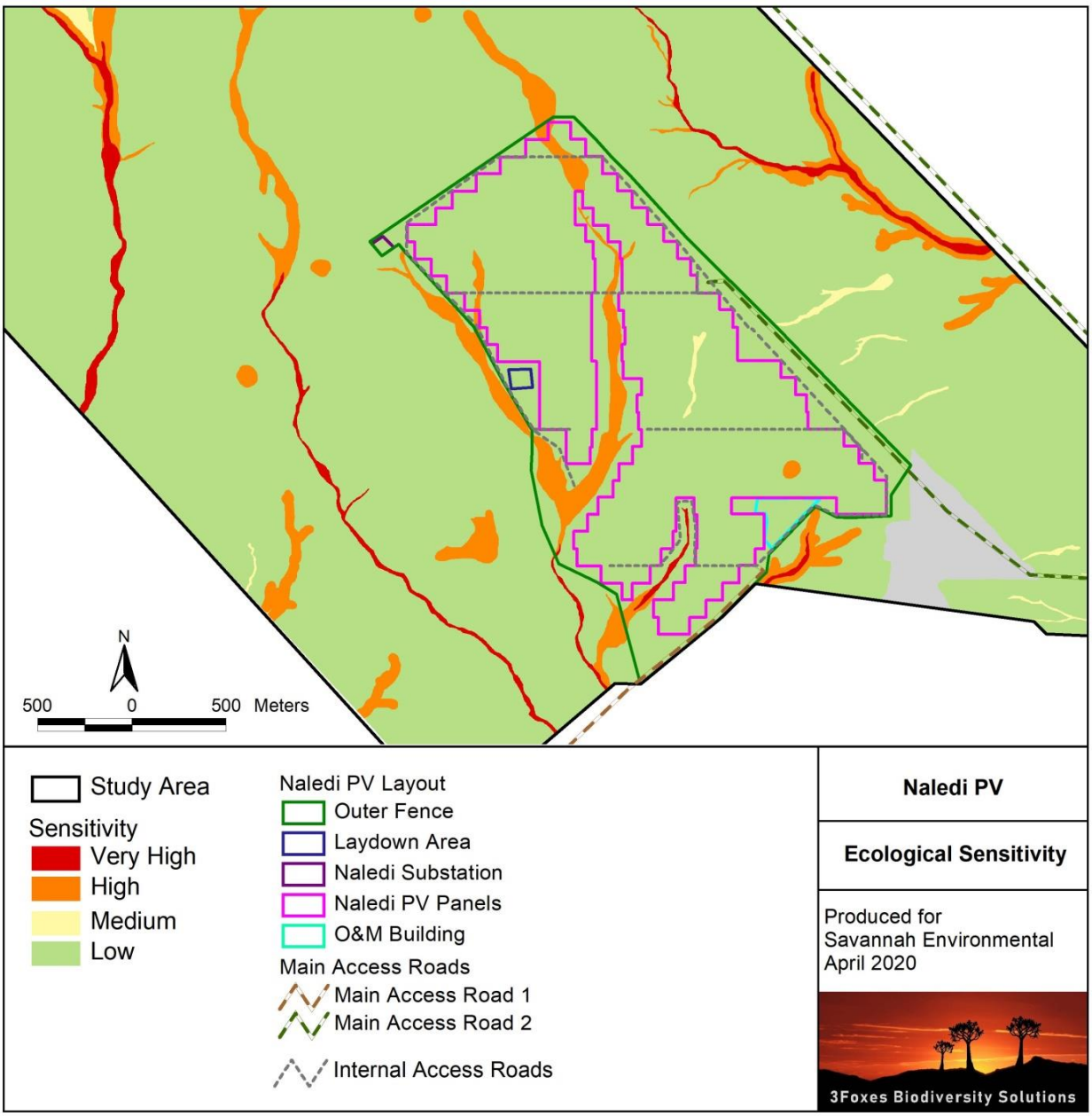

Figure 8.3: Ecological sensitivity map overlain with the Naledi PV layout

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

The impacts assessed below apply to the development area assessed for Naledi PV. Based on the proposed and assessed development footprint, which already avoids highly sensitive ecological features, the significance of the impacts with the implementation of the recommended mitigation measures are medium or low (depending on the impact being considered), which is acceptable from an ecological perspective.

Construction Phase Impacts

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

Impacts on vegetation will occur due to disturbance and vegetation clearance associated with the construction of the facility. In addition, it is likely that some loss of individuals of protected tree species will occur.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (4)	Low (3)
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 readily mitigated because the loss of vegetation is unavoidable and is a certain outcome of the development. The significance of the impact can only be slightly reduced.	

Mitigation:

- A pre-construction walk-through of the facility's final layout (i.e. development footprint) must be undertaken in order to locate species of conservation concern that can be translocated as well as comply with the Northern Cape Nature Conservation Act (Act No. 9 of 2009) of 2009 and DAEA,RD & LR/ DEFF permit conditions.
- Search and rescue for identified species of concern must be undertaken before construction commences.
- Vegetation clearing to commence only after the walk-through and the search and rescue has been conducted and the necessary permits obtained.
- Pre-construction environmental induction for all construction staff on site must be undertaken to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within demarcated construction areas etc.
- The Contractor's Environmental Officer (EO) to provide supervision and oversee the vegetation clearing activities within sensitive areas such as areas near the pan.
- Vegetation clearing must be kept to a minimum. No unnecessary vegetation must be cleared.
- All construction vehicles must adhere to clearly defined and demarcated roads. No off-road driving must 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 a 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 will result in 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 the 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 noise and disturbance generated within the development area during construction is largely unavoidable, impacts such as those resulting from the presence of construction personnel at the site can be easily mitigated.	

Mitigation:

- All personnel must 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 must be removed to safety by an appropriately qualified person.
- All construction vehicles must adhere to a low speed limit (40km/h for light vehicles and 30km/h for heavy vehicles) to avoid collisions with susceptible species such as snakes and tortoises.
- All hazardous materials must be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site must be cleaned up in the appropriate manner as related to the nature of the spill.
- If trenches need to be dug for electrical cabling, these must not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches that are standing open should have places where there are soil ramps allowing fauna to escape the trench. Larger fauna can be excluded with barrier nets.

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 the operation of the facility*

The operation and presence of the facility may lead to disturbance or persecution of fauna within or within areas 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 operation activities must 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 must be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site must be cleaned up in the appropriate manner as related to the nature of the spill.
- All vehicles accessing the site must adhere to a low speed limit (40km/h max for light vehicles and 30km/h max for heavy vehicles) 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 the construction phase of the facility will leave the site vulnerable to erosion and alien plant invasion for several years into the operation phase.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (3)
Magnitude	Moderate (4)	Low (3)
Probability	Probable (4)	Probable (3)
Significance	**Medium (36)**	**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 within the development area must take place according to the Erosion Management Plan and Rehabilitation Plan (**Appendix F** of the EMPr).
- Access roads should have run-off control features that redirect water flow and dissipate any energy in the water which may pose an erosion risk.
- Undertake regular monitoring for erosion during the operation phase to ensure that no erosion problems have developed as result of the disturbance, as per the Erosion Management and Rehabilitation Plans (**Appendix F** of the EMPr) for the project.
- All erosion problems observed must be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.
- There must be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous perennial shrubs and succulents from the local area.

- » Alien management at the site must take place according to the Alien Invasive Management Plan.
- » Regular monitoring for alien plant proliferation during the operation phase must be undertaken to ensure that no erosion problems have developed as result of the disturbance, as per the Alien Management Plan (**Appendix C** of the EMPr) for the project.
- » Woody aliens must 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 are likely to occur even with the implementation of control measures but would have a low impact.

Decommissioning Phase Impacts

Nature: *Habitat degradation due to erosion and alien plant invasion*

Disturbance created during the decommissioning of the facility will leave the site vulnerable to erosion and alien plant invasion for several years.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (3)
Magnitude	Moderate (4)	Low (3)
Probability	Probable (4)	Probable (3)
Significance	**Medium (36)**	**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 within the development area must take place according to the Erosion Management Plan and Rehabilitation Plan (**Appendix F** of the EMPr).
- » Access roads should have run-off control features that redirect water flow and dissipate any energy in the water which may pose an erosion risk.
- » Undertake regular monitoring for erosion during the operation phase to ensure that no erosion problems have developed as result of the disturbance, as per the Erosion Management and Rehabilitation Plans (**Appendix F** of the EMPr) for the project.
- » All erosion problems observed must be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.
- » There must be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous perennial shrubs and succulents from the local area.
- » Alien management at the site must take place according to the Alien Invasive Management Plan (**Appendix C** of the EMPr).
- » Regular monitoring for alien plant proliferation must be undertaken to ensure that no erosion problems have developed as result of the disturbance, as per the Alien Management Plan (**Appendix C** of the EMPr) for the project.
- » Woody aliens must 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 are likely to occur even with the implementation of control measures but would have a low impact.

Nature: *Direct faunal impacts due to decommissioning activities*

Due to disturbance, noise and the operation of heavy machinery, faunal disturbance due to decommissioning will extend beyond the footprint and impact adjacent areas to some degree. This will however be transient and restricted to the period while the machinery is operational. In the long term, decommissioning should restore the ecological functioning and at least some habitat value to the affected areas.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Low (3)
Probability	Highly Probable (4)	Probable (3)
Significance	**Low (28)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Although noise and disturbance generated within the development footprint is probably unavoidable, this will be transient and ultimately, the habitat should be restored to something useable by the local fauna.	

Mitigation:

- All personnel must 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 decommissioning activities must be removed to safety by an appropriately qualified Environmental Officer.
- All vehicles must adhere to a low speed limit (40km/h for light vehicles and 30km/h for heavy vehicles) 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 and be removed from site as part of decommissioning. 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.
- The site should be rehabilitated with locally occurring species to restore ecosystem structure and function.

Residual Impacts:

Although some components of disturbance cannot be avoided, the site itself would have low faunal abundance at decommissioning and no significant residual impacts are likely.

8.3.4 Comparative Assessment of Main Access Road Alternatives

From the two (2) main access road alternatives proposed by the proponent, Alternative 2 is regarded as the preferred option from an ecological perspective as it will require fewer road crossings, however, Alternative 1 is also considered to be acceptable (should it not be possible not to construct the Alternative 2 option).

Aspect: *Ecology*

	Alternative 1	**Alternative 2**
Main Access Road	» Acceptable	» Alternative 2 is preferred from an ecological perspective as it will require road crossings. » Preferred and acceptable

8.3.5 Implications for Project Implementation

Based on the proposed and assessed development footprint, which already avoids highly sensitive features not suitable for development, the significance of the impacts with the implementation of the recommended mitigation measures are medium or low (depending on the impact being considered), which is considered to be acceptable from an ecological perspective. From the outcomes of the ecological impact assessment undertaken, it is concluded that the solar PV facility and associated infrastructure can be developed with the implementation of the recommended mitigation measures. 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:

- The larger drainage features are associated with a significant woody component and therefore are of a very high sensitivity. These features are considered unsuitable for development and while it would be necessary for roads to occasionally traverse these features, which is considered acceptable, the placement of PV panels within these features is not permitted.
- The less well-developed drainage features and wash areas are of a medium to high sensitivity depending on the extent and degree of vegetation development; therefore, some limited development in these features is considered acceptable. In addition, as a result of the presence of several washes within the Naledi PV development area, the layout for the solar PV facility has been designed to minimise impact on these features and avoids the major portions of the wash areas.
- In terms of the two main access road alternatives proposed, Alternative 2 is the preferred alternative from an ecological perspective as it will require a few road crossings in comparison to Alternative 1. However, both alternatives are acceptable, therefore Alternative 1 can be constructed should it not be possible to construct Alternative 2.
- A pre-construction walk-through of the final development footprint must be undertaken for species of conservation concern that would be affected and that can be translocated 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 / removed, where deemed necessary by the ecologist conducting the pre-construction walk-through survey. Permits from the relevant national and provincial authorities, i.e. the DAFF and the Northern Cape DENC, must be obtained before the individuals are disturbed.
- No electrified strands must 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.

8.4. Assessment of Impacts on Avifauna

Based on the proposed and assessed development footprint of Naledi PV and identified features of high significance, the significance of the impacts with the implementation of the recommended mitigation measures are assessed as medium or low (depending on the impact being considered), which is considered to be acceptable from an avifauna perspective. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix E** of the Final BA Report for more details).

8.4.1 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 study area and development area. **Figure 8.4** was generated by integrating avian microhabitats present within the study area and development area, and avifaunal information collected during the spring (4 – 8 October 2018) and late summer (9 – 12 April 2019) field surveys.

The study area supports three (3) main avifaunal microhabitats, which are referred to as the plains, drainage features and small pans. These three (3) habitats have marginally different sensitivities as a result of the subtle differences in the avifaunal assemblages that they support. As a result, these habitats have been classified as being of a medium, high, and very high sensitivity and are described below.

The plains habitat is associated with a medium sensitivity. The habitat supports a combination of an open gravel and sandy plains habitat which contributes to the habitat diversity of the area. The plains habitat supports the Near-Threatened Karoo-Korhaan and the Kori-Bustard and the Endangered Ludwig's Bustard.

The riparian habitat of the drainage features and small pans is unique and restricted within the study area. The habitat is associated with a denser vegetation; therefore, the development of the solar PV facility would result in much of the habitat and ecological functioning being lost. Therefore, where possible, buffer zones of 50 – 100m wide should be included around the habitat since the preservation of the habitat associated with these features will also ensure adequate drainage of the study area during rainfall events. As a result, the riparian habitat associated with the drainage features and small pans is of a high sensitivity and these features have been largely avoided by the layout (**Figure 8.4**).

The proposed layout for Naledi PV does not infringe on the habitat for the Karoo Korhaan species along the eastern boundary of the study area. This area has been identified as a possible corridor for this species based on their consistent presence within the plain's habitat, which consists mainly of gravel substrate along the eastern section of the study area. This corridor for the korhaans does extend further to the east and north of the area surrounding the study area; therefore, this species is associated with a wider distribution and would not be affected by the development of Naledi PV. In addition, the proposed layout does infringe to some degree into the high sensitivity areas associated with the dense vegetated washes and drainage features within the study area. Therefore, approximately, 36ha of high sensitivity habitat would be contained within the boundaries of the Naledi PV development area, of which 7-10ha would be lost to the development. While this would have a local impact on the affected washes and drainage features, the overall extent of habitat loss is considered to be low and would not result in a significant impact on the availability of this habitat in the wider area.

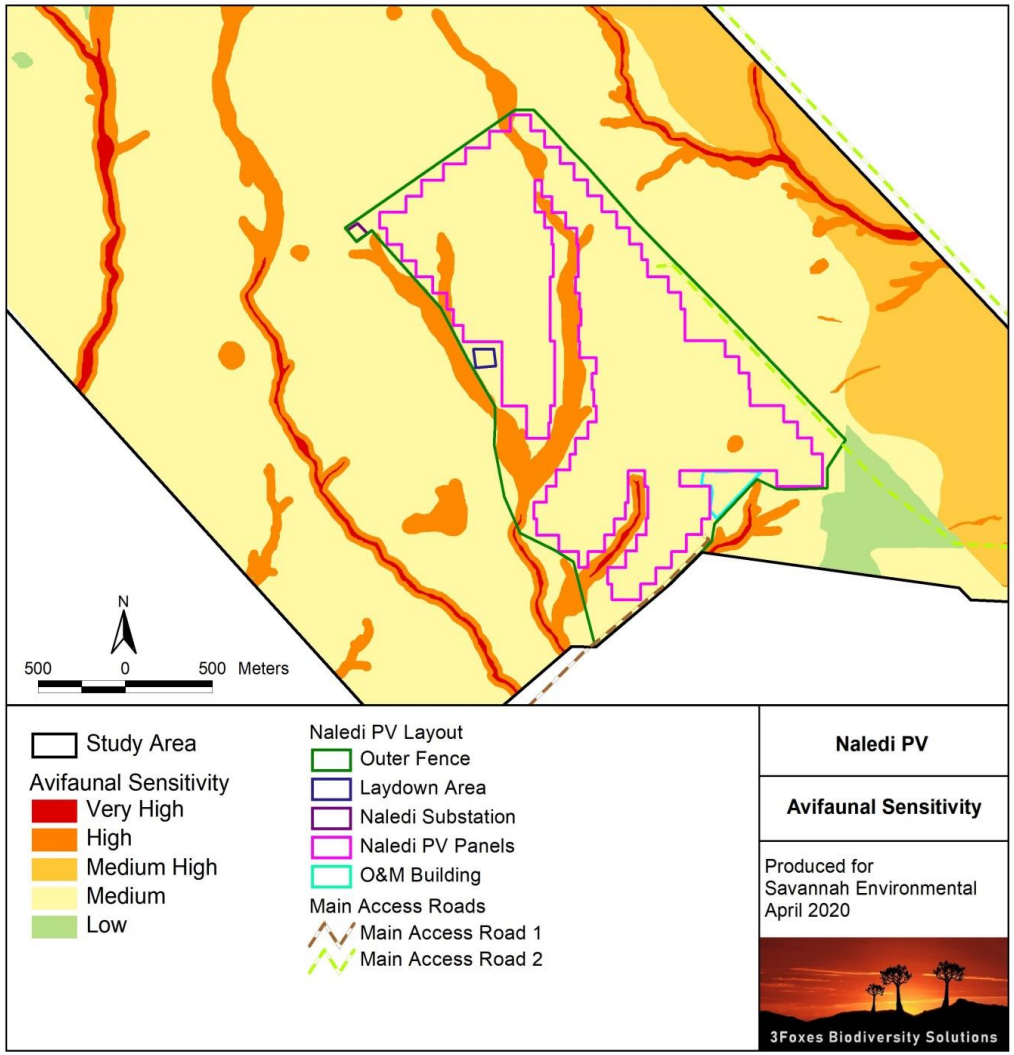

Figure 8.4: A map illustrating the avifaunal sensitivity within the Naledi PV development area overlain with the proposed layout.

8.4.2 Description of Avifaunal Impacts

Negative avifauna impacts anticipated to occur with the development of Naledi PV include habitat loss and disturbance of small passerines, disturbance and collision risk of medium and large terrestrial birds and raptors.

» *Habitat loss 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. The loss of habitat will be permanent while disturbance may be continuous during the operation phase of Naledi PV. Although numerous species will be impacted, all of these species have large distribution ranges and will, therefore, only experience population decline on a localised scale within the development footprint and immediate surroundings, and not on a regional or national scale. Some of the most abundant species that will be impacted and that are also common in the adjacent habitats include, the Spike-heeled Lark, Sabota Lark, Fawn-coloured Lark, Eastern Clapper Lark, Rufous-eared Warbler, Chat Flycatcher and the Black-chested Prinia. Disturbance impacts as a result of reflective solar PV panels is not likely to have a significant impact on these small species. Therefore, the impacts in general can be expected to be minor, as the smaller species are far less susceptible compared to the 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 the Pale Chanting Goshawk and the terrestrial Namaqua Sandgrouse, Northern Black Korhaan, Double-banded Courser and most importantly, the Near-Threatened Karoo Korhaan. These species may be susceptible to collisions with associated infrastructure such as the PV panels, however, this not expected to have a major impact on most of these species. The Northern Black Korhaan and Karoo Korhaan may, however, be at more risk based on recent research depending on the type of perimeter fencing installed at the facility.

» *Habitat loss, disturbance and collision risk of large terrestrial birds and raptors*
The group of primary concern is the medium-large non-passerines, which include the large terrestrial birds and diurnal raptors. Many of these are also red-listed, such as the White-backed Vulture, Lappet-faced Vulture, Martial Eagle, Tawny Eagle, Secretary bird and the Lanner Falcon, as well as the Near Threatened Kori Bustard. These species are expected to lose a portion of their large foraging ranges, while disturbances during the construction phase and operation (maintenance) phase of the solar PV facility is also expected to have some negative impact; however, this will primarily be on the Kori Bustard and possibly the Secretary bird.

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

The impacts assessed below apply to the development area assessed for Naledi PV. Based on the proposed and assessed development footprint, which already avoids the highly sensitive avifauna features, which include the Karoo Korhaan habitat, the significance of the impacts with the implementation of the recommended mitigation measures are medium or low (depending on the impact being considered), which is acceptable from an avifauna perspective.

Construction Phase Impacts

Nature: *Habitat loss and disturbance due to vegetation clearing*

Vegetation clearance which will be required during the construction phase for the placement of various infrastructure and components required for the solar PV facility will lead to the loss of habitat and inevitably displace the avifauna species from their habitat.

	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 readily 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 should be placed, where feasible, to avoid habitat loss and disturbance to adjoining areas.
- The major drainage features and pans should be avoided as far as possible as these contribute to the habitat diversity, but also the majority of the eastern boundary and the south eastern corner of the study area, which should serve as a buffer between the existing Khi Solar One facility and the wooded drainage feature to the east.
- All building waste produced during the construction phase should be removed from the development area and be disposed of at a registered waste management facility. Similarly, all liquid wastes should be contained in appropriately sealed containers within the development area and be disposed of at a designated waste management facility after use.
- Any liquid and chemical spills must be dealt with accordingly to avoid contamination of the environment.
- Pre-construction environmental induction for all construction staff on site must be undertaken to ensure that basic environmental principles are adhered to, and awareness is created 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.
- The induction must also include awareness regarding no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc.
- All construction vehicles must 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 max for light vehicles and 30km/h max for heavy vehicles) 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 Environmental Officer or any other suitably qualified person.
- If holes or trenches need to be dug, these should not be left open for extended periods of time as terrestrial avifauna or their flightless young may fall in and become trapped in them. Holes must only be dug when they are equipped and must be used and filled shortly thereafter.
- No construction activity must occur near active raptor nests. Should these be discovered, prior to or during the construction phase, and if there are active nests near construction areas, these should be reported to the ECO and be monitored until the birds have finished nesting and the fledglings have left the nest.
- The perimeter fence around the facility should be designed with potential impacts on terrestrial avifauna in mind.

Double-face designs where the inner electric fence is positioned within one (1) metre of the outer mesh fence may result in medium-sized non-passerine species colliding with either fence when trapped. Single-fence designs, whereby the electrical fencing component is attached to the inside of the mesh fence are considered preferable as terrestrial birds cannot be trapped between these components.

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.

Operation Phase Impacts

Nature: *Collisions with PV panels, potential entrapment along perimeter fencing and disturbance due to traffic and night lighting.*

Mortality among the avifauna may result due to direct collisions with PV panels or entrapment along the perimeter fence of the solar PV facility.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low to Moderate (5)	Low (4)
Probability	High 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 where double fencing is used as opposed to bird-friendly single-fencing.	

Mitigation:

- All incidents of collision with panels must 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, if there are high collision rates, as this will contribute towards understanding bird interactions with solar panels.
- The major drainage features should be avoided as far as possible.
- If the site must be lit at night for security purposes, this must be done with downward-directed low ultraviolet (UV) type lights (such as most Light-emitting diodes (LEDs)), which do not attract insects. The use of lighting at night should be kept to a minimum, so as to not unnecessarily attract invertebrates to the facility and possibly their avian predators; therefore, minimising the number of birds flying over the facility at night.
- If bird nests on the infrastructure of the facility cannot be tolerated due to an operational risk of fire, electrical shorts, soiling of panels or other concerns, birds should be prevented from accessing the nest by using mesh or any other appropriate manner of excluding them. Birds must 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 where possible or be removed to a suitable area outside the development footprint of the solar PV facility.
- If there are any persistent problems with avifauna, then an avifaunal specialist must be consulted for advice on further mitigation.
- Any movements by vehicles and personnel should be limited to the footprint of the solar PV facility and other associated infrastructure, especially during routine maintenance procedures.
- All vehicles accessing the site must adhere to a low speed limit (40km/h max for heavy vehicles and 30km/h max for light vehicles) to avoid collisions with susceptible species such as nocturnal and crepuscular (e.g. nightjars,

thick-knees and owls) which sometimes forage or nest on roads at night.
» Maintenance of the perimeter fencing must ensure that it minimises impacts on terrestrial species susceptible to entrapment between the fencing components, especially where double-fence designs are used (not recommended). If double-fence designs must be used, instead of preferred single-fence designs, the space between the outer mesh and inner electrical fence must be kept clear of vegetation which may attract terrestrial species to forage there, while also ensuring that there are no gaps/holes in these fences that will allow terrestrial birds to enter the space between the two fences.

Residual Impacts:
Although high rates of mortality due to collisions have not been recorded in South Africa, there is some risk that this may occur, in addition to some potential mortality associated with entrapment of terrestrial birds along perimeter fencing, especially for double-fence designs (if implemented).

Decommissioning Phase Impacts

Nature: *Habitat loss and disturbance due to clearing of the solar PV facility and disturbance due to traffic and presence of personnel.*

The decommissioning phase will result in disturbance and the loss of avifaunal microhabitats due to the removal and clearing of the solar PV facility and associated infrastructure footprint. Disturbances will be caused by increased traffic or vehicles, and particularly heavy machinery used for uninstalling and removing the infrastructure.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (4)	Low to Moderate (3)
Probability	Definite (5)	Definite (5)
Significance	**Medium (35)**	**Medium (30)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	The disturbance impact can be mitigated to an extent as it will be transient and have no long-term impact.	

Mitigation:
» All infrastructure should be removed from the development area and disposed of in the appropriate manner.
» All waste produced during decommissioning must be disposed of at a designated waste management facility.
» Environmental induction for all personnel must be undertaken on site to ensure that basic environmental principles are adhered to, and awareness about not harming or hunting terrestrial species (e.g. bustards, korhaans, thick-knees and coursers), and owls, which are often persecuted out of superstition is provided.
» This induction should also include awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, and remaining within demarcated decommissioning areas.
» All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed in undisturbed natural areas outside of the decommissioning area.
» The major drainage features and pans should be avoided as far as possible, but also the majority of the eastern boundary and the south eastern corner of the study area, which should serve as a buffer between the existing Khi Solar One facility and the wooded drainage feature to the east.
» All construction vehicles should adhere to a low speed limit (40km/h on site for light vehicles and 30km/h for heavy vehicles) to avoid collisions with susceptible species such as nocturnal and crepuscular species (e.g. nightjars, thick-knees and owls) which sometimes forage or rest along roads.
» Any avifauna threatened by the activities should be removed to safety by the EO or any suitably qualified person.
» If holes or trenches need to be dug, these should not be left open for extended periods of time as terrestrial avifauna or their flightless young may become entrapped in them. Holes should only be dug when they are required and should be used and filled shortly thereafter.

» No activity should occur near to active raptor nests should these be discovered prior to or during the decommissioning phase. If there are active nests near the decommissioning areas, these should be reported to the ECO and should be monitored until the birds have finished nesting and the fledglings left the nest
Residual Impacts: Disturbance during the decommissioning phase is an unavoidable consequence but will have a low residual impact with the implementation of the mitigation measures. The sensitivity of the affected habitat is however low and the overall residual impact on avifaunal habitat loss remains low.

8.4.4 Comparative Assessment of Main Access Road Alternatives

From the two (2) main access road alternatives proposed by the proponent, Alternative 1 is the preferred option from an avifauna perspective due to the majority of the route has already been tarred; therefore, little transformation of any habitat would be required.

Aspect: *Avifauna*		
	Alternative 1	**Alternative 2**
Main Access Road	» Preferred, due to the majority of the route is already tarred; therefore, little transformation of any habitat would be required. » Acceptable & preferred	» Acceptable

8.4.5 Implications for Project Implementation

With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of avifauna impacts associated with Naledi PV will be medium and low (depending on the impact being considered). From the outcomes of the avifauna impact assessment undertaken, it is concluded that the PV facility can be developed and impacts on avifauna be managed by taking the following into consideration:

» The drainage features and the small pans within the study area are a restricted habitat due to the dense vegetation they support; therefore these features are associated with a high sensitivity even though red-listed avian species may not be directly associated with the habitats. Due to the drainage features and pans occurring throughout much of the study area and development area, the development of Naledi PV would potentially result in much of these habitats and their ecological functioning being lost. Therefore, it is recommended that where possible, 50-100m wide buffer zones be included around the largest and most significant of these habitats, as the preservation of the larger drainage features will also ensure the adequate drainage of the study area during rainfall events. From the layout assessed within the BA process and by the specialist, these features (i.e. drainage features and small pans etc.) have largely been avoided and adequate buffers are provided.
» The Naledi PV development area does not infringe on the Karoo Korhaan habitat that is located along the eastern boundary of the study area. This area has been identified as a possible corridor for the Karoo Korhaan species due to their consistent presence in the area that is associated with the plains habitat that mostly contains a gravel substrate. The habitat for the Karoo Korhaan does extend further east and north of the development area of Naledi PV and therefore has a wider distribution within the surrounding area and would not be directly affected by the proposed development. Therefore, the development of Naledi PV is unlikely to have an impact on the Karoo Korhaan habitat.

» To a certain degree, the proposed development of Naledi PV does infringe on high sensitivity features associated with more densely vegetated washes and drainage features of the study area. Approximately 36ha of high sensitivity habitat would be contained within the boundaries of the Naledi PV layout, of which 7-10ha would be lost to the development. While this would have a local impact on the affected washes and drainage features, the overall extent of the habitat loss is considered to be relatively low and would not result in a significant impact on the availability of this habitat in the wider area.

8.5. Assessment of Impacts on Aquatic Resources

The significance of the impacts on aquatic resources expected with the development of Naledi PV have been assessed as being of high or medium significance, which can be reduced to low with the implementation of mitigation measures. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix F** of the Final BA Report for more details).

8.5.1 Results of the Aquatic Resources Impact Assessment

The study area for Naledi PV falls within the D73F catchment area which is associated with the Helbrandleegte and Helbrandkloofspruit aquatic systems in the Nama-Karoo region. These are short tributaries of the Orange River (located 10km south of the study area) and are largely ephemeral alluvial systems. The outcomes of the Aquatic Resources Impact Assessment (**Appendix F**) have indicated that these alluvial systems are in a natural state, when compared to the Orange River reach which has modified floodplains and flows.

Secondary alluvial watercourses that are either fragmented or contain no riparian zones and two (2) small depressions/pan wetlands (**Figure 8.5**) were identified; one within the development area and another within the 500m of the development area of Naledi PV. These features are associated with a moderate sensitivity as they contain no aquatic habitat and only function as a means to sustain or convey baseflows within the greater catchment. Furthermore, in terms of the NEFPA Assessment, all the systems within the development area have been assigned a condition AB score, which indicates that they are largely intact and of a significant ecological importance.

As a result of anthropogenic disturbance in the area, other impacts on the aquatic resource are prevalent, particularly downstream where the Helbrandleegte and Helbrandkloofspruit system confluence with the Orange River.

The assessment concludes that for activities occurring within 500m of the delineated watercourses, a water use authorisation will be required in terms of section 21 (i) and (c) of the National Water Act (Act No. 36 of 1998) of 1998.

8.5.2 Description of Aquatic Impacts

Negative impacts on aquatic resources anticipated to occur with the development of Naledi PV include the loss of major riparian systems, impact on secondary alluvial watercourses and minor drainage features through physical disturbance, impact on riparian and wetland systems, an increase in sedimentation and erosion, and risks on the general aquatic environment as a result of water quality impacts.

» *Loss of the larger pans and the major riparian systems associated with the mainstem rivers, Helbrandleegte and Helbrandkloofspruit through physical disturbance and the impact on secondary alluvial watercourses and minor drainage features.*
The physical removal or disturbance of the narrow woody riparian zones, disturbance of channels and the small pan being replaced by hard engineered surfaces will alter the hydrological regime of the area by increasing the surface run-off velocities, while reducing the potential for any run-off to infiltrate the soils. This impact will, however, be localised as the PV panels and mounting structures traverse the watercourses, any flows would still be allowed to leave the footprint of the solar PV facility through the larger systems which will remain intact. Furthermore, the proposed layout for Naledi PV avoids the more defined channels, which are associated with a high sensitivity, with the exception of one depression and some infringement on some portions of the proposed buffers; however, these were unavoidable due to technical constraints and it is envisaged that infringement into these areas would not have a significant impact on the functioning of the catchment.

» *Impact on riparian systems through the possible increase in surface water run-off on riparian form and function.*
An increase in hard surface areas and roads that require stormwater management will increase through the concentration of surface water flows which could result in localised changes to flows which would result in form and function changes within the riparian systems, which are currently ephemeral.

» *Increase in sedimentation and erosion wihtin the development footprint.*
The development of Naledi PV will leave some of the soil within the development footprint exposed to soil erosion and sedimentation which will be exacerbated by erosion agents, such as surface water run-off and wind.

» *Impact on localised surface water quality*
During the construction phase and to a limited extent, also during the operation phase of Naledi PV, chemical pollutants (i.e. hydrocarbons from equipment and vehicles, cleaning products, cement powder, wet cement, shutter oil, etc.), associated with site-clearance machinery and construction activities could be washed downstream through the ephemeral systems in the area.

8.5.3 Impact tables summarising the significance of impacts on aquatic resources during construction, operation, and decommissioning (with and without mitigation)

The impacts assessed below apply to the development area assessed for Naledi PV. Based on the proposed and assessed development footprint, which already avoids the very high sensitive drainage features and will have an impact on some of the high sensitivity aquatic features (i.e. washes and the depression/wetland only measuring 0.2ha) which are fragmented or contain no riparian zones, the significance of the impacts with the implementation of the recommended mitigation measures is low, which is acceptable from an aquatic perspective.

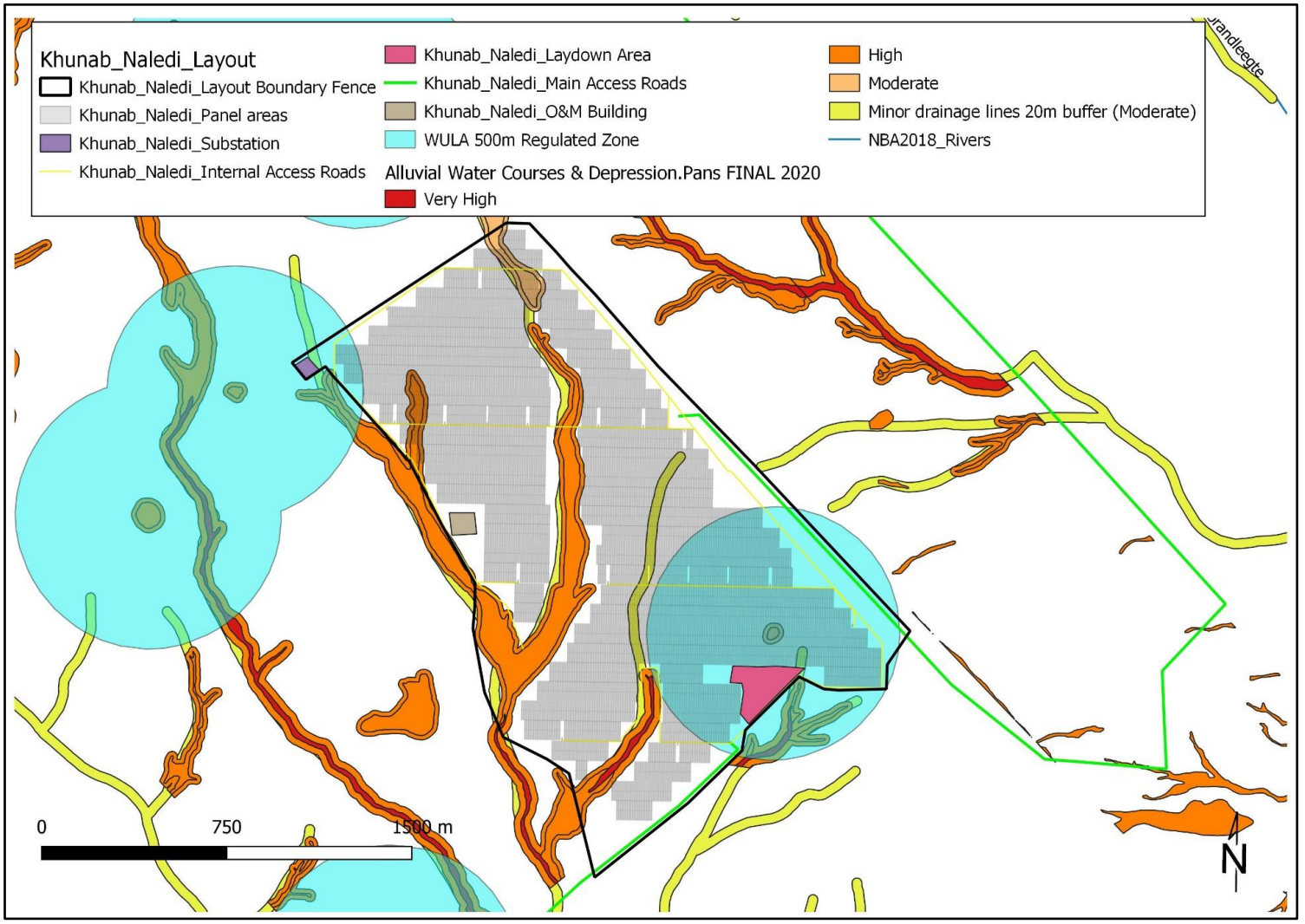

Figure 8.5: A map illustrating the delineated watercourses within the study area and development area for Naledi PV

Construction and Operation Phase Impacts

Nature: *Loss of the larger pans and the major riparian systems associated with the mainstem rivers, Helbrandleegte and Helbrandkloofspruit through physical disturbance.*

The physical removal or disturbance of the narrow woody riparian zones, disturbance of channels and the small pan being replaced by hard engineered surfaces will alter the hydrological regime of the area by increasing the surface run-off velocities, while reducing the potential for any run-off to infiltrate the soils. This impact will, however, be localised as where the PV panels and mounting structures traverse the watercourses, any flows would still be allowed to leave the footprint of the solar PV facility through the larger systems which will remain intact. Furthermore, the proposed layout for Naledi PV avoids the more defined channels, which are associated with a very high sensitivity, with the exception of one depression (high sensitivity) and some infringement on some portions of the proposed buffers; however, these were unavoidable due to technical constraints and it is envisaged that infringement into these areas would not have a significant impact on the functioning of the catchment.

	Without mitigation	**With mitigation**
Extent	High (3)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	High (7)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**High (70)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

The following measures should be implemented:

- All alien plant re-growth must be monitored, and should these alien plants reoccur, these plants should be re-eradicated. The scale of Naledi PV does not warrant the use of a Landscape Architect or Landscape Contractor.
- It is further recommended that a comprehensive Rehabilitation/Monitoring Plan (**Appendix E** of the EMPr) be implemented from the project onset to ensure a net benefit to the environment within all areas that will remain undisturbed.

Residual Impacts:
Possible impact on the remaining catchment due to changes in run-off characteristics in the development area.

Nature: *Impact on secondary alluvial watercourse with fragmented riparian systems.*

The removal of narrow strips of woody riparian zones being replaced by hard engineered surfaces will alter the hydrological regime of the area, by increasing the surface water run-off velocities while reducing the potential for any run-off to infiltrate the soils. However, this impact will be localised since the mounting structures for the PV panels traverse the watercourses, any flows would still be allowed to leave the footprint of the solar PV facility through the larger systems which will remain intact. The infringement on these systems was unavoidable due to technical constraints and it is envisaged that infringement into these areas would not have a significant impact on the functioning of the catchment. The most significant form of mitigation would be to select a development area which contained no drainage features. The proposed layout for Naledi PV has been developed to avoid the important systems; therefore, requiring only crossings or footprints within areas rated as having a moderate sensitivity to physical disturbance, although hydrological function would still remain.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**Medium (45)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

The following measure must be implemented:

» Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment. Suitable dust and erosion mitigation measures must be included in the EMPr to mitigate against these impacts.

Residual Impacts:
Diversion of run-off away from downstream systems is unlikely to occur as the annual rainfall figures are low.

Nature: *Impact on riparian systems through a possible increase in surface water run-off on riparian form and function.*

An increase in hard surface areas, and roads that require stormwater management will increase through the concentration of surface water flows that can result in localised changes to flow volume, which will result in form and function changes within the riparian systems, which are currently ephemeral. Changes to the riparian systems will lead to changes to the species composition, which will ultimately lead to habitat change and/or loss.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (2)	Low (2)
Probability	Definite (5)	Probable (3)
Significance	**Medium (35)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes.	

Mitigation:

» Any stormwater within the development area must be handled in suitable manner, i.e. separate clean and dirty water streams around the plant and install stilling basins to capture large volumes of run-off, trap sediments and reduce flow velocities (e.g. water used when washing the panels) (refer to **Appendix G** of the EMPr for further details).
» The project should also try to capture and recycle any form of run-off created by its daily operations. This would minimise the amount of water required by the project. This will also serve to limit the downstream impacts on the riparian systems through an increase in run-off, a situation that these systems are currently unaccustomed to.

Residual Impacts:
Possible impact on the remaining catchment due to changes in run-off characteristics in the development area.

Nature: *Increase in sedimentation and erosion within the development footprint.*

Increase in hard surface areas, and roads that require stormwater management will increase through the concentration of surface water flows. These higher volume flows, with an increased velocity result in downstream erosion and sedimentation.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (2)	Low (1)
Probability	Definite (5)	Probable (3)
Significance	**Medium (35)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- Any stormwater within the development area must be handled in suitable manner, i.e. separate clean and dirty water streams around the plant and install stilling basins to capture large volumes of run-off, trap sediments and reduce flow velocities (e.g. water used when washing the panels).
- Suitable stormwater management features with erosion control measures must be installed in areas where concentrated flows are anticipated (**Appendix G** of the EMPr).

Residual Impacts:

Possible impact on the remaining catchment due to changes in run-off characteristics in the development area.

Nature: *Impact on localised surface water quality*

During the construction phase and to a limited extent, also during the operation phase of Naledi PV, chemical pollutants (i.e. hydrocarbons from equipment and vehicles, cleaning products, cement powder, wet cement, shutter oil, etc.), associated with site-clearance machinery and construction activities could be washed downstream through the ephemeral systems in the area.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (2)	Low (1)
Probability	Definite (5)	Probable (3)
Significance	**Medium (35)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- Undertake strict use and management of all hazardous materials on site.
- Undertake strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles and machinery, cement during construction etc.).
- Undertake containment of all contaminated water by means of careful run-off management on-site.
- Appropriate ablution facilities must be provided for construction workers during the construction and operation phase of the solar PV facility.
- Strict control over the behaviour of construction workers must be undertaken.
- Appropriate waste management must be undertaken.
- Working protocols incorporating pollution control measures (including approved method statements by the Contractor), must be clearly set out in the EMPr for the project and be strictly enforced.

Residual Impacts:
Residual impacts will be negligible after appropriate mitigation.

Decommissioning Phase Impacts

The nature of the impacts anticipated for the decommissioning phase would be similar to those of the construction phase, therefore, the impacts associated within the development of Naledi PV for this phase will not be assessed any further.

8.5.4 Comparative Assessment of Main Access Road Alternatives

From the two (2) main access road alternatives proposed by the proponent, Alternative 1 is the preferred option from an aquatic perspective due to majority of the route already being tarred; therefore, little transformation of any aquatic habitat would be required.

Aspect: *Aquatic*		
	Alternative 1	**Alternative 2**
Main Access Road	» Majority of the route already tarred » Acceptable and preferred	» Acceptable

8.5.5 Implications for project implementation

With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of aquatic impacts associated with Naledi PV will be low. From the outcomes of the aquatic resources impact assessment undertaken, it is concluded that the PV facility can be developed and impacts on aquatic resources be managed by taking the following into consideration:

- The development of Naledi PV and the associated infrastructure through the development of the PV panel area and the internal access road crossings will have an impact on secondary alluvial watercourses/features that are either fragmented or contain no riparian zones. These include the minor drainage feature areas/washes and the one depression/wetland that measures 0.2ha in extent and contains little wetland functionality. These features are associated with a moderate sensitivity; therefore, with the implementation of the recommended mitigation measures, which include the development and implementation of a proper stormwater management plan during the pre-construction and post-construction phase of the development, these impacts would be low and acceptable for the development of Naledi PV. This is a result of the affected watercourses and feature having functioned as a means to sustain or convey baseflows within the greater catchment. Therefore, the proposed development of Naledi PV would in essence not have an impact on the surface water run-off, although managed to prevent erosion, it would still emanate from the site and therefore maintain this aspect of the hydrological system observed, as such, no changes to the assessed layout will be required.
- Due to the development area being located within the regulated area of watercourse and pans, a water use authorisation in accordance with Section 21 of the National Water Act (Act No. 36 of 1998) will required prior to the commencement of construction activities.
- Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution

or quickly erode and then cause sedimentation in the lower portions of the catchment, and suitable dust and erosion control mitigation measures should be included in the EMPr.

» All construction materials including fuels and oil should be stored in demarcated areas that are contained within berms / bunds to avoid spread of any contamination / leaks. Washing and cleaning of equipment should also be done in berms or bunds, to trap any cement / hazardous substances and prevent excessive soil erosion. Mechanical plant and bowsers must not be refuelled or serviced within or directly adjacent to any channel.
» An EO with a good understanding of the local flora must be appointed during the construction phase. The EO, in consultation with the ECO, must make clear recommendations with regards to the re-vegetation of the newly completed/disturbed areas along aquatic features, using selected species detailed in the Aquatic Resources Impact Assessment Report (refer to **Appendix F** of the Final BA Report) assisted by a suitably qualified person, where possible.
» All alien plant re-growth must be monitored, and should these alien plants reoccur, the plants should be re-eradicated.
» A comprehensive rehabilitation plan and the stormwater management plan (**Appendix G** of the EMPr) must be implemented from the project onset (i.e. pre-construction and construction phase) within watercourse areas (including of buffers) to ensure a net benefit to the aquatic environment. The comprehensive rehabilitation plan should form part of the suggested walk-down as part of the final EMPr preparation.

8.6. Assessment of Impacts on Soils, Land Types and Agriculture Potential

The significance of the negative impacts on soil, land types and agricultural potential expected with the development of Naledi PV has been assessed as medium and low with the implementation of the mitigation measures. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix G** of the Final BA Report for more details).

8.6.1 Results of the Soil, Agriculture Potential and Land Type Impact Assessment

The majority of the extent of the development area and the Main Access Road Alternative 2 is located within the Ae10 land type. The Ag1 land type is confined to the south of the study area and occupies much of the route of the Main Access Road Alternative 1. Both these soil types are associated with a mixture of shallow to very shallow Mispah soils with an apedal soil profile and are associated with the underlying geology of the Namaqualand Metamorphic Complex.

In line with the newly launched land capability[31] classification systems released by DAFF, the PV panel area for Naledi PV is associated with a mixture of Class 3 (Low-Very Low), Class 4 (Low-Very Low) and Class 5 (Low) land capability, which is an indication that the development area is only suitable for animal grazing and not dryland crop production. The grazing capacity[32] of the veld in the development area falls between 28 and 32ha per large stock animal; however, when this is converted to small stock units, the

[31] The extent to which land can meet the needs of one or more uses under defined conditions of management.
[32] The grazing capacity of a specified area for domestic herbivores is given either in large animal unit per hectare or in hectares per large animal unit.

area has a grazing capacity of 7-8ha per small stock unit, which shows that the development area for Naledi PV is suitable for the grazing of 10-12 heads of cattle or 41-47 of heads of sheep or goats.

The Naledi PV development area, including the proposed main access roads has a limited to no suitability for rain crop production. The most suitable agricultural activities in the region is either livestock farming at low density or irrigated crop production using water abstracted from the Orange River. No irrigated farming areas are present within the development area of Naledi PV. In addition, the areas considered for the two main access roads also have no suitability for agricultural production.

Taking into consideration the baseline data and the findings of the field-based survey, the development area for Naledi PV is associated with a low sensitivity (refer to **Figure 8.6**). As the shallow soil profiles in the area have a limited grazing capacity, the development of Naledi PV and other renewable energy projects within the greater Upington area will have a minimal negative effect on the agricultural economy of the region.

8.6.2 Description of Soil, Agriculture Potential and Land Type Impacts

Considering the characteristics of the development area proposed for Naledi PV in terms of the soil, agricultural potential, and land type the following impacts are expected to occur.

» *Soil erosion and chemical pollution*

Soil erosion is anticipated due to slope and vegetation clearance. The impact of soil erosion is both direct and indirect. Direct impacts include the reduction in soil quality which results from the loss of nutrient-rich upper layers of the soil and the reduced water-holding capacity of severely eroded soils. The off-site indirect impacts of soil erosion include the disruption of riparian ecosystems and sedimentation. Furthermore, the development will also require the use and storage of dangerous substances during the construction and operation phases. This impact will be located within the development footprint of Naledi PV subject to the implementation of the mitigation measures.

» *Impact on current land capability*

In areas of permanent changes, such as roads and the erection of infrastructure, rock spoil material discards from site and topsoil stockpiles, the current land capability and land use of the development area will be lost completely. This impact will also be localised within the development footprint of Naledi PV subject to the implementation of the mitigation measures.

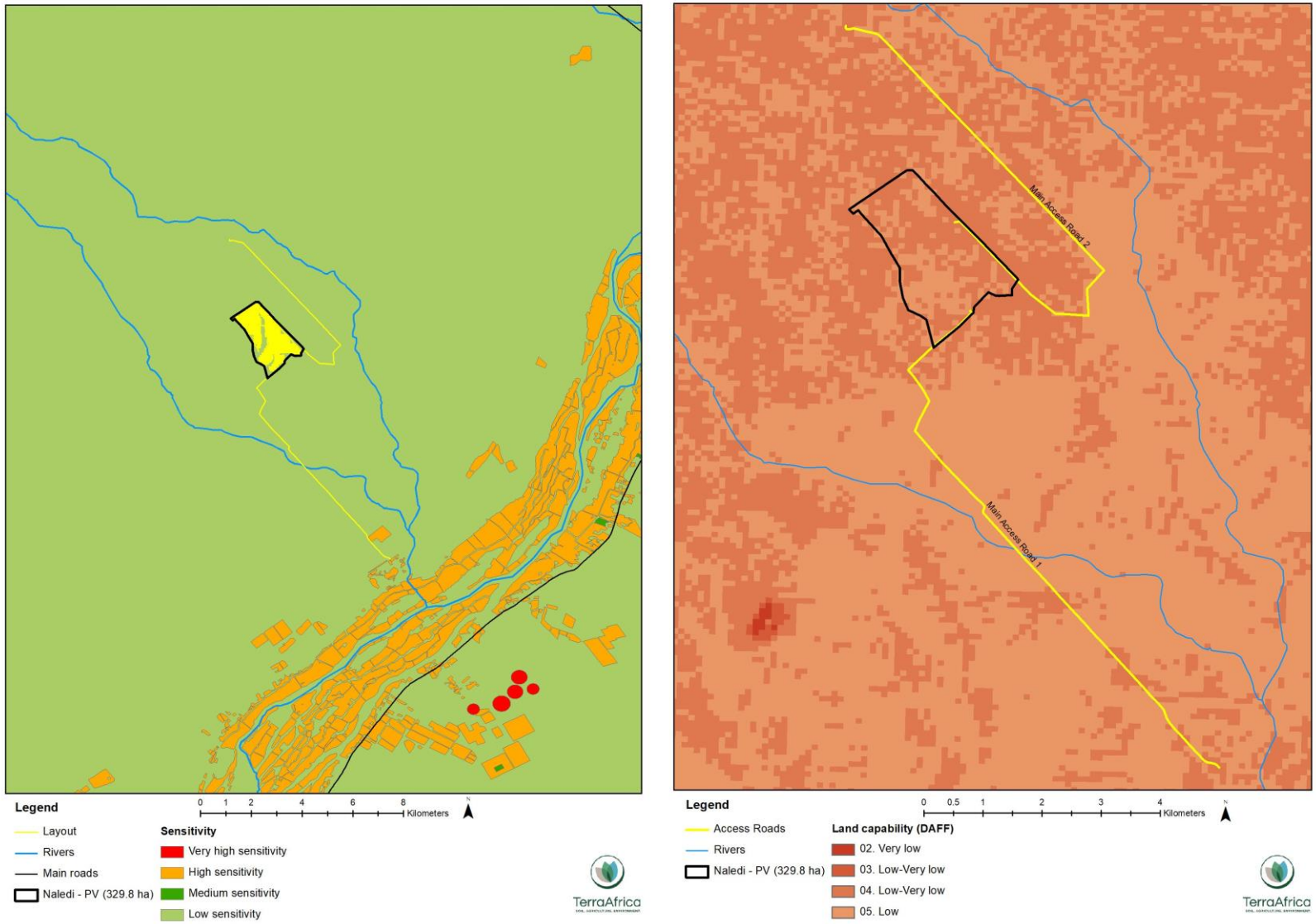

Figure 8.6: Maps illustrating the low agricultural sensitivity and land capability of the development area of Naledi PV

8.6.3 Impact tables summarising the significance of impacts on soil, agriculture potential and land types during construction, operation and decommissioning (with and without mitigation)

Construction and Operation Phase Impacts

Nature: *Susceptibility to soil erosion due to construction and operation of Naledi PV*

The construction of Naledi PV and the associated infrastructure will require the clearing and levelling of a limited area of land. The clearing and levelling will create disturbance and potentially increase the susceptibility of the disturbed areas to soil erosion.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (30)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:

- Land clearance must only be undertaken immediately prior to construction activities and only within the development footprint;
- Avoid unnecessary land clearance;
- Soil stockpiles must be dampened with dust suppressant or equivalent measures;
- Soil stockpiles must be located away from any waterway or preferential water flow path in the landscape, to minimise soil erosion from these;
- Geo-textiles must be used to stabilise soil stockpiles and uncovered soil surfaces during the construction phase to serve as a sediment trap to contain as much soil as possible that might erode away;
- The Stormwater Management Plan (SWMP)(**Appendix G** of the EMPr), should provide for a drainage system sufficiently designed to prevent surface water run-off from the solar PV panels to cause soil erosion;
- Where discharge of rainwater on roads will be channelled directly into the natural environment, the application of diffuse flow measures must be included in the design; and
- Re-vegetate cleared areas as soon as possible after construction activities.

Residual Impacts:

The residual impact from the construction and operation of Naledi PV on the susceptibility to erosion will be negligible.

Nature: *Chemical pollution due to the construction and operation of the Naledi PV facility*

Spillages of hydrocarbons from machinery and vehicles during the construction phase will have an impact on the properties of the soil within the development footprint for Naledi PV. In addition, the improper disposal of effluent, particularly of ablution facilities will also have an impact on the properties of the soil within the development area.

	Without mitigation	**With mitigation**
Extent	High (3)	Low (1)
Duration	Medium-term (3)	Short-term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (36)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low

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

Mitigation:

- » High level maintenance must be undertaken on all vehicles and construction/maintenance machinery to prevent hydrocarbon spills.
- » Impermeable and bunded surfaces must be used for storage tanks and to park vehicles;
- » Site surface water and wash water must be contained and treated before reuse or discharge from site;
- » Spills of fuel and lubricants from vehicles and equipment must be contained using a drip tray with plastic sheeting filled with absorbent material;
- » Spill kits should be available on site and should be serviced regularly;
- » Waste disposal at the construction site and during operation must be avoided by separating, trucking out and the recycling of waste;
- » Potentially contaminating fluids and other wastes must be contained in containers stored on hard surface levels in bunded locations; and
- » Accidental spillage of potentially contaminating liquids and solids must be cleaned up immediately by trained staff with the correct equipment and protocols outlined in the EMPr.

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

Nature: *Loss of land capability as a result of the Naledi PV facility*

The land capability of the development area will be lost as a result of the construction activities associated with the development. The loss of land capability will be attributed to the removal of vegetation, undertaking of earthworks, and the construction of access roads and the PV panel area.

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

Mitigation:

- » The layout of infrastructure should aim to be as dense as possible to avoid unnecessary large areas of impact.

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

Decommissioning Phase Impacts

The nature of the impacts anticipated for the decommissioning phase would be similar to those of the construction phase, therefore, the impacts associated within the development of Naledi PV for this phase will not be assessed any further.

8.6.4 Comparative Assessment of Main Access Road Alternatives

The two (2) main access road alternatives proposed by the proponent make use of existing roads; therefore, since both alternatives largely exist, there will be no additional impact on soil properties or the

agricultural potential of either the road alternative. Therefore, considering the increased traffic on the unsurfaced road (Alternative 2) which will lead to dust generation, Alternative 1 is the preferred option from a soils and agricultural potential perspective. Although the dust generation may be far from the viticulture blocks located south-east (refer to **Figure 8.6**) of the development area for Naledi PV, a continuous dust plume may cause dust to settle on the vine leaves and affect photosynthesis of the plants

Aspect: *Soils, Land Types & Agricultural Potential*		
	Alternative 1	**Alternative 2**
Main Access Road	» Acceptable and preferred, due to part of the access road from the N14 is already tarred, therefore, this will lead to a lower level of dust generation.	» Higher level of dust generation expected. » Acceptable.

8.6.5 Implications for Project Implementation

With the implementation of the mitigation measures by the developer, contractors and operational staff, the significance of the soil, agriculture potential and land type impacts associated with Naledi PV will be medium and low. From the outcomes of the soil, land type and agricultural potential impact assessment, it is concluded that the PV facility can be developed, and the impacts managed by taking the following into consideration:

» The development area for Naledi PV is mainly located on shallow, rocky soils associated with a very low to low land capability and a low grazing capacity, the proposed development of the solar PV facility is suitable for the development of a solar renewable energy facility; therefore, no changes to the assessed layout from an agriculture and land potential perspective will be required. Furthermore, the following mitigation measures are proposed for the development of the solar PV facility:
  * Land clearance must only be undertaken immediately prior to construction activities and only within the development footprint.
  * Stockpiles must be dampened with a dust suppressant or equivalent;
  * Soil stockpiles must be located away from waterways or preferential flow paths within the development footprint to minimise soil erosion;
  * Geo-textiles must be used to stabilise soil stockpiles and uncovered soil surfaces during the construction phase and to serve as a sediment trap to contain as much soil as possible that might erode away; and
  * Cleared areas should be revegetated as soon as possible after construction has been completed.

8.7. Assessment of Impacts on Heritage (including archaeological and palaeontological resources)

The significance of the negative impact on heritage, including archaeological and palaeontological resources expected within the development area have been assessed as low since no significant heritage resources were identified within the development area for Naledi PV. In addition, the development area is also within an area of low palaeosensitivity due to the geology of the development area associated largely with igneous and metamorphic rocks which contain little to no fossils. The potential impact and its relative significance are summarised below (refer to **Appendix H** of the Final BA Report for more details).

8.7.1 Results of the Heritage and Palaeontological Impact Assessment

During the archaeological field assessment Stone Age and historical archaeological resources (refer to **Figure 8.7**) were identified within the Naledi PV development footprint, however these resources are not considered to be conservation-worthy as they are widely scattered and have no associated contextual material. No formal or informal graves were identified within the development area of Naledi PV.

Several occurrences of archaeological surface material dating to the 19th and 20th century were identified within the vicinity of the of the development area; these include two (2) Martini-Henry bullet casings (located outside the development area for Naledi PV), dating between 1870 and the turn of the century. The surrounding area within the vicinity of the Naledi PV development area is also well known for the conflict between the British forces and the Koranna people who lived on the Orange River islands. The region was also actively monitored by the Cape Colonial Police as from the 1890s, and during military operations of the Anglo Boer War between 1899-1902.

Based on the nature of the project, surface activities may impact on fossil heritage if preserved within the development footprint. The geological structures suggest that the rocks are either igneous and much too old to contain fossils or are alluvial and aeolian sands. The Gordonia Formation alluvial and aeolian sands are young and have been transported so are unlikely to preserve any fossils. Only if palaeo-pans or palaeo-channels are present is there a small chance of finding fossils. However, none have been recorded and the geological maps and satellite imagery do not indicate the presence of such features within the development footprint. Therefore, the potential impact to fossil heritage resources is low (refer to **Figure 8.8**).

Based on the specialist experience and the lack of any previously recorded fossils from the study area, it is extremely unlikely that any fossils would be preserved in the loose Quaternary Sands. There is a very small chance that fossils may occur in the adjacent shales of the early Permian Vryheid Formation. However, the development footprint lies on the Gordonia Formation dune and aeolian sands and the impact to palaeontological resources is unlikely.

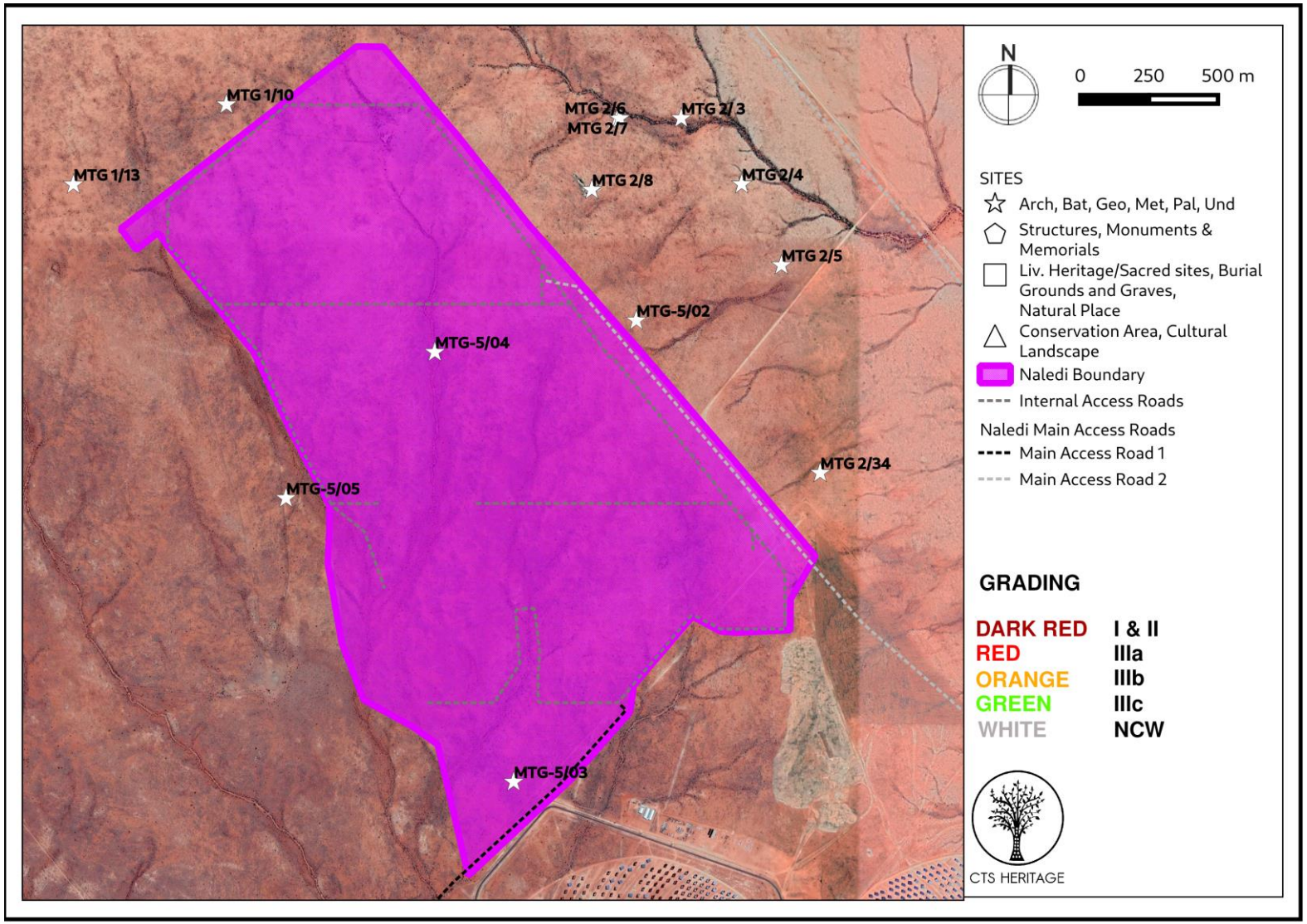

Figure 8.7: A map illustrating the heritage sites identified within the broader study area and development area of Naledi PV. All sites are graded as not being conservation worthy, as a result of their small sample size and lack of archaeological context which offers minimal scientific value.

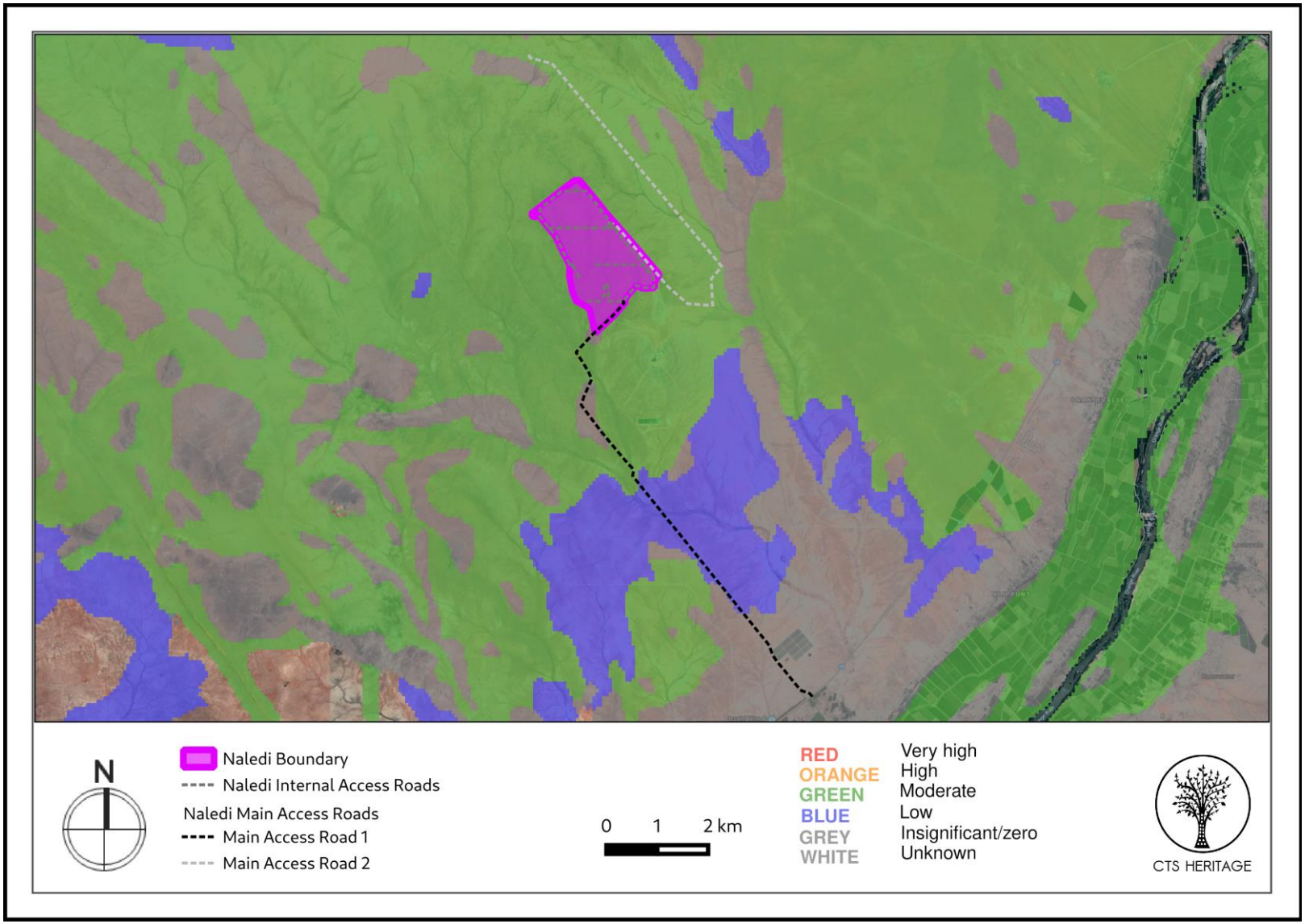

Figure 8.8: A map illustrating the location of Naledi PV within an area of moderate palaeo-sensitivity.

8.7.2 Description of Heritage Impacts (including archaeology and palaeontology)

The development of Naledi PV will not have a negative impact on the heritage resources (including archaeological and palaeontological resources) found within the vicinity of the development area and study area. The identified lithic and historical material identified is of a low significance and although these resources may be destroyed during the construction phase. In addition, it is also extremely unlikely that any fossils would be preserved within the area. There is, however, a chance that fossils may occur in adjacent shales of the early Permian Vryheid Formation and as such, a Chance Fossil Find Protocol should be added to the EMPr (**Appendix L** of the EMPr).

It must be noted that archaeological and palaeontological impacts are only expected to occur during the construction phase when groundworks are undertaken. No impacts are expected during the operation and decommissioning phases of Naledi PV.

8.7.3 Impact table summarising the significance of the impact on heritage and palaeontological resources during construction (with and without mitigation)

The impacts assessed below apply to the development area assessed for Naledi PV. Based on the proposed and assessed development footprint, which contains no heritage resources of a high significance and is located within an area associated with a low palaeonsenstivity,the significance of the impacts with the implementation of the recommended mitigation measures is low, which is acceptable from a heritage and palaeontology perspective.

Nature: *Impact to archaeological resources located within the development area.* No heritage resources of a high significance were identified within the development area of Naledi PV.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (5)	Long-term (5)
Magnitude	Low (2)	Low (2)
Probability	Improbable (1)	Improbable (1)
Significance	**Low (8)**	**Low (8)**
Status (positive or negative)	Negative	Negative
Reversibility	Any impacts to heritage resources that do occur are irreversible.	Any impacts to heritage resources that do occur are irreversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	N/A	
Mitigation: » No impact is anticipated within the development area assessed within the Heritage Impact Assessment.		
Residual Impacts: Should any significant resources be impacted (however unlikely), residual impacts may occur, including a negative impact due to the loss of potentially scientific cultural resources.		

Nature: *Impact to palaeontological resources located within the development area.* No palaeontological resources of a high significance were identified during the field-based survey of the development area of Naledi PV.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (5)	Long-term (5)
Magnitude	Low (2)	Low (1)
Probability	Improbable (1)	Probable (3)
Significance	**Low (8)**	**Low (8)**
Status (positive or negative)	Negative	Negative
Reversibility	Any impacts to heritage resources that do occur are irreversible.	Any impacts to heritage resources that do occur are irreversible.
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	N/A	
Mitigation: » No impact is anticipated within the development area assessed within the Heritage Impact Assessment. A Chance Fossil Finds protocol should be added to the eventual EMPr.		
Residual Impacts: Should any significant resources be impacted, residual impacts may occur, including a negative impact due to the loss of potentially scientific cultural resources.		

8.7.4 Comparative Assessment of Main Access Road Alternatives

From the two (2) main access road alternatives proposed by the proponent, there is no preferred alternative in terms of heritage impacts and both alternatives are acceptable for development; therefore, the technically preferred alternative of the proponent is preferred from a heritage perspective.

Aspect: *Heritage*		
Main Access Road	**Alternative 1**	**Alternative 2**
	» Acceptable and preferred	» Acceptable

8.7.5 Implications on Project Implementation

The development of Naledi PV will not have a negative impact on the heritage resources situated within the development area. The identified lithic and historic material (refer to **Figure 8.7**) is of a low significance. Although these resources may be destroyed during the construction phase, the impact is inconsequential. Based on the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the Gordonia Formation (**Figure 8.8**). Furthermore, there is also a small chance that fossils may occur in the adjacent shales of the Vryheid Formation; therefore, a Chance Find Protocol and/or Procedure should be included to the EMPr and implemented should any discoveries be made.

8.8. Assessment of Visual Impacts

Negative impacts on visual receptors will occur during the undertaking of construction activities and the operation of Naledi PV. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix H** of the Final BA Report for more details).

8.8.1 Results of the Visual Impact Assessment

Naledi PV is anticipated to have a low visual impact on observers travelling along the N14 national road due to the presence of other existing (i.e. Khi Solar One, Dyasons Klip 1 & 2, and Sirius Solar PV Project One) and proposed solar energy projects (McTaggarts PV1, PV2, PV3 and Klip Punt PV1 and Sirius PV Project Three and Four) within the vicinity of Naledi PV. The R359 is located on the opposite side of the Orange River Valley from the development area; therefore, the affected areas are approximately 12.3km away from the development area of Naledi PV. In addition, the extent of the large woody vegetation on the edge of the Orange River Valley and the presence of the existing solar renewable energy projects in the area, screen the views of the proposed development from this road.

In terms of adjacent homesteads, the Zone of Theoretical Visibility (ZTV)[33] analysis (refer to **Figure 8.9**), indicates that views of the proposed development from adjacent homesteads will be unlikely. Furthermore, adjacent settlements within the vicinity of the proposed development area are relatively small and generally associated with the agricultural activities of the Orange River Valley, and the ZTV analysis further indicates that views of the proposed development from the adjacent settlements will be unlikely.

There are two (2) areas where glare impacts may be of concern. These include the Upington International Airport and the unsurfaced Lutzputs Road. The Upington International Airport is located approximately 22km away from the development area; therefore, given the distance of the solar PV facility from the Airport, it would only be possible for reflected light from the array to affect pilots on the northern flight path into the Airport. In terms of the Lutzputs Road, potentially affected sections of the road by glare are located approximately 2.5km to the east. The section of the road to the east is only likely to be affected during late afternoons when the sun is at its furthest west. If fixed PV panel technology is used, the PV panels will face north, which will mean the glare could be apparent from this section of the road when the sun is low in the west. Between mid-April and mid-September, the sun is north of west; therefore, it is unlikely that there will be an impact on the road during this period of the year; however, an impact may be possible for the remainder of the year. Furthermore, the section of the road to the north-west is unlikely to be affected by glare due to the fact that the sun would be low in the north-east for glare to occur.

The Naledi PV development area will have a visual impact on sensitive visual receptors identified within a radius of 11.3km from the development area of Naledi PV. These receptors include the following:

- Area Receptors
  - Including the minor urban settlement areas that are located within the Orange River Corridor Landscape Character Area (LCA)[34]. From the site visit undertaken, it appears that the majority of the settlement areas related to agricultural use of the River Valley. In addition, it is also likely that residents of these minor settlement areas are predominantly focused on agricultural production. As

[33] A Zone of Theoretical Visibility (ZTV), also known as the Zone of Visual Influence (ZVI), is a computer-generated tool used to identify the likely (or theoretical) extent of the visibility of a development.
[34] Landscape Character Areas (LCAs) are defined as, 'single unique areas which are the discrete geographical areas of a particular landscape type.

these settlement areas are located within the Orange River LCA, it is also likely that views of Naledi PV, particularly from the northern side of the Valley will be difficult as a result of vegetation screening views of the development which may be possible from the Orange River Valley;

- Linear Receptors
  - Linear receptors or routes through the area include the N14 national road, the R359 road, the Lutzputs Road and the Upington-Kakamas Spur Railway Line. Both the N14 and the R359 roads are of tourism significance; however, the N14 national road is the most significant as it links Upington with Kakamas, which is where the Augrabies National Park is located. The Lutzputs Road is an unsurfaced road that runs approximately 3.2km to the north-east of the study area for Naledi PV. This road is likely to be mainly used by local people, whereas the Upington-Kakamas Spur Railway Line is used for the transportation goods; and
- Point Receptors
  - Point receptors include individual homesteads that are located within the Orange River LCA and the Plateau LCA. From the site visit, it is unlikely that settlements on the northern side of the Orange River will have views over Naledi PV. It is, however, possible that settlements on the higher sections, particularly on the southern side of the Valley could have views of the development. These will, however, be distant views and are likely to be softened by the vegetation on the fringes of the Orange River Valley.

8.8.2 Description of the Visual Impacts

Visual impacts associated with the development of Naledi PV include the following:

- A change in the character and sense of place of the landscape setting;
- A change in the character of the landscape as seen from the N14;
- A change in the character of the landscape as seen from the R359;
- A change in the character of the landscape as seen from the Lutzputs Road;
- A change in the character of the landscape as seen from the local homesteads and settlement areas in the area; and
- Impacts from glare and lighting, particularly during the operation of the facility at night for night-time observers.

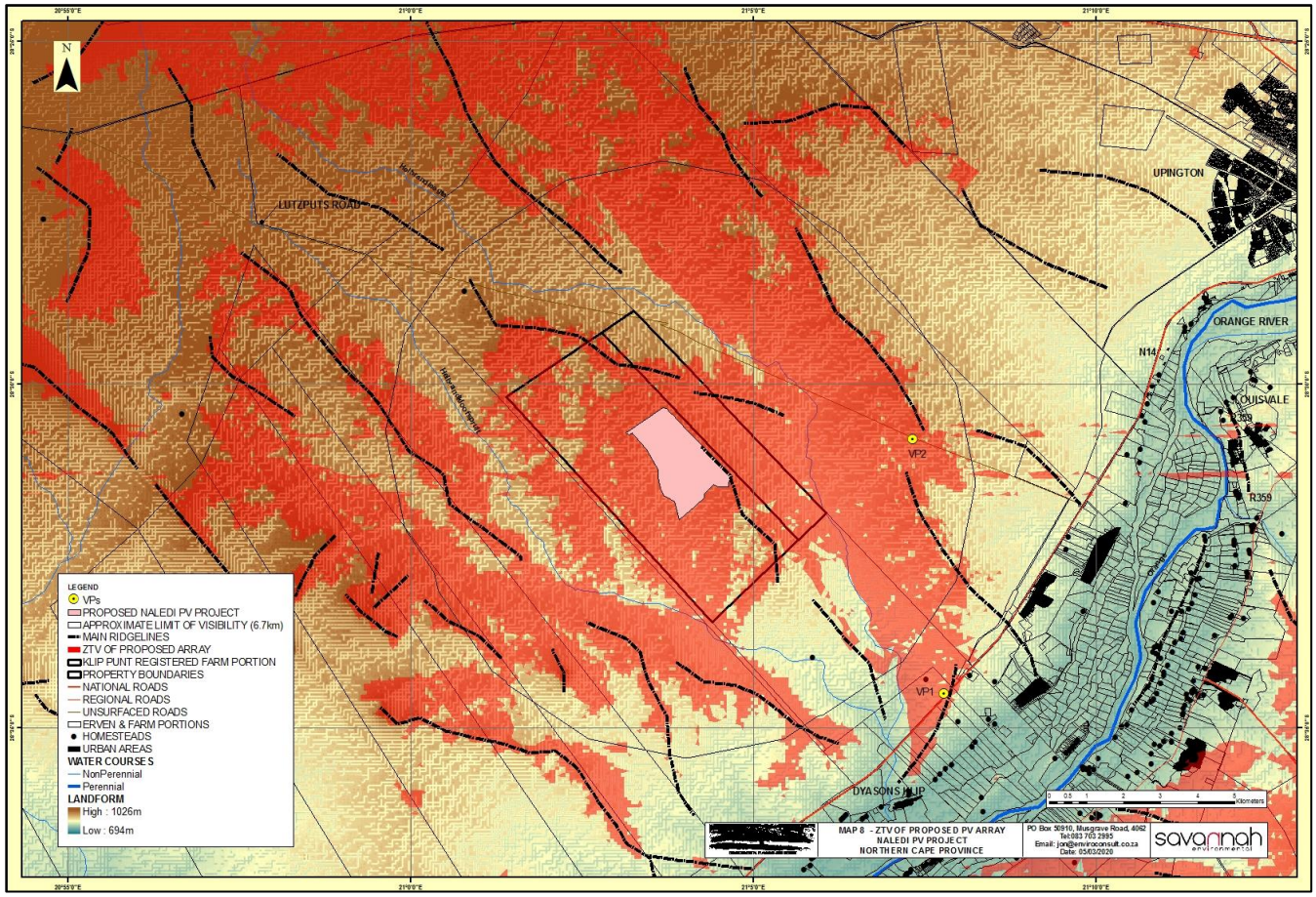

Figure 8.9: A map showing the Zone of Theoretical Visibility of Naledi PV. The map illustrates the potential (theoretical) visibility of the project within the surrounding landscape on the basis of the topography of the area surrounding the study area (without due consideration of other factors such as vegetation, buildings etc which may alter the view).

8.8.3 Impact tables summarising the significance of the visual impacts during construction, operation and decommissioning (with and without mitigation)

The impacts assessed below apply to the development area assessed for Naledi PV. Based on the proposed and assessed development footprint, the development of Naledi PV is located within an area where existing solar renewable energy facilities already impose a visual impact on the surrounding landscape and the identified sensitive visual receptors. Therefore, the visual impacts for the development of Naledi PV are associated with a low significance following the implementation of the recommended mitigation measures, as such, the development of the solar PV facility is acceptable from a visual perspective.

Construction, Operation and Decommissioning Phases

Nature: *A change in the character and sense of place of the landscape setting*

Naledi PV is located within an arid plateau landscape area which is within approximately 9km from the closest section of the verdant Orange River Corridor. The difference between these landscape areas is marked with the semi-dessert plateau contrasting strongly with the green arable landscape of the Orange River Valley. The ZTV analysis indicates that Naledi PV is unlikely to be visible from the Orange River Valley; therefore, the proposed development is unlikely to have a major impact on this LCA, however, it may be visible from the upper sections of the valley slopes. Therefore, from these areas, vegetation generally softens or screens views.

	Without mitigation	***With mitigation***
Extent	Orange River LCA Site and immediate surroundings (2) Plateau LCA Site and immediate surroundings (2)	Orange River LCA Site and immediate surroundings (2) Plateau LCA Site and immediate surroundings (2)
Duration	Orange River LCA Long-term (4) Plateau LCA Long-term (4)	Orange River LCA Long-term (4) Plateau LCA Long-term (4)
Magnitude	Orange River LCA Small (0) Plateau LCA Minor (2)	Orange River LCA Small (0) Plateau LCA Small to minor (1)
Probability	Orange River LCA Very improbable (1) Plateau LCA Probable (3)	Orange River LCA Very Improbable (1) Plateau LCA Probable (3)
Significance	Orange River LCA **Low (6)** Plateau LCA **Low (24)**	Orange River LCA **Low (6)** Plateau LCA **Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High

Irreplaceable loss of resources?	The components of the proposed development can be dismantled and removed at the end of the operation phase. However, given the likely long-term nature of the project, it is possible that a proportion of stakeholders will view the loss of view as irreplaceable.	No irreplaceable loss.
Can impacts be mitigated?	Yes.	

Mitigation:

Planning:

» Plan levels to minimise earthworks to ensure that levels are not elevated.
» Plan to maintain the height of structures as low as possible.
» Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operation:

» Reinstate any areas of vegetation that have been disturbed during construction.
» Remove all temporary works.
» Monitor rehabilitation areas post-construction and implement remedial actions.
» Minimise disturbance and maintain existing vegetation as far as possible both within and surrounding the development area.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site; and
» Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Residual Risks:

The residual risk relates to loss of natural vegetation cover being obvious following the decommissioning of the development. Therefore, it is critical that effective rehabilitation measures are implemented during this phase.

Nature: *A change in the character of the landscape as seen from the N14 national road*

The ZTV analysis indicates that views of Naledi PV and the associated infrastructure will be limited to short sections of this road. The proposed development will also be viewed in the context of the Khi Solar One facility, as well as, Sirius Solar PV Project One, Dyasons Klip 1 and Dyasons Klip which are operational. Therefore, it is unlikely that Naledi PV will be obvious from this road.

	Without mitigation	***With mitigation***
Extent	Site and immediate surroundings (2)	Site and immediate surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Small (0)	Small (0)
Probability	Very Improbable (1)	Very Improbable (1)
Significance	**Low (6)**	**Low (6)**
Status (positive or negative)	Given that the surrounding area is developing as a renewable energy development zone, it is possible that some stakeholders will see the development in a positive light. For those visiting the area for its natural attributes, and for residents whose view is affected, the change is likely to be seen as a **Negative Impact.**	Negative

Reversibility	High	High
Irreplaceable loss of resources?	The components of the proposed development can be dismantled and removed at the end of the operation phase. There will, therefore, be no irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	Yes, only to a limited extent.	

Mitigation:

Planning:

» Plan levels to minimise earthworks to ensure that levels are not elevated.
» Plan to maintain the height of structures as low as possible.
» Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operation:

» Reinstate any areas of vegetation that have been disturbed during construction.
» Remove all temporary works.
» Monitor rehabilitation areas post-construction and implement remedial actions.
» Minimise disturbance and maintain existing vegetation as far as possible both within and surrounding the development area.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site; and
» Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Residual Risks:

The residual risk relates to loss of natural vegetation cover being obvious following the decommissioning of the development. Therefore, it is critical that effective rehabilitation measures are implemented during this phase.

Nature: *A change in the character of the landscape as seen from the R359 road*

The ZTV analysis indicates that the proposed development is unlikely to be visible from this road. The ZTV analysis however indicates that very limited sections of the road could be affected, however, these areas are outside the ALV of both the on-site facility substation and the PV panel array.

	Without mitigation	***With mitigation***
Extent	Site and immediate surroundings (2)	Site and immediate surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Small (0)	Small (0)
Probability	Very Improbable (1)	Very Improbable (1)
Significance	**Low (6)**	**Low (6)**
Status (positive or negative)	Given that the surrounding area is developing as a renewable energy development zone, it is possible that some stakeholders will see the development in a positive light. For those visiting the area for its natural attributes, and for residents whose view is affected, the change is likely to be seen as a negative impact, however, due to the distance and likely screening and as a result of the small sections of the development being visible, these will	Neutral

	be seen in the context of the existing renewable solar energy projects in the area, the change in the view is likely to be seen as a neutral impact.	
Reversibility	High	High
Irreplaceable loss of resources?	The components of the proposed development can be dismantled and removed at the end of the operation phase. There will, therefore, be no irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	Yes, but mitigation is unlikely to affect the assessed levels of impact.	

Mitigation:

Planning:

» Plan levels to minimise earthworks to ensure that levels are not elevated;
» Plan to maintain the height of structures as low as possible.
» Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operation:

» Reinstate any areas of vegetation that have been disturbed during construction.
» Remove all temporary works.
» Monitor rehabilitation areas post-construction and implement remedial actions.
» Minimise disturbance and maintain existing vegetation as far as possible both within and surrounding the development area.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site; and
» Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Residual Risks:

The residual risk relates to loss of natural vegetation cover being obvious following the decommissioning of the development. Therefore, it is critical that effective rehabilitation measures are implemented during this phase.

Nature: *A change in the character of the landscape as seen from the Lutzputs Road*

The ZTV analysis indicates that Naledi PV will be seen from up to approximately 4.8km of this road. The project will however be seen in the context of the operational Khi Solar One facility, where the view of the entire heliostat field and the power tower will be possible.

	Without mitigation	***With mitigation***
Extent	Site and immediate surroundings (2)	Site and immediate surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Small (0)	Small (0)
Probability	Improbable (2)	Highly Improbable (1)
Significance	**Low (12)**	**Low (6)**
Status (positive or negative)	Given that the surrounding area is developing as a renewable energy development zone, it is possible that some stakeholders will see the development in a positive light. For those visiting the area for its natural attributes, and for residents whose view is affected, the change is likely to be seen as a negative	Neutral

	impact. However, the change in view is also likely to be seen as a neutral impact by some and a negative impact by others.	
Reversibility	High	High
Irreplaceable loss of resources?	The components of the proposed development can be dismantled and removed at the end of the operation phase. There will, therefore, be no irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	Yes	

Mitigation:

Planning:

» Plan levels to minimise earthworks to ensure that levels are not elevated;
» Plan to maintain the height of structures as low as possible.
» Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operation:

» Reinstate any areas of vegetation that have been disturbed during construction.
» Remove all temporary works.
» Monitor rehabilitation areas post-construction and implement remedial actions.
» Minimise disturbance and maintain existing vegetation as far as possible both within and surrounding the development area.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site; and
» Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Residual Risks:

The residual risk relates to loss of natural vegetation cover being obvious following the decommissioning of the development. Therefore, it is critical that effective rehabilitation measures are implemented during this phase.

Nature: *A change in the character of the landscape as seen from local homesteads*

As a result of the low carrying capacity of the landscape, there are a few agricultural homesteads in the vicinity of the proposed development. The closest homestead is located approximately 5.4km to the north-west of Naledi PV and the ZTV analysis indicates that the proposed development is unlikely to be visible from this receptor.

	Without mitigation	***With mitigation***
Extent	Site and immediate surroundings (2)	N/A
Duration	Long-term (4)	
Magnitude	Small (0)	
Probability	Very Improbable (1)	
Significance	**Low (6)**	
Status (positive or negative)	As the development is unlikely to be obvious, it is, therefore, also unlikely that it will be perceived as having a negative visual impact. The status is, therefore, neutral.	
Reversibility	High	
Irreplaceable loss of resources?	No irreplaceable loss	
Can impacts be mitigated?	No, no mitigation measures required.	
Residual Risks:		

The residual risk relates to the infrastructure being left in place during the decommissioning phase of the project. Therefore, it is critical that effective rehabilitation measures are implemented during this phase.

Nature: *A change in the character of the landscape as seen from local settlement areas*

All local settlements are located close to or within the Orange River Corridor. The closest settlement is in excess of 7.5km to the south-east of Naledi PV and the ZTV analysis indicates that the proposed development is unlikely to be visible from the settlements.

	Without mitigation	***With mitigation***
Extent	Site and immediate surroundings (2)	N/A
Duration	Long-term (4)	
Magnitude	Small (0)	
Probability	Very Improbable (1)	
Significance	**Low (6)**	
Status (positive or negative)	As the development is unlikely to be obvious, it is, therefore, unlikely that there will be a visual impact. The status is, therefore, neutral.	
Reversibility	High	
Irreplaceable loss of resources?	No irreplaceable loss	
Can impacts be mitigated?	No, no mitigation measures required.	

Residual Risks:
No residual risk.

Nature: *Glare impacts*

There are two (2) areas where glare could be of a concern to stakeholders. These areas include:

- Upington International Airport; and
- The Lutzputs Road.

The visual impact assessment has shown that the impact of glare on the Upington International Airport is highly unlikely. Furthermore, from the ZTV analysis, glare could impact on the Lutzputs Road during late afternoons particularly between mid-September and mid-April; however, due to the very limited number of vehicles on this road, this impact is unlikely to have a high significance.

	Without mitigation	***With mitigation***
Extent	Upington International Airport Regional (3) Lutzputs Road Site and immediate surroundings (2)	Upington International Airport Regional (3) Lutzputs Road Site and immediate surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Upington International Airport Small (0) Lutzputs Road Minor to low (3)	Upington International Airport Small (0) Lutzputs Road Small (0)

Probability	Upington International Airport Very improbable (1) Lutzputs Road Improbable (2)	Upington International Airport Very improbable (1) Lutzputs Road Very Improbable (1)
Significance	Upington International Airport **Low (7)** Lutzputs Road **Low (18)**	Upington International Airport **Low (7)** Lutzputs Road **Low (6)**
Status (positive or negative)	Neutral	Neutral
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	Yes	
Mitigation: Operation: » Should glare affect motorists on the Lutzputs Road, mitigation measures could include the implementation of screen fencing or earth berms.		
Residual Risks: No residual risk.		

Nature: *Potential visual impact of operational, safety and security lighting of the facility at night on observers.*

Naledi PV will be lit by security lights to a level sufficient to ensure that security cameras can operate at night. This is likely to result in the array being obvious at night from surrounding areas. The Khi Solar One facility, located immediately to the south-west, appears relatively dark at night.

There are obvious lights from Upington, as well as, from passing traffic and small settlements and homesteads particularly in the Orange River Valley. The area is, therefore, not completely dark during the night. There is potential for the development to add to these existing lighting levels.

	Without mitigation	***With mitigation***
Extent	Site and immediate surroundings (2)	Site (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Small to Minor (1)
Probability	Definite (5)	Improbable (2)
Significance	**Medium (50)**	**Low (12)**
Status (positive or negative)	The appearance of a large lit area may be accepted by most people. It is, however, likely that some people will see the expansion of lighting as a negative impact.	If the lights are generally not visible then, the occasional light is unlikely to be seen as negative. The impact is therefore neutral.
Reversibility	High	High
Irreplaceable loss of resources?	It would be possible to change and adapt the lighting / camera system so the impact cannot be seen as an irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	Yes	

Mitigation:
Operation:
» Use low key lighting around buildings and operational areas that are triggered only when people are present.

» Plant to utilise infra-red security systems or motion sensor triggered security lighting. » Ensure that lighting is focused on the development with no light spillage outside the site. » Keep lighting low, no tall mast lighting should be used.
Residual Risks: No residual risk.

8.8.4 Comparative Assessment of Main Access Road Alternatives

From the two (2) main access road alternatives proposed by the proponent, both alternatives are deemed acceptable from a visual perspective as the use of either main access road is unlikely to result in any significant visual impact. Therefore, from a visual perspective, the technically preferred alternative is nominated as the preferred alternative.

Aspect: *Visual*		
	Alternative 1	**Alternative 2**
Main Access Road	» Preferred and acceptable	» Acceptable

8.8.5 Implications for Project Implementation

Overall, the significance of the visual impacts is expected to be low following the implementation of the recommended mitigation measures. Although it is recognised that the development of the PV facility may have an impact on the surrounding landscape and the sensitive visual receptors identified, this should be considered within the context of the following:

* All the assessed impacts for the development from a visual perspective are associated with a low significance following the implementation of the recommended mitigation measures;
* The recommended mitigation meaures by the specialist are achievable; and
* Existing solar renewable energy projects (i.e Khi Solar One) in the area already have an impact on the surrounding landscpae and the identified sensitive visual receptors.

In addition, the following mitigation is possible from a visual perspective:

» Plan the placement of the laydown area and 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.
» Should glare affect motorists on the Lutzputs Road, mitigation measures could include the implementation of screen fencing or earth berms.
» Use low key lighting around buildings and operational areas that are triggered only when people are present.

8.9. 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 Naledi PV are summarised below (refer to **Appendix I** of the Final BA Report).

8.9.1 Results of the Social Impact Assessment

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 development. 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".

8.9.2 Description of the Social Impacts

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

Positive and negative social impacts associated with the construction phase of Naledi PV:
- Direct and indirect employment and skills development opportunities
- Economic multiplier effects
- Influx of jobseekers and change in population
- Safety and security impacts
- Impacts on daily living and movement patterns
- Nuisance impacts, including noise and dust
- Visual impacts and sense of place impacts

Positive and negative social impacts associated with the operation phase of Naledi PV:
- Direct and indirect employment and skills development opportunities
- Development of non-polluting renewable energy infrastructure
- Contribution to Local Economic Development (LED)and social upliftment
- Visual impact and sense of place impacts
- Impacts associated with the loss of agricultural land

8.9.3 Impact tables summarising the significance of the social impacts during construction, operation, and decommissioning (with and without mitigation)

The impacts assessed below apply to the development area assessed for Naledi PV. Based on the proposed and assessed development footprint, the development of Naledi PV is located within an area where existing solar renewable energy facilities already have had a positive and negative social impact on the surrounding area. Therefore, the development of Naledi PV is associated with low and medium significance following the implementation of recommended enhancement measures, as a result, the development of the solar PV facility is acceptable from a social perspective.

Construction Phase

Nature: *The creation of direct and indirect employment opportunities during the construction phase of the project*.

It is anticipated that the construction of Naledi PV will result in the creation of approximately 300 employment opportunities at the peak of construction, comprising a mixture of skilled, semi-skilled, and low-skilled opportunities. Employment opportunities generated as a result of the project will be temporary in nature and will last for the duration of the construction period (i.e. 12- 18 months). 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.

A number of indirect employment opportunities will also be created. Indirect employment opportunities will predominantly be created in the service industry, through the opportunity for the provision of secondary services to the construction team. Services may include, but are not limited to, accommodation, catering, transport and laundry services.

	Without enhancement	**With enhancement**
Extent	Local- Regional (3)	Local- Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Minor (2)	Moderate (6)
Probability	Highly probable (4)	Definite (5)
Significance	**Low (28)**	**Medium (55)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes (enhanced)	

Enhancement:

- A local employment policy should be adopted to maximize opportunities made available to the local labour force.
- Labour should be sourced from the local labour pool where possible. If the necessary skills are unavailable, labour should be sourced from (in order of preference) the greater Kai !Garib LM, ZF Mgcawu DM, Northern Cape Province, South Africa, or elsewhere. Where required, training and skills development programmes should be initiated prior to the commencement of the construction phase.
- Labour force suppliers should as far as possible be sourced locally.
- Where feasible local suppliers and contractors, that are compliant with Broad-Based Black Economic Empowerment (B-BBEE) criteria, should be used as far as possible to ensure that the benefits resulting from the project accrue as far as possible to the local communities which are also likely to be most significantly impacted / affected by the project.
- The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.
- Proof of skills development must be provided to the upskilled individual.

Residual impacts:

- Improved pool of skills and experience in the local area.
- Economic growth for small-scale entrepreneurs.

Nature: *Significance of the impact from the economic multiplier effects from the use of local goods and services.*

There are likely to be opportunities for local businesses and service providers to provide services and materials for, and in doing so benefit from, the construction phase of the proposed project. Off-site accommodation in the nearest towns (Keimoes or Upington) may be required for contract workers and certain employees. The economic multiplier effects from the use of local goods and services will include, but is not limited to, construction materials and equipment, and workforce essentials such as catering, trade clothing, safety equipment, accommodation, transportation and other goods.

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	Local- Regional (3)	Local- Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Moderate (6)
Probability	Highly probable (4)	Definite (5)
Significance	**Medium (36)**	**Medium (55)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes (enhanced)	

Enhancement:

» A local procurement policy should be adopted to maximize the benefit to the local economy and the existing local SMMEs.
» A database of local companies, specifically Historically Disadvantaged Individuals (HDIs) which qualify as potential service providers (e.g. construction companies, security companies, catering companies, waste collection companies, transportation companies etc.) should be created and companies listed thereon should be invited to bid for project-related work where applicable.
» Local procurement must be encouraged along with engagement with local authorities and business organisations to investigate the possibility of procurement of construction materials, goods and products from local suppliers where feasible.

Residual impacts:

» Improved local service sector, growth in local business.

Nature: *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.*

An influx of people looking for employment or other economic opportunities could result in increased pressure being placed on economic and social infrastructure, and a change in the local population. Population change refers to the size, structure, density as well as demographic profile of the local community.

An influx of jobseekers into an area, could lead to a temporary increase in the level of crime, cause social disruption and put pressure on basic services. This includes municipal services such as sanitation, electricity, water, waste management, health facilities, transportation and the availability of housing. It could also potentially create conflict between locals and outsiders due to potential differences in racial, cultural and ethnic composition. A further negative impact that could result due to an influx of jobseekers into an area is an increase in unemployment levels

due to an oversupply of available workforce, particularly with respect to semi- and unskilled workers.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Small (0)	Small (0)
Probability	Probable (3)	Improbable (2)
Significance	**Low (9)**	**Low (6)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Develop and implement a recruitment protocol in consultation with the municipality and local community leaders. Ensure that the procedures for applications for employment are clearly communicated.
» Develop and implement a local procurement policy which prioritizes "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 local's first procurement policy.
» Provide transportation for workers (from towns such as Keimoes and Upington) to ensure workers can easily access their place of employment and do not need to move closer to the site.
» Compile and implement a grievance mechanism.
» Appoint a Community Liaison Officer (CLO) to assist with the procurement of local labour.
» Prevent the recruitment of workers at the site.
» 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.
» Establish clear rules and regulations for access to the proposed site.
» Appoint a security company and implement appropriate security procedures to ensure that workers do not remain on-site after working hours.
» Inform local community organisations and policing forums of construction activities and times and the duration of the construction phase.

Residual impacts:

» Possibility of outside workers remaining in the area after construction is completed and subsequent pressures on local infrastructure, resources and services.

Nature: *Temporary increase in safety and security concerns associated with the influx of people during the construction phase.*

The commencement of construction activities can be associated with an increase in crime within an area. The perceived loss of security during the construction phase of a project due to an influx of workers and / or outsiders to the area (as in-migration of newcomers, construction workers or jobseekers are usually associated with an increase in crime), may have indirect effects such as increased safety and security concerns for neighbouring properties, damage to property, increased risk of veld fire, stock theft, poaching, crime and so forth.

The labour force will not permanently reside within the area or have any reason to be on-site after hours.

	Without mitigation	With mitigation
Extent	Local (2)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	High (8)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (36)**	**Low (20)**

Status (positive or negative)	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Working hours should be kept within daylight hours during the construction phase.
» Employees should be easily identifiable and must adhere to the security rules of the site.
» Provide transportation for workers (from towns such as Keimoes and Upington) to ensure workers do not need to move closer to the site.
» The perimeter of the construction site should be appropriately secured to prevent any unauthorised access to the site. The fencing of the site should be maintained throughout the construction period.
» The appointed EPC contractor must appoint a security company and implement appropriate security procedures and measures.
» Access in and out of the construction site should be strictly controlled by a security company appointed for the project.
» A CLO should be appointed to implement a grievance mechanism. A communication protocol should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process.
» A stakeholder management plan must be implemented by the EPC contractor to address neighbouring farmer concerns regarding safety and security.

Residual impacts:

» None anticipated.

Nature: *Temporary increase in traffic disruptions and movement patterns during the construction phase which will create impact on daily living and movement patterns*

Project components and equipment will be transported to site using road transport. The N14 national road provides the primary access to the area, while the development area itself can be accessed via the Lutzputs Road (gravel in nature) from the N14. Local farmers utilise the gravel access roads to access their farms.

Increased traffic due to construction vehicles could cause disruptions to the local community and increase safety hazards. The use of local roads and transport systems may cause road deterioration and congestion. This impact will be magnified since farm roads are not designed to carry heavy traffic and are prone to erosion. Noise, vibrations, dust and visual pollution from heavy vehicle traffic during the construction phase could also negatively impact local residents and road users.

	Without mitigation	**With mitigation**
Extent	Local-Regional (3)	Local-Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	High (8)	Moderate (6)
Probability	Probable (3)	Probable (2)
Significance	**Medium (39)**	**Low (22)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Working hours must preferably be restricted to daylight hours during the construction phase. Where deviation of the working hours is required it must be approved by the relevant authorities and surrounding landowners must be notified.
» All vehicles must be road worthy and drivers must be licensed, obey traffic rules, follow speed limits and made

aware of the potential road safety issues.
» Construction vehicles should be inspected regularly by the EPC contractor to ensure their road worthiness.
» Adequate and strategically placed traffic warning signs and control measures must be implemented along the N14, Lutzputs road and gravel farm access roads to warn road users of the construction activities taking place for the duration of the construction phase. Warning signs must be visible at all times, and especially at night. Signage must be maintained throughout the construction phase,
» Implement penalties for reckless driving as a way to enforce compliance to traffic rules.
» Avoid heavy vehicle activity through residential areas during "peak" hours (when children are taken to school, people driving to work, etc.).
» The developer and EPC contractor must ensure that all fencing along access roads is maintained in the present condition or repaired if disturbed or damaged due to construction activities.
» The developer and EPC Contractor must ensure that the roads utilised for construction activities are either maintained in the present condition or upgraded if damaged (i.e. wear and tear) due to construction activities.
» A protocol for communication must be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process.
» Undertaken information sessions with the surrounding communities prior to construction in order to ensure that communities are fully informed of the project to be developed in its final form. This must be undertaken through the appointment of a Community Liaison Officer (CLO).

Residual impacts:
» None anticipated.

Nature: *Nuisance impacts in terms of temporary increase in noise and dust*

Nuisance impacts associated with construction related activities include noise, dust, and possible disruption to adjacent properties. Site clearing activities increase the risk of dust and noise being generated, which can in turn negatively impact on adjacent properties. The movement of heavy construction vehicles and construction activities and equipment also have the potential to create noise in the development area, as well as along the N14 national road, and gravel access roads. The primary sources of noise during construction would be from construction equipment, vehicle and truck traffic. Noise levels can be audible over a large distance although are generally short in duration. Dust would be generated from construction activities as well as trucks / vehicles driving on gravel access roads. This impact will negatively impact sensitive receptors. The impact of noise and dust on sensitive receptors can be reduced through the application of appropriate mitigation measures.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	High (8)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (44)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:
» The movement of heavy vehicles associated with the construction phase through populated areas should be timed to avoid weekends, public holidays and holiday periods, where feasible.
» Dust suppression techniques 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.
» A speed limit of 40km/hr should be implemented on gravel roads.
» Ensure all vehicles are road worthy, drivers are licensed and are made aware of the potential noise and dust issues.

» A CLO must be appointed. A method of communication must be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process.

Residual impacts:

» Residual damage from construction activities.

Nature: *Intrusion impacts from construction activities will have an impact on the areas "sense of place"*

Intrusion impacts such as aesthetic pollution (i.e. building materials, construction vehicles, etc.), noise and light pollution will impact the "sense of place" for the local community. Construction related activities have the potential to negatively impact a local area's "sense of place". Such an impact is likely to be present during the construction phase. It is however expected that the project will mostly affect areas and receptors that have already been exposed to other existing energy generation infrastructure and other industrial infrastructure (i.e. for which the sense of place has already been altered).

Given the location of Naledi PV on a private property, within an area characterised as having a low population density, and given the project's location within close proximity to the operational and highly visible Khi Solar One facility, as well as to the Sirius Solar PV Project One, Dyasons Klip 1 and 2 PV projects, all currently operational, the visual impact and impact on the area's sense of place, from a social perspective, associated with the construction of the proposed project is anticipated to be of limited significance due to the development being located in a REDZ area, which is earmarked for the development of renewable energy facilities.

The assessment of the sense of place impact was undertaken through the consideration of the Visual Impact Assessment (**Appendix I**) undertaken for the project.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Small (0)
Probability	Improbable (2)	Very improbable (1)
Significance	**Low (10)**	**Low (3)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Limit noise generating activities to daylight working hours and avoid weekends and public holidays.
» The movement of heavy vehicles associated with the construction phase should be timed to avoid weekends, public holidays and holiday periods where feasible.
» Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.
» All vehicles must be road-worthy, and drivers must be licensed and made aware of the potential road safety issues and need for strict speed limits.
» Communication, complaints and grievance channels must be implemented, and contact details of the CLO must be provided to the local community in the study area.
» Ensure proper management and tidiness of the construction site.
» Implement the relevant mitigation measures as recommended in the Visual Impact Assessment.

Residual impacts:

» None anticipated.

Operation Phase

***Nature**: The creation of employment opportunities and skills development opportunities during the operation phase for the country and local economy.*

During the operation phase, it is expected that up to 30 full-time employment opportunities will be available, depending on the operational requirements of the facility. These employment opportunities will include low-skilled (70%), semi-skilled (25%) and skilled (5%) opportunities. The employment opportunities generated as a result of the project will be long term and will last for the duration of operation (i.e. approximately 20 years). None of the employees appointed during the operation phase will be housed on-site. In addition to the direct employment opportunities it is anticipated that additional indirect employment opportunities will be generated during the operation of the project.

	Without enhancement	**With enhancement**
Extent	Local (2)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Small (1)	Small (1)
Probability	Highly probable (4)	Definite (5)
Significance	**Low (20)**	**Low (25)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes (enhance)	

Enhancement:

- A local employment policy should be adopted to maximise the opportunities made available to the local community.
- The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.
- Vocational training programs should be established to promote the development of skills of the employees.
- Proof of skills development must be provided to the upskilled individual.

Residual impacts:

- Improved pool of skills and experience in the local area.

***Nature**: Development of non-polluting, renewable energy infrastructure.*

South Africa currently relies predominantly on coal-generated electricity and as a result, the country's carbon emissions are considerably higher than those of most developing countries. The use of solar technology for power generation is considered a non-consumptive use of a natural resource which produces zero greenhouse gas emissions during its operation. The generation of renewable energy (RE) utilizing solar power will contribute positively to South Africa's electricity market. Given South Africa's reliance on Eskom as a power utility, the benefits associated with provision of electricity by an IPP are regarded as an important contribution, and the advancement of RE has been identified as a priority for South Africa.

Increasing the contribution of the RE sector to the local economy would contribute to the diversification of the local economy and provide greater economic stability. The growth in the RE sector as a whole could introduce new skills and development into the area. This is especially true with regards to solar power specifically considering the number of other solar power projects proposed and operational within the broader area.

The development of RE projects have the potential to contribute to the stability of the economy and could contribute to the local economy through employment generation (direct, indirect, and local service providers) and revenue

generation for the LM. While the overall contribution of the project to South Africa's total energy requirements is small the facility will also contribute towards offsetting the total carbon emissions associated with energy generation in South Africa. It should however be noted that such a benefit is associated with all RE projects and not only solar power projects in particular.

	Without enhancement	**With enhancement**
Extent	Local- Regional- National (4)	N/A
Duration	Long term (4)	N/A
Magnitude	Low (4)	N/A
Probability	Highly probable (4)	N/A
Significance	**Medium (48)**	N/A
Status (positive or negative)	Positive	N/A
Reversibility	Yes	
Irreplaceable loss of resources?	Yes (impact of climate change)	
Can impacts be mitigated?	No	

Mitigation/Enhancement:

» None required.

Residual impacts:

» Reduced carbon emissions through the use of renewable energy and contribute to reducing global warming.

Nature: *Contribution to LED and social upliftment during the operation of the project*

Projects which forms part of the DoE's REIPPP Programme are required as part of their bidding requirements to contribute towards 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 need to be invested into LED projects and programmes. Naledi PV therefore has the potential to contribute positively towards socio-economic development and improvements within the local area.

Socio-economic spin-offs from the project could contribute towards upliftment of the surrounding communities. An in-depth Community Needs Assessment (CNA) is required to ensure that the beneficiary community's needs are understood and sufficiently addressed by the proposed development programmes in order to contribute meaningfully towards local economic growth and development.

	Without enhancement	**With enhancement**
Extent	Local-Regional (3)	Local-Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (52)**	**Medium (60)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes (enhance)	

Enhancement:

» A CNA must be conducted to ensure that the LED and social upliftment programmes proposed by the project are meaningful.

» Ongoing communication and reporting is required to ensure that maximum benefit is obtained from the

programmes identified, and to prevent the possibility for such programmes to be misused.
» The programmes should be reviewed on an ongoing basis to ensure that they are best suited to the needs of the community at the time (bearing in mind that these are likely to change over time).

Residual impacts:
» Social upliftment of the local communities through the development and operation of the project.

Nature: *Visual impacts and sense of place impacts associated with the operation phase of Naledi PV*

Intrusion impacts such as aesthetic pollution (i.e. building materials, construction vehicles, etc.), noise and light pollution will impact the "sense of place" for the local community. Construction related activities have the potential to negatively impact a local area's "sense of place". Such an impact is likely to be present during the construction phase. It is however expected that the project will mostly affect areas and receptors that have already been exposed to other existing renewable energy generation infrastructure and other industrial infrastructure (i.e. for which the sense of place has already been altered).

Given the location of Naledi PV on a private property, within an area characterised as having a low population density, and given the project's location within close proximity to the operational and highly visible Khi Solar One CSP Facility, as well as to the operational Sirius Solar PV Project One and the Dyasons Klip 1 and 2 PV projects (2 x 75MW), the visual impact and impact on the area's sense of place, from a social perspective, associated with the construction of the proposed project is anticipated to be of limited significance.

The identification of the significance of the impact on sense of place for the construction phase was undertaken through the consideration of the Landscape and Visual Impact Assessment (Environmental Planning and Design, 2020) undertaken for the project. The impact is considered to be of a low significance, before and after the application of the recommended mitigation measures, as per the findings of the Landscape and Visual Impact Assessment.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Small (0)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (14)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:
» Maintain and manage the facility to be in a good and neat condition to ensure that no degradation of the area and site takes place and impacts the visual quality of the area.
» Implement the relevant mitigation measures as recommended in the Landscape and Visual Impact Assessment for the change in character and sense of place of the landscape setting.

Residual impacts:
» The visual impact of Naledi PV will remain until the infrastructure is completely decommissioned and removed. Thereafter the impact will be removed.

Nature: *Loss of agricultural land and overall productivity as a result of the operation of the proposed project on an agricultural property*

Land capability is defined as "the extent to which land can meet the needs of one or more uses under defined

conditions of management". The area proposed for the development of Naledi PV has a Low to Very-Low land capability which indicates that the area is only suitable for animal grazing and no dryland crop production.

The grazing capacity of the study area ranges between 28 and 32 ha per Large Stock Unit. The area proposed for the development of Naledi PV is suitable for 10 to 11 head of cattle or 38 to 43 head of sheep and goats.

The availability of grazing land available for livestock production will be lost in the area where the Naledi PV will be developed. The impact remains present through the operation phase of the facility. Considering the land capability and grazing capacity of the site, the significance of the impact on the loss of agricultural land will be low, before the implementation of mitigation, from a social perspective.

The Agricultural compliance Statement for the proposed Naledi PV Project (TerraAfrica Consult, 2020) was considered for the identification of the significance relating to the impact on loss of agricultural land. It must be noted that the assessment made here is based on the impact from a social perspective.

	Without mitigation	**With mitigation**
Extent	Site (1)	Site (1)
Duration	Long-term (4)	Long term (4)
Magnitude	Low (4)	Minor (1)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Keep the project footprint as small as possible.
» Implement mitigation measures recommended by the soils specialist.

Residual impacts:

» None expected to occur

Decommissioning Phase Impacts

Typically, major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income and will be similar to the impacts during the construction phase. This has implications for the households who are directly affected, the communities within which they live, and the relevant local authorities. However, in the case of Naledi PV it is anticipated that the proposed facility will be refurbished and upgraded to prolong its lifespan, where possible, and decommissioning will only take place once the economic viability of the project has come to an end.

8.9.4 Comparative Assessment of Main Access Road Alternatives

From the two (2) main access road alternatives proposed by the proponent, both alternatives are deemed acceptable from a social perspective as there would be a little difference in social impacts from the use of either road as a main access road to the Naledi PV development area. Therefore, the technically preferred alternative is nominated as the preferred alternative from a social perspective.

Aspect: *Social*		
Main Access Road	**Alternative 1**	**Alternative 2**
	» Technically preferred » Acceptable and preferred	» Acceptable

8.9.5 Implication for Project Implementation

The significance of the *positive impacts* associated with the social aspects that will be affected by Naledi PV ranges from medium to high with the implementation of the enhancement measures recommended. No negative impacts with a high significance rating have been identified to be associated with the development of Naledi PV. All negative social impacts are within acceptable limits with no impacts considered as unacceptable from a social perspective. The recommendations proposed for the project are considered to be appropriate and suitable for the mitigation of the negative impacts and the enhancement of the positive impacts.

The implications of the proposed development from a social perspective are negative and positive. The negative social implications include, an influx in the number of people within the surrounding area, nuisance as a result of noise and dust generation during construction activities and a pressure on the social services provided to the surrounding communities. The positive implications include, skills development, job and business opportunities for local SMMEs in the area. Therefore, the social enhancement measures for Naledi PV 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 Kai !Garib 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.
- Proof of skills development must be provided to the upskilled individual.
- A Community Needs Assessment (CNA) 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 Naledi PV ranges from low to medium 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.

- Undertaken information sessions with the surrounding communities prior to construction in order to ensure that communities are fully informed of the project to be developed in its final form. This must be undertaken through the appointment of a Community Liaison Officer (CLO).
- 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.

8.10. Assessment of Traffic Impacts

Traffic impacts have been identified and assessed for the development of Naledi PV. The details of the impact assessment are also provided within the traffic impact assessment (refer to **Appendix K** of the Final BA Report).

8.10.1 Results of the Traffic Impact Assessment

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

The routes leading to the development area and proposed to be used for transportation of project components, are Provincial and National Roads.

The development area is located north of the N14 national road and adjacent to the Lutzputs Road, which is a gravel road that also provides access to the existing settlement of Lutzputs. Two main access roads are proposed to provide access to Naledi PV. For the construction of Naledi PV the total trips can be estimated between 2 858 and 4 286 heavy vehicle trips, which will generally be made over the 12-18-month construction phase. In a worst-case scenario, the calculated number of trips is 17 daily trips. The impact of this on the road network would, however, be negligible as the additional peak hourly traffic would, at most, be between 4-7 trips. Therefore, this impact on the existing road network in the area is deemed nominal.

The solar PV facility is expected to operate for a minimum period of 20 years and will operate 7 days a week, during daylight hours. It is assumed that once the facility is fully operational, it will require approximately 30 full time employees. It is also assumed that the workforce will be accommodated within the surrounding areas, therefore, the vehicle trips generated will be low and will have a negligible impact on the external road network.

8.10.2 Description of the Traffic Impacts

Traffic impacts are expected during the construction and operation phases of Naledi PV. For the construction phase of Naledi PV, an estimated 2 858 and 4 286 heavy vehicles trips are anticipated for the

12-18-month duration of the construction phase. Taking into consideration that the number of vehicle trips during peak hour traffic in the rural environment is estimated at 20-40% of the average daily traffic, the resulting vehicle trips of the construction phase for Naledi PV is approximately 4-7 trips per day. Therefore, the traffic impacts as a result of the proposed development on the capacity of the N14 is nominal. In terms of the construction phase, the impacts will be negligible and will not have any impact on the surrounding road network. Therefore, no impact assessment table has been included below for the traffic impacts during the operation phase.

8.10.3 Impact tables summarising the significance of impacts on traffic during the construction, operation, and decommissioning (with and without mitigation)

The impacts assessed below apply to the development area assessed for Naledi PV. Based on the proposed and assessed development footprint, the development of Naledi PV is located within an area where numerous solar renewable energy facilities are proposed and could have an impact on the road network of the area. Therefore, the traffic impacts of the development of Naledi PV will be low following the implementation of the recommended mitigation measures, as a result, the development of the solar PV facility is acceptable from a traffic perspective.

Construction Phase Impacts

Nature: *Traffic congestion as a result of the transportation of components required for the development of the facility.* The transportation of equipment, material and staff to the site will lead to traffic congestion on local roads.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Very Short-term (1)	Very Short-term (1)
Magnitude	Moderate (6)	Low (4)
Probability	Highly Probable (4)	Improbable (2)
Significance	**Medium (36)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Stagger infrastructure delivery to the site. » Reduce the construction phase period. » Make use of mobile batching plants and quarries in close proximity to the site. » Staff and general trips must occur outside peak traffic hours. » Regular maintenance of gravel roads by the Contractor during the construction phase and by the developer or operations manager during the operation phase.		
Residual Impacts: None, traffic will return to normal levels after the construction phase is complete.		

Nature: *Dust pollution as a result of the transportation of components required for the development of the facility.* The transportation of equipment, material and staff to the site will lead to traffic congestion which will lead to dust pollution on the surrounding environment.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Very Short-term (1)	Very Short-term (1)
Magnitude	Moderate (5)	Minor (2)
Probability	Highly Probable (4)	Improbable (2)
Significance	**Medium (32)**	**Low (8)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Regular maintenance of gravel roads by the Contractor during the construction phase and by the developer or operations manager during the operation phase.		
Residual Impacts: Dust pollution during the construction phase cannot be completely mitigated but mitigation measures will significantly reduce the impact. Dust pollution is limited to the construction phase.		

Operation Phase Impacts

The traffic generated during this phase will be negligible and will not have an impact on the surrounding road network.

Decommissioning Phase Impacts

The traffic impacts of the decommissioning phase will be similar to those of the construction phase, i.e. traffic congestion, air and noise pollution, as similar vehicle trips are anticipated.

8.10.4 Comparative Assessment of Main Access Road Alternatives

The comparison of the two (2) main access alternative roads to provide access to the Naledi PV development area was based on the direct and indirect impacts on the surrounding road network. The main access road Alternative 2 is the preferred alternative, as it makes sense from an access management perspective that the proposed facilities in the area (i.e. Khunab Solar Development projects) share an access route to limit the number of accesses along the N14.

Aspect: *Traffic*		
Main Access Road	**Alternative 1**	**Alternative 2**
	» Acceptable	» Provides direct access to the development area » Acceptable and preferred

8.10.5 Implications for Project Implementation

- The traffic impacts associated with the development of Naledi PV will be low following the implementation of the mitigation measures. No impacts of medium or high significance are expected to occur and as such the development of the solar PV facility is acceptable from a traffic perspective. The following mitigation measures have been recommended:
- Stagger infrastructure delivery to the site.
- Construction materials (i.e. cement & quarry) to be sourced from local suppliers as much as possible to limit the impact on the regional network.
- Staff and general trips should occur outside of peak traffic periods.

8.11. Assessment of the 'Do Nothing' Alternative

The do-nothing' alternative (i.e. no-go alternative) is the option of not constructing Naledi PV. Should this alternative be selected, there would be no environmental impacts on the site due to the construction and operation activities of a solar PV facility.

a) Land use and agriculture

There are no high potential soils present within the development area and the soils are of moderate potential at best due mainly to a combination of the shallow depth and the sandy texture which will lead to rapid water infiltration and the soils drying out. In addition, the low rainfall in the area means that there is little potential for rain-fed arable agriculture in the area. Arable production would, therefore, be possible only by irrigation, and no indications of any irrigated areas within, and surrounding the development area, can be identified. Irrigation infrastructure is only available close to the Orange River.

In general, the soils that do occur within the broader study area and development area are suited for extensive grazing at best and furthermore the grazing capacity of the area is very low, at around 28-32ha/large stock unit.

Considering the state of the agricultural potential and the land capability of the study area and development area, the undertaking of productive agricultural activities will not be possible and will be highly restricted if attempted. The development of Naledi PV provides an opportunity to undertake an efficient and productive land use activity on a property which is currently restricted in use, as described above. Furthermore, Portion 3 of the Farm McTaggarts Camp 453 where the development area of Naledi PV is located has been previously authorised for the development of the Kai !Garib CSP Tower Facility; therefore, this is an indication that the land use on the affected properties has always been earmarked for renewable energy generation.

The implementation of the 'do-nothing' alternative would leave the land-use restricted to the current land use (i.e. grazing), losing out on the opportunity to generate renewable energy from solar energy in addition to current land use activities. 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 broader study area which allows the current land-use activities to continue.

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 jobseekers into the Upington area, nuisance impacts (noise and dust during construction), visual impacts and safety and security impacts. The impact is therefore neutral.
- There agricultural potential of the study area is low, with no irrigation infrastructure present; therefore, the no-go option would be a lost opportunity for area to be used for an appropriate land use as a result of the solar resource availability over the area. Should the no-go option be considered, the low agricultural potential of the area will remain due to no irrigation infrastructure being present to warrant for the undertaking of commercial farming practices and the area having a low land capability.
- The main and current land use of the study area is renewable energy generation (due to the operations of Khi Solar One) and the undertaking of grazing activities to a limited extent, which is not considered to be an effective land use and offers limited benefit and income to the landowner, Khi CSP South Africa (Pty) Ltd, a renewable energy developer who purchased the property for the development of renewable energy facilities. Should the no-go option be considered and implemented the landowner will lose an opportunity to develop and implement a land use that will be more suited to the land and area and beneficial to the landowner based on the grazing capacity of the property.
- There would be 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. The impact is negative.

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 towns of Upington, Keimoes and Kakamas, as well as the smaller settlements located within the surrounding areas of the development area. 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 solar 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: Naledi PV is likely to create approximately ~300 (at its peak) employment opportunities (temporary) for a period of ~12 to 18 months, depending on the final design, during the construction phase. Of this approximately 70% of the opportunities will be available to low skilled workers (construction labourers, security staff, drivers, equipment operators etc.), 25% will be available to semi-skilled personnel (electricians, site managers etc.) and 5% of employment opportunities will be for skilled individuals

(engineers, project managers, site managers etc.). The development of Naledi PV within the Kai !Garib Local Municipality, and directly adjacent to 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 Naledi PV 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, which is demarcated as a REDZ, 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 Naledi PV would contribute towards addressing the 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

Should the no-go option be considered and implemented, the status quo pertaining to the requirement for additional capacity in the region will remain, as a result, the benefits associated with the introduction of renewable energy would not be realised. The Northern Cape has an ample solar resource and Naledi PV is only proposed to contribute a contracted capacity of up to 100MW, which 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, with the country's significant renewable energy potential largely untapped to date.

The Integrated Resource Plan (IRP) 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 updated IRP 2019, a total of 6 422MW have been procured under the REIPP Programme and 3 876MW has been commissioned and made available to the grid. In addition, there is currently 1 474MW available from installed and operational PV facilities while an additional 5 670MW has been allocated between 2025 and 2030. This plan is yet to be finalised and promulgated. 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 surrounding area experiences ample solar resource, not developing Naledi PV would see such an opportunity being lost. As current land use activities can continue on the study area once the project is operational, the loss of the land to this project during the operation phase (equivalent to 8% of the study area) is not considered significant. In addition, the Northern Cape Province will not benefit from additional generated power being evacuated directly into the Province's 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 Naledi PV. All impacts associated with the project can be mitigated to acceptable levels. If the solar PV facility is not developed the following positive impacts will not be realised:

» Job creation and skills development 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 the energy generation mix in a most economic and rapid manner.
» Provision of clean, renewable energy in an area where the energy resource is optimally available.

As detailed above, the 'do-nothing' alternative will result in a number of lost opportunities. The 'do nothing' alternative is, therefore, not preferred and not proposed to be implemented for the development of Naledi PV.

CHAPTER 9: ASSESSMENT OF POTENTIAL CUMULATIVE IMPACTS

As identified and assessed in Chapter 8, a solar PV facility may have impacts (positive and negative) on natural resources, the social environment and on the people living in the area surrounding the project. The preceding impact assessment chapter has reported on the assessment of the impacts associated with Naledi PV largely in isolation (from other similar developments).

The Naledi PV study area and development area are located within a Renewable Energy Development Zone (REDZ). The specific REDZ zone within which the project is proposed is known as the Upington REDZ or REDZ 7. The REDZ areas are zones identified by the DEA as geographical areas of strategic importance for the development of large-scale solar photovoltaic and wind energy development activities. Therefore, the REDZ areas are considered as nodes for the development of renewable energy developments where a concentration of such development has been undertaken and is expected to be further developed and grow. In close proximity to the development area and the study area of Naledi PV prominent renewable energy features and infrastructure has been introduced to the landscape, biophysical environment and the social environment present within the area. Therefore, the development of Naledi PV will not introduce renewable energy to an untouched, undeveloped landscape but rather expand such features and developments within the landscape and add to the concentration of such developments within the REDZ.

The DMRE, under the REIPPP Programme, released a request for proposals (RFP) in 2011 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) since 2011, in which developers submit planned renewable energy projects for evaluation and selection. The bid selection process considers a number of qualification and evaluation criteria. The proposed tariff and socio-economic development contributions by the project bidder are the main basis for selection after the qualification criteria have been met.

As a result of the REIPPP Programme and the promulgation of the REDZ zones, there has been a substantial increase in interest in solar PV facility developments in South Africa (largely in the Northern Cape Province), with 23 PV facilities currently operational (Energyblog[35], 2020). It is, therefore, important to follow a precautionary approach in accordance with NEMA to ensure that the potential for cumulative impacts[36] is considered and avoided where possible.

This chapter assesses the potential for the impacts associated with Naledi PV to become more significant when considered in combination with the other known or proposed solar facility projects within the area.

[35] https://www.energy.org.za/data-and-tools/project-database?art_title=&programme=&project_type=Solar+Photovoltaic+%28PV%29&province=Northern+Cape&status=Fully+operational&cck=project&scale=Large+Scale+Utility&country=South+Africa&search=project_search&task=search

[36] 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.

The projects within the area under consideration in this cumulative assessment include both PV and CSP (Concentrated Solar Power) due to the existing and proposed PV and CSP facilities located in the area.

CSP makes use of a different solar power technology (which contains a different suite of infrastructure required to be constructed and operated), but is considered as part of the cumulative impact assessment as there exists an overlap between the cumulative impacts expected with the development of both PV and CSP projects in the surrounding areas of the Naledi PV study area.

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

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

Requirement	Relevant Section
3(j)(i) an assessment of each identified potentially significant impact and risk, including cumulative impacts.	The cumulative impacts associated with the development of Naledi PV are included and assessed within this chapter.

9.2 Approach taken to Assess Cumulative Impacts

The cumulative impacts that have the potential to be compounded through the development of the solar PV facility and its associated infrastructure in proximity to other similar developments in this area south-west of Upington and include impacts such as those listed below:

- Unacceptable loss of habitat or landscape connectivity through clearing, resulting in an impact on the conservation status of such flora, fauna or ecological functioning;
- Unacceptable risk to avifauna through loss of avifaunal habitats, and impacts to nesting areas;
- Unacceptable risk to aquatic resources through disturbance associated with construction activities and increased runoff and erosion during the operation phase;
- Unacceptable loss of agricultural potential areas presenting a risk to current land use activities and increased soil erosion;
- Unacceptable loss of heritage resources (including palaeontological and archaeological resources);
- Complete or whole-scale change in the sense of place and character of an area and unacceptable visual intrusion;
- Unacceptable impact to social factors and components; and
- Unacceptable risk due to traffic related impacts.

The role of the cumulative assessment is to determine and confirm if such impacts are relevant to Naledi PV within the study area being considered for the development.

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 in order to ensure that the concentration of renewable energy developments, specifically solar PV and CSP facilities does not lead to detrimental environmental impacts. 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 solar PV facility developments throughout South Africa, while the significance of the

cumulative impact on visual amenity and loss of land within a concentrated area may only be influenced by solar PV facility developments that are in closer proximity to each other. For practical purposes a sub-regional scale of 30km has been selected for this cumulative impact evaluation.

Figure 9.1 indicates the location of Naledi PV in relation to all other known and viable (i.e. projects with a valid Environmental Authorisation) solar PV and CSP facilities located within a radius of 30km from the

development area under assessment. These projects were identified using the DEA Renewable Energy Database and current knowledge of projects being proposed and developed in the area. In the case of Naledi PV, there are several solar PV facilities located within a 30km radius of the development area (refer to **Figure 9.1** and **Table 9.1**), all at various stages of approval[37]. Further to the solar PV facilities located within the area, existing and proposed CSP facilities are also located within the surrounding areas of the development area.

The potential for cumulative impacts is summarised in the sections that follow and has been considered within the specialist studies (refer to **Appendices D – K**).

Table 9.1: Solar facilities (including PV and CSP) located within the surrounding area (within a 30km radius) of the Naledi PV development area

Project Name	DEA Reference Number(s)	Location	Project Status
Khunab Solar Development (4x 75MW PV), comprising: Klip Punt PV1 McTaggarts PV1 McTaggarts PV2 McTaggarts PV3	14/12/16/3/3/1/2110 14/12/16/3/3/1/2111 14/12/16/3/3/1/2112 14/12/16/3/3/1/2113	Portion 3 of the Farm McTaggarts Camp 453 and Portion 12 a portion of Portion 3 of the Farm Klip Punt 452	Approved
Sirius Solar PV Project One (1 x 75MW PV)	14/12/16/3/3/2/469	Remaining Extent of the Farm Tungsten Lodge No. 638	Operational
Sirius Solar PV Project Two (1 x 75MW PV)	14/12/16/3/3/2/470	Remaining Extent of the Farm Tungsten Lodge No. 638	Approved
Sirius Solar PV Project Three (1 x 100MW PV)	14/12/16/3/3/1/2704	Remaining Extent of the Farm Tungsten Lodge No. 638	Approved
Sirius Solar PV Project Four (1 x 100MW PV)	14/12/16/3/3/1/2705	Remaining Extent of the Farm Tungsten Lodge No. 638 and Remaining Extent of the Farm Olyvenhouts Drift Agriculture Holdings 1080	Approved
Khi Solar One (1 x 50MW CSP)	12/12/20/1831	Portion 03 of the Farm McTaggarts Camp No. 435	Operational

[37] 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	Project Status
Dyasons Klip 1 and Dyasons Klip 2 (2 x 75MW)	14/12/16/3/3/2/538/1 14/12/16/3/3/2/538/2	Remainder of the Farm Dyason's Klip No. 454	Operational
Bloemsmond Solar 1 and Bloemsmond Solar 2 (2 x 75MW PV)	14/12/16/3/3/2/815 14/12/16/3/3/2/816	Portions 5 and 14 of the Farm Bloemsmond No. 455	Approved
Rooipunt (1 x 150MW CSP)	14/12/16/3/3/1/427	Farm McTaggarts Camp No. 435	Approved
Solis Power I (1 x 150MW CSP) and Solis Power II (1 x 125MW CSP)	14/12/20/16/3/3/3/82 14/12/16/3/3/2/621	Portion 443 to 450 of the Farm Van Rooys Vlei	Approved
Upington Airport Solar PV (1 x 8.9MW PV)	12/12/20/2146	Erf 6013 Upington	Operational
Allepad PV (4 x 100MW)	14/12/16/3/3/2/1105 14/12/16/3/3/2/1106 14/12/16/3/3/2/1107 14/12/16/3/3/2/1108	Erf 5315 and Erf 01 Upington	Approved
Ephraim Sun Solar PV (1 x 75MW PV)	14/12/16/3/3/2/821	Remaining Extent of Portion 62 of the Farm Vaalkoppies No. 40	Approved
Ofir-Zx PV Plant (1 x 200MW PV)	12/12/20/2229	Remaining extent of the Farm 616	Approved
Eenduin Solar Park (1x 75MW PV)	14/12/16/3/3/2/631	Portion 2 of the Farm Eenduin No. 465	Proposed
Bright Source CSP Facility (1 x 125MW CSP)	14/12/16/3/3/2/605	Remaining extent of the Farm No. 426	Approved
Bloemsmond 3, 4 & 5 (3x100MW PV)	14/12/16/3/2/2/2042 14/12/16/3/2/2/2044 14/12/16/3/2/2/2043	Portions 5 and 14 of the Farm Bloemsmond No. 455	Approved
Ngwedi PV (1x 100MW PV)	TBC	Portion 3 of the Farm McTaggarts Camp 453 and Portion 12 a portion of Portion 3 of the Farm Klip Punt 452	In Process

It should be noted that not all the solar facilities (PV and CSP) 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 (DEFF, DMRE, NERSA and Eskom) due to the following reasons:

- There may be limitations to the capacity of the existing or future Eskom grid;
- Not all applications will receive a positive environmental authorisation;
- There are stringent requirements to be met by applicants in terms of the REIPPP Programme and a highly bidding competitive process that only selects the most competitive projects;
- Not all proposed solar 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 solar facilities will be implemented, this results in it being difficult to quantitatively assess the potential cumulative impacts. The cumulative impacts of other known solar facilities (PV and CSP) in the surrounding area and Naledi PV are therefore qualitatively assessed in this Chapter. The following potential impacts are considered:

- Cumulative impacts on ecological processes (including fauna and flora)
- Cumulative impacts on avifauna
- Cumulative impacts on aquatic resources
- Cumulative impacts on soil, land types and agricultural potential
- Cumulative impacts on heritage resources (including archaeology and palaeontology)
- Cumulative visual impacts
- Cumulative social impacts
- Cumulative traffic impacts

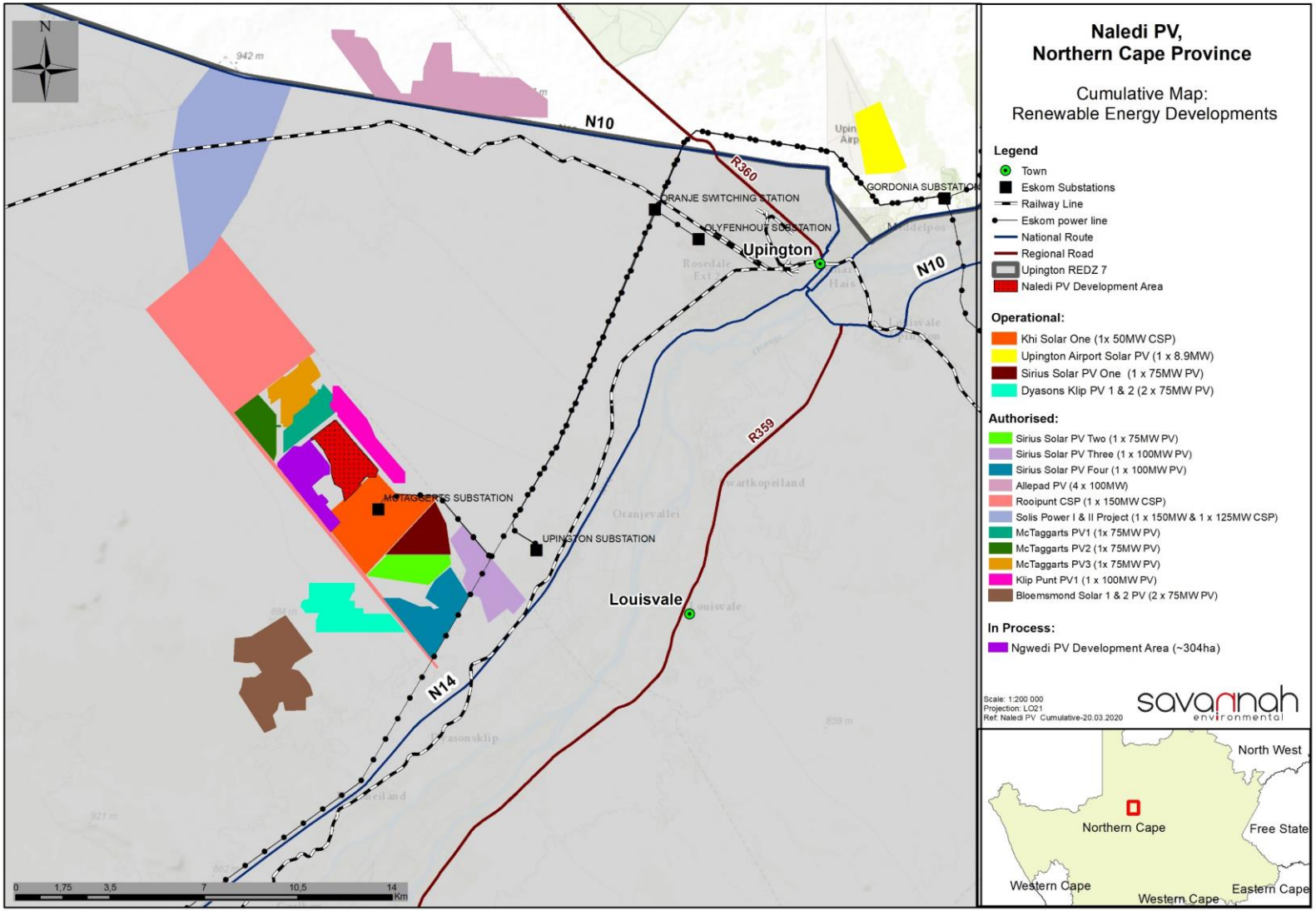

Figure 9.1: Identified solar facility projects (including PV and CSP) located within a 30km radius of the Naledi PV development area that are considered as part of the cumulative impact assessment

9.3 Cumulative Impacts on Ecological Processes

Cumulative impacts from an ecological perspective have been identified and assessed for the development of Naledi PV (**Appendix D** of the Final BA Report) and are considered as a potential significant concern due to the proliferation of solar energy developments in the wider Upington area and particularly along the N14 located to the south of the proposed project.

Provided that landscape connectivity can be maintained through the implementation of adequate buffers around the major drainage features, then the contribution of Naledi PV to cumulative impacts on habitat loss and fragmentation in the area would be acceptable. In terms of habitat loss within the REDZ zone, 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 currently intact habitat likely to result from the development is not considered highly significant. Cumulative impacts associated with the development are therefore considered acceptable.

The ecological cumulative impacts associated with Naledi PV will be of a low or medium significance, depending on the impact being assessed. These impacts have been assessed in the context of the extent of the proposed development, other renewable energy developments within the area and general habitat loss and transformation due to agriculture and other land use activities within the area.

Nature: *Reduced ability to meet conservation obligations and targets due to cumulative habitat loss* The development of Naledi PV 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 significant sensitive habitats such as drainage features, pans and quartz patches are avoided by the development footprint. » Ensure that the fencing around each facility is fauna friendly. This includes not having any electrified strands within 30cm of the ground as well as implementing a design that prevents fauna 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 solar plants. » Ensure that an alien management plan and erosion management plan is compiled for each project and effectively implemented.		

Nature: *Negative impact on broad-scale ecological processes* Development of Naledi PV may impact on broad-scale ecological processes such as the ability of fauna to disperse.		
	Overall impact of the proposed project	**Cumulative impact of the project and**

	considered in isolation	other projects in the area
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low to minor (3)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	No	No
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 faunal movement corridors such as drainage features are avoided, but if these are fenced into the facility that the fence should be adequately permeable to fauna so as to reduce impacts on faunal habitat loss and movement.
» Ensure that the mitigation hierarchy is applied with a particular emphasis on reducing the development footprint, rehabilitating disturbed areas and minimising degradation around the development area.
» An open space management plan must be developed for the development area, which should include management of biodiversity within the affected areas, as well as that in the adjacent veld.

9.4 Cumulative Impacts on Avifauna

Cumulative impacts on avifauna have been identified (**Appendix E** of the Final BA Report) and include impacts to avifauna habitats, migration routes, nesting areas due to cumulative loss and fragmentation of the impacted habitats.

In terms of habitat loss, the affected Kalahari Karroid Shrubland vegetation type is still approximately 90% intact, while it has an extensive range within the bioregion. The transformation and loss of this habitat associated with Naledi PV within the Upington REDZ is not considered highly significant in terms of avifaunal habitat loss. In terms of potential losses to landscape connectivity, the development area is not considered to lie within an area that is considered a likely avifaunal movement corridor or along an important ecological gradient.

The cumulative avifauna impact of the development is considered likely to be low. However, to maintain habitat continuity for species such as Karoo Korhaan, suitable tracks of gravel plains habitat to the east and north of the study area should be maintained in a natural state. The cumulative impact considering the other solar facilities within the surrounding area of the development area will be of a medium significance.

Nature: *Impact on avifaunal habitats and nesting areas due to cumulative loss and fragmentation of habitat.*
The development of Naledi PV and other solar energy developments will contribute to cumulative avifauna impacts which relates to impact on habitats and nesting areas.

	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 mitigated	

Mitigation:

- Minimise the development footprint as far as possible, as well as disturbance of the topsoil. A cover of indigenous grasses should be encouraged and maintained within the facility area that prevents the invasion of weeds and is the easiest to manage in the long-term. Furthermore, the developer could consider the option of allowing livestock (sheep) grazing for maintaining a low height of the grass, 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, which is undesirable.
- Ensure that suitable ecological corridors within the surrounding area are identified and maintained, whereby ecological connectivity between areas of higher conservation value are preserved.
- The facility must be fenced off in a manner which allows small fauna to pass through the facility, but that does not result in terrestrial avifauna (e.g. bustards, korhaan, thick-knees, coursers) being trapped and electrocuted along the boundary fences. 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. Single-fence designs (with the electrical fencing attached to the inside) as opposed to double-fence designs are preferred to avoid terrestrial birds becoming entrapped in the space between the two fences.
- No electrified ground-strands must be present within 30cm of the ground, while the electrified strands must also be located on the inside of the fence and not the outside.

9.5 Cumulative Impacts on Aquatic Resources

Cumulative impact on aquatic resources has been identified and assessed for the development of Naledi PV (**Appendix F** of the Final BA Report). These include:

- An increase in surface run-off velocities and the reduction in the potential for groundwater infiltration is likely to occur, considering that the development area is near the main drainage channels, however the annual rainfall figures are low.
- Downstream alteration of hydrological regimes due to the increased run-off from the area.
- Downstream erosion and sedimentation of the downstream systems and farming operations. During flood events, the unstable banks (eroded areas) and sediment bars (sedimentation downstream) already deposited downstream could be washed into the Orange River, although, currently there are no direct connections with the Orange River, extreme high flows do enter the river from the development area.

The aquatic specialist has (through his involvement in water use license processes for numerous projects in the Upington area, including the Upington REDZ), developed an understanding of the mitigation implemented or proposed to be implemented by other projects within the area. Mitigation has included the selection of the best possible sites to minimise the local and regional impacts or improving the drainage or hydrological conditions within the affected aquatic systems. The improving of affected systems is viewed as a net benefit. However, the worse-case scenario has been assessed in the cumulative impact table below, i.e. only minimum mitigation is implemented by the other projects, and that flows within these systems are sporadic.

The cumulative impact considering the other solar facilities within the surrounding area of the development area will be of a medium significance.

Nature: *Potential cumulative impacts to the aquatic resources* Cumulative impacts to aquatic resources that could occur with the development of Naledi PV includes an increase in surface run-off velocities and the reduction in the potential for groundwater infiltration, downstream alteration of hydrological regimes and downstream erosion and sedimentation.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (1)	Low (2)
Probability	Probable (3)	Definite (5)
Significance	**Low (18)**	**Medium (35)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Improve the current stormwater and energy dissipation features not currently found along the tracks and roads within the region. » Install properly sized culverts with erosion protection measures at the present (i.e. existing) road / track crossings.		

9.6 Cumulative Impacts Soil, Land Types and Agricultural Potential

Cumulative impacts are related to an increase in the loss of agricultural land used for livestock farming (i.e. grazing) within the Upington REDZ zone, in addition to the other areas where solar facilities have been and is proposed to be constructed. These impacts can be reduced by keeping the development footprints minimised where possible and strictly implementing soil management measures pertaining to erosion control and management and monitoring of any possible soil pollution sources such as vehicles traversing over the sites (refer to **Appendix G** of the Final BA Report).

It must, however, be noted that the grazing capacity of the veld in the development area is low, approximately 28 to 32 hectares per large stock unit. When this is converted to small stock units (7 to 8 hectares per small stock unit), it indicates that the development area can support 41 to 47 head of sheep or goats for grazing purposes. Sheep farming is a viable long-term land use of the development area permitting that the current crippling drought conditions ceases and as long as the field quality is maintained by never exceeding the grazing capacity.

The significance of the cumulative soil impacts will be medium.

Nature: *Cumulative impacts in terms of loss of agricultural land* There will be a decrease in areas with suitable land capability for livestock farming, which includes areas suitable for grazing.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Regional (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Moderate (3)

Probability	Probable (4)	Probable (4)
Significance	**Medium (32)**	**Medium (40)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	No
Mitigation:		
» Keep the development footprints of all solar energy facilities as small as possible; and		
» Manage the soil quality by avoiding far-reaching soil degradation such as erosion.		

Nature: *Cumulative impacts in terms of soil erosion*		
There will be an impact on areas susceptible to soil erosion, as well as an increase in areas susceptible to soil erosion.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Regional (2)
Duration	Medium-term (3)	Permanent (5)
Magnitude	Moderate (6)	Moderate (3)
Probability	Probable (3)	Probable (4)
Significance	**Medium (30)**	**Medium (40)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	No
Mitigation:		
» Each development must adhere to the highest standards for soil erosion prevention and management as provided for in the Agricultural Compliance Statement for the proposed Naledi PV.		

Nature: *Cumulative impacts in terms of soil pollution*		
There will be an increased risk for soil pollution and an increase in areas susceptible to soil pollution.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	High (3)	Regional (2)
Duration	Medium-term (3)	Permanent (5)
Magnitude	Moderate (6)	Moderate (3)
Probability	Probable (3)	Probable (4)
Significance	**Medium (36)**	**Medium (40)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	No
Mitigation:		
» Each development must adhere to the highest standards for soil pollution and management as provided for in the Agricultural Compliance Statement for Naledi PV.		

9.7 Cumulative Impacts on Heritage (including archaeology and palaeontology)

Cumulative heritage impacts have been identified for Naledi PV (refer to **Appendix H** of the Final BA Report).

Due to the location of the Naledi PV development area within a REDZ, where existing and proposed solar facilities are located, the heritage cumulative impacts relate mainly to a negative impact on the cultural landscape due to a change in the landscape character from natural wilderness to semi-industrial. This change in landscape character is related to an impact on the sense of place from a heritage perspective. However, due to the remoteness of the area the impact on the experience of the cultural landscape is not considered to be significant.

The cumulative heritage impacts will be low due to the remote character of the landscape within which Naledi PV is proposed to be developed.

Nature: *Cumulative heritage impacts* The addition of multiple solar PV facilities and related infrastructure can result in widespread destruction of heritage resources and increased visual clutter in the natural and cultural landscape.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (1)
Duration	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?	No, no significant impacts are anticipated, therefore no mitigation is required.	
Mitigation: No mitigation is required.		

It must be noted that even if no mitigation is recommended by the specialist, the requirements of the National Heritage Resources Act (Act No. 25 of 1999) would still be relevant to each of the projects proposed to be developed within the area. Should any sites of significance be discovered to be associated with any of the proposed projects, these finds would need to be dealt with accordingly.

9.8 Cumulative Visual Impacts

Cumulative visual impacts have been identified and assessed for the development of Naledi PV (refer to **Appendix I** of the Final BA Report).

In terms of general landscape change, the overall cumulative impact associated with proposed and existing solar facilities within the Upington REDZ was assessed as having a medium significance, however, the contribution of Naledi PV to this cumulative impact is assessed as low.

Cumulative visual impacts associated with proposed and existing solar facilities that are likely to affect the N14, the R359, homesteads and settlement areas are likely to have a medium significance. The contribution to these impacts associated with Naledi PV is likely to be low.

Cumulative visual impacts associated with solar facilities that are likely to affect the Lutzputs Road are likely to have a medium significance. Due to its proximity of Naledi PV to the road, the contribution to this impact is likely to be of a medium significance.

With mitigation, it is likely that the cumulative effect of glare on sensitive receivers associated with other projects and Naledi PV is likely to be of a low significance. This is due to awareness of issues associated with glare, the distance of the majority of other solar facilities from sensitive receivers and the relatively simple measures that can be adopted to mitigate potential issues in this regard.

There is potential for security lighting and operational lighting associated with solar facilities to have a significant impact in a rural region where lighting levels are limited to traffic on roads passing through the area and low-level lighting associated with homesteads and small settlements. With appropriate mitigation however, general lighting levels are likely to be largely within the levels of the surrounding areas.

Cumulative visual impacts that are likely to be experienced with the development of Naledi PV is assessed as having a medium or low significance, depending on the impact being considered.

Nature: *Landscape Change*
Naledi PV will extend the general influence of development and specifically solar projects within the area. In addition, there are solar projects proposed, approved, and operational on fourteen properties within 30km of the Naledi PV development area.

Naledi PV will therefore not extend the visual influence of industry, it will however intensify the influence within a relatively small area.

The combined effect of all solar projects could be significant, however because Naledi PV will affect an area within which there is already significant industrial influence, it is only likely to have a relatively small contribution to landscape change.

As the impact of the proposed project on the Orange River Corridor is minimal and because it is more difficult to predict the impact of other projects on this area without undertaking a detailed analysis, only the impact of projects on the Plateau Landscape Character Area (LCA) is considered.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and surroundings (2)	Region (3)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	High (8)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Medium (45)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Unknown
Mitigation: Planning:		

» Plan levels to minimise earthworks to ensure that levels are not elevated;
» Plan to maintain the height of structures as low as possible;
» Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operation:

» Reinstate any areas of vegetation that have been disturbed during construction;
» Remove all temporary works;
» Monitor rehabilitated areas post-construction and implement remedial actions; and
» Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site;
» Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Nature: *Character of the landscape as seen from the N14*

Views of the PV array and the on-site facility substation associated with Naledi PV will be limited to a short section of this road at a distance of close to the Approximate Limit of Visibility (ALV).

If visible, the proposed project will also be viewed in the context of and adjacent to the Khi Solar One facility as well as the Sirius Solar PV Project One, Dyasons Klip PV 1 and 2 (all in operation).

It is unlikely therefore that Naledi PV will be obvious from this road, its influence on this cumulative impact is therefore likely to be minimal.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings (2)	Region (3)
Duration	Long term (4)	Long term (4)
Magnitude	Small (0)	Moderate to low (5)
Probability	Very improbable (1)	Probable (5)
Significance	**Low (6)**	**Medium (60)**
Status (positive or negative)	Neutral	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Unknown

Mitigation:

Planning:

» Plan levels to minimise earthworks to ensure that levels are not elevated;
» Plan to maintain the height of structures as low as possible;
» Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operation:

» Reinstate any areas of vegetation that have been disturbed during construction;
» Remove all temporary works;
» Monitor rehabilitated areas post-construction and implement remedial actions;
» Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site;
» Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Nature: *Change in the character of the landscape as seen from the R359*

Naledi PV could be visible intermittently to small sections of this road in the vicinity of Louisvale at a distance of 13.5km. Given the distance and the extent of vegetation on the edge of the Orange River Valley, Naledi PV is unlikely to be obvious from this road.

Naledi PV is largely screened from the road by landform and vegetation. Other solar PV projects are also likely to be largely screened from the road. It is therefore unlikely that Naledi PV will be obvious from this road, its influence on this cumulative impact is therefore likely to be minimal.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings (2)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Small (0)	Minor to Low (3)
Probability	Very Improbable (1)	Probable (3)
Significance	**Low (6)**	**Medium (30)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Unknown

Mitigation:

Planning:

» Plan levels to minimise earthworks to ensure that levels are not elevated;
» Plan to maintain the height of structures as low as possible;
» Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operation:

» Reinstate any areas of vegetation that have been disturbed during construction;
» Remove all temporary works;
» Monitor rehabilitated areas post-construction and implement remedial actions;
» Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site;
» Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Nature: *Change in the character of the landscape as seen from the Lutzputs Road*

Naledi PV is likely to be obvious from the Lutzputs Road and will add to the cumulative visual impact of renewable energy projects for travellers on this road. Other existing major contributors to the cumulative impact include the operational Khi Solar One facility (the heliostat field and the power tower will be visible), the Sirius Solar PV Project One and the Dyasons Klip PV 1 and 2 projects.

The overall cumulative impact could therefore have a medium significance. Naledi PV is likely to result in a relatively low contribution to this overall impact.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings (2)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Small (0)	Moderate to low (5)
Probability	Improbable (2)	Definite (5)

Significance	**Low (12)**	**Medium (60)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Unknown

Mitigation:

Planning:

» Plan levels to minimise earthworks to ensure that levels are not elevated;
» Plan to maintain the height of structures as low as possible;
» Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operation:

» Reinstate any areas of vegetation that have been disturbed during construction;
» Remove all temporary works;
» Monitor rehabilitated areas post-construction and implement remedial actions;
» Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site;
» Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Nature: *Cumulative impact on local homesteads*

Visual impacts on homesteads were assessed as being very improbable. Naledi PV is therefore unlikely to contribute significantly to cumulative visual impacts on homesteads. Because the majority of homesteads are located within the Orange River Valley and are likely to be at least partially screened from PV projects to the north by landform and vegetation their cumulative visual impact is also anticipated to be low. The Khi Solar One facility is likely to be obvious. The cumulative impact is therefore also likely to be improbable with a low significance.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings (2)	Region (3)
Duration	Long term (4)	Long term (4)
Magnitude	Small (0)	Minor (2)
Probability	Very improbable (1)	Probable (3)
Significance	**Low (6)**	**Low (27)**
Status (positive or negative)	Neutral	Neutral
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Unknown

Mitigation:

Planning:

» Plan levels to minimise earthworks to ensure that levels are not elevated;
» Plan to maintain the height of structures as low as possible;
» Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operation:

» Reinstate any areas of vegetation that have been disturbed during construction;
» Remove all temporary works;
» Monitor rehabilitated areas post-construction and implement remedial actions;
» Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site;
» Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Nature: *Cumulative impact on settlements*

There are numerous small settlement areas present along the N14 and within the Orange River Valley. Naledi PV is screened from these largely by landform.

Naledi PV was assessed as likely to have a very improbable impact of low significance on settlements. It is therefore highly unlikely that the proposed project will have a significant contribution to cumulative impacts on settlements.

Other planned projects may impact on settlement areas. The existing Khi Solar One facility, due to the height of the power tower already has significant visual impact on numerous settlements in the area.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings (2)	Regional (3)
Duration	Long-term (4)	Long term (4)
Magnitude	Small (0)	Moderate (6)
Probability	Very improbable (1)	Probable (3)
Significance	**Low (6)**	**Medium (39)**
Status (positive or negative)	Neutral	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No mitigation is necessary	Unknown

Mitigation:
None required.

Nature: *Cumulative impact of glare affecting local receptors*

A brief geometric review of the potential for glare to affect the Upington International Airport and the Lutzputs Road during the potentially worst time of the year (mid-winter) when the sun is furthest north and the possible angle of reflection is greatest has indicated that it is highly unlikely that glare from Naledi PV will affect the Airport. It is however likely that glare from Naledi PV will affect the Lutzputs Road.

Only the Lutzputs Road is considered likely to experience cumulative impacts of glare. With mitigation and because of the very low number of vehicles that use this road, the contribution to cumulative impacts is assessed as having a low significance.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings (2)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Small (0)	Minor (2)
Probability	Improbable (2)	Probable (3)
Significance	**Low (12)**	**Low (27)**
Status (positive or negative)	Neutral	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Should glare prove problematic mitigation might include the provision of an opaque fence or earth bund.

Nature: *Night-time lighting impacts*

Currently lighting in the area arises from the settlement areas and homesteads within the Orange River Valley and traffic on the N14. There is also background lighting from the urban area of Upington.

There is a risk that Naledi PV will extend the influence of lighting, however with appropriate mitigation lighting levels are anticipated to be low and within the current lighting pattern.

It is likely that the development of other solar projects in the area will increase lighting levels. However, with appropriate mitigation it is anticipated a low level of impact will occur, i.e. lighting will be within the surrounding lighting levels.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site (1)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Small to minor (1)	Small to minor (1)
Probability	Improbable (2)	Improbable (3)
Significance	**Low (12)**	**Low (24)**
Status (positive or negative)	If the lights are generally not visible, then the occasional light is unlikely to be seen as negative. The impact will be Neutral	Neutral
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Use low key lighting around buildings and operational areas that is triggered only when people are present;
» Plan to utilise infra-red security systems or motion sensor triggered security lighting;
» Ensure that lighting is focused on the development with no light spillage outside the site; and
» Keep lighting low, no tall mast lighting should be used.

9.9 Cumulative Social Impacts

The potential for social cumulative impacts is likely and includes both positive and negative impacts (refer to **Appendix J** of the Final BA Report). The significance of the negative cumulative impacts of Naledi PV and other projects in the area is low, and the significance of the positive cumulative impacts of the proposed development and other projects in the areas is medium. This is based on the location of the Naledi PV within the Upington REDZ.

Considering the concentration of solar energy developments within the surrounding area of Naledi PV, and the siting of the facility within the Upington REDZ, the potential for cumulative impacts to occur is likely. Potential cumulative impacts identified for the project include positive impacts on the economy, business development, and employment, as well as negative impacts such as an influx of jobseekers and change in the areas sense of place.

Nature: *An increase in employment opportunities, skills development and business opportunities with the establishment of more than one solar power facility.*

Naledi PV and the establishment of other solar 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 creation of employment, skills development and training opportunities, and downstream/spin-off business opportunities. The cumulative benefits to the local, regional, and national economy through employment and procurement of services are more considerable than that of Naledi PV alone.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local- Regional-National (4)	Local- Regional-National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Probable (3)	Highly Probable (4)
Significance	**Medium (36)**	**Medium (56)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	N/A	N/A
Can impacts be mitigated?	Yes (enhanced)	

Mitigation/Enhancement:

» The establishment of a number of solar facilities under the REIPPP Programme in the area has the potential to have a positive cumulative impact on the area in the form of employment opportunities, skills development and business opportunities. The positive benefits will be enhanced if local employment policies are adopted and local services providers are utilised by the developers to maximise the project opportunities available to the local community.

Nature: *Negative impacts and change to the local economy with an in-migration of labourers, businesses and jobseekers to the area.*

While the development of a single solar facility may not result in a major influx of people into the area, the development of several projects at the same time may have a cumulative impact on the in-migration and movement of people. In addition, the fact that Naledi PV is proposed within REDZ 7, which has specifically been earmarked for the development of large-scale solar PV energy facilities, implies that the surrounding area is likely to be subject to considerable future applications and expansion of solar energy facilities. Levels of unemployment, and the low level of earning potential may attract individuals to the area in search of better employment opportunities and standards of living.

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 to a local employment policy in order to reduce the potential of such an impact occurring.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (2)	Local-Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Low (4)
Probability	Very Improbable (1)	Improbable (2)
Significance	**Low (8)**	**Low (22)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No

Can impacts be mitigated?	Yes

Mitigation:

- Develop a recruitment policy / process (to be implemented by contractors), which will source labour locally.
- Work together with government agencies to ensure that service provision is in line with the development needs of the local area.
- Form joint ventures with community organisations, through Trusts, which can provide local communities with benefits, such as employment opportunities and services.
- Develop and implement a recruitment protocol in consultation with the municipality and local community leaders. Ensure that the procedures for applications for employment are clearly communicated.

9.10 Cumulative Traffic Impacts

Cumulative traffic impacts have been identified for the development of Naledi PV (refer to **Appendix K** of the Final BA Report). The key traffic issues identified from a cumulative perspective and considering the location of the proposed development within the Upington REDZ, includes traffic congestion or delays on the surrounding road network and noise and dust pollution. The cumulative traffic impact assessment assumes that all proposed solar facilities would be constructed at the same time.

The construction and decommissioning phases of the solar facilities are the only phases within which significant traffic will be generated. The duration of these phases is short-term, therefore the impact of the generated traffic on the surrounding road network is temporary. During the operation phase no significant traffic impacts to the road network is expected.

Even if all solar facilities are constructed simultaneously, the road authority will consider all applications for abnormal loads and liaise and cooperate with the respective project proponents to ensure that abnormal loads on the public roads are staggered and staged to ensure that the level of impact will be acceptable.

The cumulative traffic impacts associated with Naledi PV will be of a medium significance.

Nature: *Cumulative traffic impact*
Cumulative traffic impacts are expected to occur during the construction and decommissioning of Naledi PV and other solar facilities within the surrounding area. The cumulative impacts include traffic generation and the associated noise and dust pollution.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low (2)	Moderate (3)
Duration	Very short-term (1)	Short-Term (2)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly probable (4)	Definite (5)
Significance	**Medium (36)**	**Medium (55)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- Stagger component delivery to site;
- Undertake dust suppression;
- Reduce the construction period;
- Make use of mobile batching plants and queries in close proximity to the site; and

» Staff and general trips must occur outside of peak traffic periods.

9.11 Conclusion regarding Cumulative Impacts

The assessment of the cumulative impacts was undertaken through the consideration of the Naledi PV impacts in isolation and compared to the cumulative impacts of Naledi PV and other solar facilities (including PV and CSP) within a 30km radius from the development area. Cumulative impacts are expected to occur with the development of Naledi PV throughout all phases of the project life cycle and within all

areas of study considered as part of this BA Report. The main aim for the assessment of cumulative impacts considering Naledi PV is to determine whether the cumulative impact will be acceptable within the landscape proposed for the development, and whether the cumulative loss, from an environmental and social perspective, will be acceptable without whole-scale change.

The significance of the cumulative impacts associated with the development of Naledi PV are predominately low to medium, depending on the impacts being considered.

A summary of the cumulative impacts is included in **Table 9.3** below.

Table 9.3: Summary of the cumulative impact significance for Naledi PV within the development area

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	Low or medium (depending on the impact being considered)
Avifauna	Low	Medium
Aquatic resources	Low	Medium
Soil and agricultural potential	Low or medium (depending on the impact being considered)	Medium
Heritage (archaeology and palaeontology)	Low	Low
Visual	Low or medium (depending on the impact being considered)	Low or medium (depending on the impact being considered)
Social	Medium (positive impacts) Low (negative impacts)	Medium (positive impacts) Low (negative impacts)
Traffic	Medium	Medium

The following can be summarised and concluded regarding the cumulative impacts of Naledi PV:

» **Ecological processes:** Provided that landscape connectivity can be maintained through the implementation of adequate buffers around the major drainage features, then the contribution of Naledi PV to cumulative impacts on habitat loss and fragmentation in the area would be acceptable. Cumulative impacts associated with the development are, therefore, considered to be at an acceptable level.
» **Avifauna:** The transformation and loss of this habitat associated with Naledi PV is not considered to be highly significant in terms of avifaunal habitat loss. In terms of potential losses to landscape connectivity, the development area is not considered to lie within an area that is considered a likely

avifaunal movement corridor, or along an important ecological gradient. Cumulative impacts associated with the development are therefore considered to be at an acceptable level.

- **Aquatic Resources:** An increase in run-off velocities; an alteration of hydrological regimes due to erosion; and downstream erosion and sedimentation of the downstream and farming operations are the cumulative impacts anticipated for the development of Naledi PV which are acceptable and have a low significance for the proposed project. In addition, there will be an opportunity for project proponents within the surrounding area to improve the affected aquatic resources and the drainage or hydrological conditions. This is considered to be a net benefit.
- **Soils, land types and Agricultural Potential:** Cumulative impacts associated with the development of Naledi PV are related to an increased risk in soil erosion as a result of vegetation clearance and the pollution of soil resources. Furthermore, the impacts are also related to an increase in the loss of agricultural land used for livestock farming in addition to other areas where solar PV projects will be constructed. The significance of the cumulative impacts for Naledi PV and other projects in the area is medium. In addition, no impacts of a high significance were identified, therefore, the cumulative impacts associated with the development of the solar PV facility are considered acceptable.
- **Heritage (including archaeology and palaeontology):** The heritage cumulative impacts relate mainly to a negative impact on the cultural landscape due to a change in the landscape character from natural wilderness to semi-industrial. However, due to the remoteness of the area the impact on the experience of the cultural landscape is not considered to be significant. No cumulative impacts of a high significance were identified, therefore cumulative impacts associated with the proposed development are considered acceptable.
- **Visual:** There will be no unacceptable impact on the visual quality of the landscape associated with the development of Naledi PV and other solar facilities within the surrounding area. Cumulative visual impacts relate to change in the character of the landscape as seen from the N14, the R359 and the Lutzputs Road (gravel road), cumulative impact on local homesteads, settlements, glare and lighting of the facilities. The significance of the visual cumulative impacts will be medium to low, depending on the impact being considered. No impacts of a high significance have been identified. Cumulative impacts associated with the development are therefore considered acceptable.
- **Social:** Potential cumulative impacts identified for the project include positive impacts on the economy, business development, and employment, as well as negative impacts such as an influx of jobseekers and change in the areas sense of place. The significance of the impacts will be medium for positive impacts and low for negative impacts. Cumulative impacts associated with the development are therefore considered acceptable.
- **Traffic:** There will be no unacceptable impact on traffic associated with the development of Naledi PV and other solar facilities within the surrounding area. Cumulative traffic impacts relate mainly to the generation of traffic congestion and delays and the associated noise and dust, which will be temporary in nature. The significance of the impacts will be medium significance.

The role of the cumulative impact assessment is to test if the impacts anticipated for the proposed development are relevant to the Naledi PV development within the proposed development area. Therefore, the following can be concluded from a cumulative impact assessment for Naledi PV:

- *Unacceptable loss of habitat or landscape connectivity through clearing, resulting in an impact on the conservation status of such flora, fauna or ecological functioning*: Cumulative ecological impacts within the surrounding area are of potential concern due to the proliferation of solar energy developments within the Upington area and particularly along the N14. However, there are no features contributing significantly to maintaining ecological connectivity within the development area

of Naledi PV; therefore, the contribution of Naledi PV to cumulative impacts on habitat loss and fragmentation in the area would be acceptable. In terms of habitat loss, the affected vegetation and habitat types are widespread in the area and have not experienced significant levels of transformation; therefore, the loss of approximately 230ha of currently intact habitat, likely to result from the development is not considered to be highly significant. As a result, the cumulative impacts associated with the development of Naledi PV are acceptable from an ecological perspective.

- *Unacceptable risk to avifauna through loss of avifaunal habitats, and impacts to nesting areas:* The proliferation of renewable solar energy facilities along the N14 in the Upington remains a concern; however, with regards to habitat loss, the affected Kalahari Karroid Shrubland vegetation type is still 90% intact, while it has an extensive range within the bioregion. Therefore, the transformation and loss of 230ha of this habitat is not considered highly significant for avifaunal habitat loss. In addition, the development area is not considered to be located within an area that is an avifaunal movement corridor or along an important ecological gradient, and as such, the overall cumulative impact of the development is considered to be low.

- *Unacceptable risk to aquatic resources through disturbance associated with construction activities and increased runoff and erosion during the operation phase:* The development of Naledi PV will not result in an unacceptable risk to aquatic resources; therefore, the proposed development is considered acceptable from an aquatic perspective.

- *Unacceptable loss of agricultural potential areas presenting a risk to current land use activities and increased soil erosion*: The proposed development of Naledi PV is considered a viable land use option for an area that has been characterised by low rainfall in an erratic pattern that significantly limits the food production potential of the area. In addition, the proposed development falls within the Upington REDZ, an area considered highly suitable for the development of large-scale solar renewable energy facilities and is therefore considered acceptable within the proposed development area as it has limited impacts.

- *Unacceptable loss of heritage resources (including palaeontological and archaeological resources):* The development of Naledi PV will not result in the unacceptable loss of heritage resources, as there are no heritage resources of a high significance within the layout of the solar PV, therefore, the proposed development is considered acceptable from a heritage perspective.

- *Complete or whole-scale change in the sense of place and character of an area and unacceptable visual intrusion:* The development of Naledi PV is proposed within an area considered to be a node of existing solar renewable energy facilities, i.e. Khi Solar One, Dyasons Klip 1 & 2 and Sirius Solar PV Project One; therefore, the development of Naledi PV will not result in the whole-scale change in the sense of place and character as there are existing solar facilities within the area. As such, the proposed development will not result in an unacceptable visual intrusion within the proposed landscape, therefore, development is considered acceptable from a visual perspective.

- *Unacceptable impact to social factors and components*: The development of Naledi PV will not result in unacceptable social impacts within the area where the project is proposed, therefore the social impacts are considered acceptable.

» *Unacceptable risk due to traffic related impacts:* The impacts of the project on traffic, within an area that is considered to be rural will be nominal, therefore the impacts are considered to be acceptable from a traffic perspective.

Based on the specialist cumulative assessments and findings, the development of Naledi PV and its contribution to the overall impact of all solar facilities (including both PV and CSP) to be developed within a 30km radius, it can be concluded that the Naledi PV cumulative impacts will be of a low to medium significance. Therefore, there are no impacts or risks identified to be considered as unacceptable with the development of Naledi PV and other solar facilities within the surrounding area. In addition, no impacts which will result in whole-scale change are expected with the proposed development.

CHAPTER 10: CONCLUSIONS AND RECOMMENDATIONS

Naledi PV (Pty) Ltd, a Special Purpose Vehicle (SPV) proposes the development of Naledi PV, a photovoltaic (PV) solar energy facility, as well as, associated infrastructure on a site located 20km south-west of the town of Upington in the Northern Cape Province. A study area has been identified for the development of Naledi PV which consists of Portion 3 of the Farm McTaggarts Camp 453 and Portion 12 a portion of Portion 3 of the Farm Klip Punt 452. The study area falls within the Kai !Garib Local Municipality and the greater ZF Mgcawu District Municipality. The study area also borders the Dawid Kruiper Local Municipality to the east.

A development area of 330ha has been identified within the study area by the proponent for the development of Naledi PV and associated infrastructure, which has been fully considered within this BA process and assessed in terms of its suitability from an environmental and social perspective within this BA Report.

The development area is regarded as being of a sufficient extent to provide opportunity for the avoidance of major environmental sensitivities. Naledi PV will have a contracted capacity of up to 100MW and will include specific infrastructure, namely:

- Fixed-tilt or tracking solar PV panels with a maximum height of 3.5m;
- Centralised inverter stations or string inverters;
- A permanent laydown area;
- Cabling between the panels, to be laid underground where practical;
- A 22kV or 33kV/132kV on-site facility substation of up to 1ha in extent to facilitate the connection between the solar PV facility and the electricity grid;
- An access road to the development area with a maximum width of 6m;
- Internal access roads within the PV panel array area with a maximum width of 5m; and
- Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses, a workshop and visitors centre.

Naledi PV (Pty) Ltd has confirmed that the development area is suitable for the development of a solar energy facility from a technical perspective due to the available solar resource, access to the electricity grid, current land use, land availability, site-specific characteristics such as topography and accessibility, the location within the Upington REDZ, as well as the proximity of the area to authorised and constructed solar energy facilities, i.e. the operational Khi Solar One facility, Sirius Solar PV Project One and the Dyasons Klip 1 and Dyasons Klip 2 PV projects.

A summary of the recommendations and conclusions for the proposed development as determined through the BA process is provided in this Chapter.

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

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

Requirement	Relevant Section
3(k) where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report	A summary of the findings of the specialist studies undertaken for Naledi PV has been included in section 10.2.
3(l) an environmental impact statement which contains (i) a summary of the key findings of the environmental impact assessment, (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.	An environmental impact statement containing the key findings of the environmental impacts of Naledi PV has been included as section 10.6. Sensitive environmental features located within the Naledi PV study area and development area, overlain with the proposed development footprint have been identified and are shown in **Figure 10.1, 10.2, 10.3** and **10.4.** A summary of the positive and negative impacts associated with Naledi PV has been included in section 10.4.
h (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity.	A concluding statement indicating the preferred alternatives and the preferred location of the activity is included in section 10.5.
3(n) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation.	All conditions required to be included in the Environmental Authorisation of Naledi PV have been included in section 10.6.
3(p) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.	A reasoned opinion as to whether Naledi PV should be authorised has been included in section 10.6.

10.2. Evaluation of Naledi PV

The preceding chapters of this Final BA Report together with the specialist studies contained within **Appendices D-K** provide a detailed assessment of the potential impacts that may result from the development of Naledi PV. This chapter concludes the environmental assessment of the solar PV facility by providing a summary of the results and conclusions of the assessment of the development footprint proposed for Naledi PV. In doing so, it draws on the information gathered as part of the BA process, the knowledge gained by the environmental specialists and the Environmental Assessment Practitioner (EAP) and presents a combined and informed opinion of the environmental impacts associated with the development.

No environmental fatal flaws were identified in the detailed specialist studies conducted, and no impacts of unacceptable significance are expected to occur with the implementation of the recommended mitigation measures. These measures include, amongst others, the avoidance of sensitive features and the undertaking of monitoring, as specified by the specialists. Some mitigation measures have already been considered and implemented through the micro-siting of the solar PV facility development footprint, such as the avoidance of the major drainage features located within the development area of Naledi PV.

The potential environmental impacts associated with Naledi PV identified and assessed through the BA process include:

- Impacts on ecology, flora and fauna.
- Impacts on avifauna.
- Impacts on aquatic resources.
- Impacts to soils, land types and agricultural potential.
- Impacts on heritage resources, including archaeology and palaeontology.
- Visual impacts on the landscape as a result of the facility.
- Positive and negative social impacts.
- Traffic impacts.

10.2.1 Impacts on Ecology

The Ecological Impact Assessment (**Appendix D**) assessed the impact of Naledi PV on the sensitive ecological features present within the development area for the life-cycle of the development. The assessment identified impacts associated with the construction, operation and decommissioning phases of the project.

During the pre-construction and construction phase (and the decommissioning phase), the impacts include impacts on vegetation and listed or protected plant species and direct faunal impacts. The duration of the impacts ranges from long-term to short-term, with the magnitude of the impacts ranging from medium to low. The significance of the construction phase impacts is medium and low, depending on the impact being considered, and with the implementation of the mitigation measures recommended by the specialist. No impacts of high significance were identified from an ecological perspective.

During the operation phase, the anticipated impacts include habitat degradation due to erosion and alien plant invasion and faunal impacts due to the operation of the facility and maintenance activities. The duration of the impacts will be long-term, with the magnitude of the impacts ranging from low to minor. The significance of these impacts for the operation phase will be low, with the implementation of the recommended mitigation measures. No impacts of a medium or high significance were identified.

From the findings of the Ecological Impact Assessment it can be concluded that no impacts of high ecological significance or fatal flaws were identified which would hinder the development of Naledi PV. The development area is considered suitable for the establishment of Naledi PV and all impacts associated with the development can be mitigated to an acceptable level of significance of either low or medium, depending on the impact under consideration. Therefore, the proposed development is considered to be appropriate and the ecological impact acceptable from an ecological perspective and will not result in detrimental impacts to ecosystems and habitat features within the development area and within the adjacent properties. As a result, the specialist has indicated that the development may be authorised, constructed and operated subject to the implementation of the recommended mitigation measures.

Considering the development footprint assessed for Naledi PV, the specialist has indicated that the project can be supported from a terrestrial ecology point of view.

10.2.2 Impacts on Avifauna

The Avifauna Impact Assessment (**Appendix E** of the Final BA Report) is based on the findings of two field surveys undertaken in spring (4 – 8 October 2018) and late summer (9 -12 April 2019). The avifauna impacts identified to be associated with the pre-construction and construction phase (including decommissioning) will be negative with a short-term duration and will have a magnitude ranging from moderate to low. For the operation phase, the impact will also be negative, with a long-term duration for the life of the facility and a magnitude of moderate to low.

During the pre-construction and construction phase (and decommissioning phase) of Naledi PV, direct avifauna impacts include habitat loss and disturbance related to vegetation clearance and the displacement of shy avifauna species as a result of noise and an increased human presence associated with construction-related activities. The significance of the construction phase impact will be medium, with the implementation of mitigation measures. No impacts of a high significance for the construction phase are expected to occur.

Impacts on avifauna during the operation phase of Naledi PV include collisions with PV panels, entrapment along perimeter fencing, disturbance due to traffic and night lighting. The significance of the impacts will be low, with the implementation of mitigation measures. However, impacts with medium significance post mitigation are expected to occur during the construction phase.

From the results of the Avifauna Impact Assessment, it can be concluded that the development area for Naledi PV is considered to represent a broadly suitable environment for the location of a solar PV facility. Taking into consideration that the development area supports a typical bioregional avifaunal assemblage, and that there are no known communal breeding or roosting sites of red-listed species, there are no impacts associated with the development that are regarded to be of a high residual significance and which cannot be mitigated to a low significance. Therefore, the development of Naledi PV is considered to be acceptable and supported from an avifaunal perspective.

From the results of the Avifauna Impact Assessment, it is concluded that no fatal flaws will be associated with the development of Naledi PV. The specialist has indicated that the project can be authorised subject to the implementation of the recommended mitigation measures.

10.2.3 Impacts on Aquatic Resources

The Aquatic Resources Impact Assessment (**Appendix F** of the Final BA Report) assessed the impact of Naledi PV on aquatic resources and/or features present within the study area and development area for the life-cycle of the project.

During the construction and operation phases, impacts will include a loss of the larger pans and the major riparian systems associated with the mainstem rivers Helbrandleegte and Helbrandkloofspruit through physical disturbance; impacts on secondary alluvial watercourses with fragmented riparian systems; an impact on riparian systems through a possible increase in surface water run-off on riparian form and function; increase in sedimentation and erosion within the development footprint; and an impact on localised surface

water quality. The impacts will be negative with mainly a long-term duration and moderate to low magnitude.

From the findings of the Aquatic Resources Impact Assessment, it is concluded that the proposed layout for Naledi PV would have no direct impact on the larger drainage features within the surrounding area (e.g. Helbrandleegte and Helbrandkloofspruit rivers) and the aquatic environment for the most part, as the layout avoids the significant high sensitivity watercourses. Some impacts such as road crossings and the PV panels are located in the smaller drainage areas (medium sensitivity), which are fragmented and contain no riparian zones; therefore, with suitable mitigation (proper stormwater management and post construction rehabilitation), the impacts would be of a low significance. This is also based on the fact that some of the aquatic features to be affected by the proposed development contain no aquatic habitat and only function as a means to sustain or convey baseflows within the catchment. The development of Naledi PV would not have an impact on this aspect, as surface run-off will emanate from the development footprint (when significant rainfall occurs); therefore, the hydrological system observed within the area will be maintained. Furthermore, the significance of the remaining impacts assessed for aquatic systems after mitigation would be low. This includes the internal roads and the sections of the PV panel area that will infringe on some of these systems. The infringement is considered to be acceptable from an aquatic perspective, particularly for the one small depression that could not be avoided by the layout, as it is rather small and showed little wetland functionality (i.e. important aquatic habitat or associated species). Therefore, the loss is considered to be acceptable on the basis that all other similar features within the study area but located outside the development area of Naledi PV would remain intact and attempts will be made to protect these systems from further degradation.

The construction and operation of Naledi PV and the associated infrastructure is supported from an aquatic resources perspective and is considered acceptable subject to the developer obtaining the necessary water use authorisation from the Department of Water and Sanitation.

10.2.4 Impacts on Soil and Agricultural Potential

The Agricultural Compliance Statement for the proposed Naledi PV (**Appendix G** of the Final BA Report) has identified and assessed impacts associated with the development of Naledi PV. These impacts are expected during the construction and operation phases and include, soil erosion, chemical pollution and an impact on the current land capability of the development area. These impacts will be negative with a permanent to medium-term duration depending on the impact being considered and will have a magnitude of moderate to low. The significance of the impacts is medium and low, depending on the impact being considered and following the implementation of the recommended mitigation measures. No impacts of a high significance have been identified.

No fatal flaws have been identified from a soils and agricultural perspective; therefore, all impacts can be mitigated to be within an acceptable level of impact during life cycle of the project. Therefore, the development of Naledi PV is considered to be acceptable from a soils and agricultural perspective.

The specialist has indicated that the development of Naledi PV can be authorised and that the development footprint proposed and assessed as part of this BA Report is acceptable from a soils and agricultural potential perspective. This is subject to the implementation of the recommended mitigation measures as provided by the specialist.

10.2.5 Impacts on Heritage (including archaeology and palaeontology)

The Heritage Impact Assessment (**Appendix H** of the Final BA Report) assessed the impact of Naledi PV on archaeological and palaeontological resources within the study area and development area for the life cycle of the project. It is expected that impacts to heritage resources will occur during the construction phase due to the on-ground disturbance required by the construction activities.

No significant heritage resources or formal and informal graves were identified within the development area for Naledi PV. Two (2) Stone Age archaeological resources were identified within development area, with other additional archaeological resources located outside the development area for Naledi PV. These resources are not considered to be conservation worthy as they are widely scattered and have no contextual material. The lithic and historic material identified is of a low significance and considering that the resources may be destroyed during the construction phase of the solar PV facility, the impact is inconsequential, and no further mitigation would be required. The significance of the impact on archaeological resources is therefore low, with a long-term duration and a low magnitude. Therefore, the development of Naledi PV will not have a significant negative impact on the heritage resources identified within the development area.

Taking into consideration the nature of the development, construction-related activities may have an impact on the fossil heritage if preserved within the development area, however, for Naledi PV, the geological structures of the area suggests the rocks are either of an igneous origin and too old to contain any fossil heritage. Therefore, based on the experience of the specialist and the lack of any previously recorded fossils from the study area, it is unlikely that any fossil heritage will be preserved and therefore the impact is considered to be of a low significance. However, there is a small opportunity for fossils to occur within the adjacent shales of the early Permian Vryheid Formation; therefore, a Fossils Finds Chance Protocol (**Appendix L** of the EMPr) has been included in the EMPr.

Based on the nature of the heritage resources identified and the lack of any fossils recorded or expected in the area, the significance of the impacts will be low, without the implementation of the recommended mitigation measures. As such, the development of Naledi PV is not associated with any fatal flaws from a heritage, archaeological and palaeontological perspective, and it is for this reason that the project is considered to be acceptable.

10.2.6 Visual Impacts

The Visual Impact Assessment (**Appendix I** of the Final BA Report) identified negative and neutral impacts on visual receptors during the construction and the operation phases of Naledi PV. The impacts includes a change in the character and sense of place of the landscape setting; a change in the character of the landscape as seen from the N14, the R359 and the Lutzputs Road; a change in the landscape as seen from local homesteads and settlement areas in the area and impacts from glare and lighting, particularly during the operation phase of the facility at night for night-time observers.

The duration of the impacts is expected to be long-term for majority of the visual impacts and with a magnitude ranging from low to small. The significance of the impacts will be medium and low with the implementation of mitigation, depending on the impact being considered. No impacts of a high

significance are expected to occur and it can be concluded that the development of Naledi PV will be viewed in the context of the operational Khi Solar One, Dyasons Klip 1 & 2 PV sites, and Sirius Solar PV Project One located within the vicinity of the development area of Naledi PV. The development of Naledi PV is therefore considered to be acceptable from a visual perspective.

10.2.7 Social Impacts

The Social Impact Assessment (**Appendix J** of the Final BA Report) identified that most social impacts associated with the development of Naledi PV will have a short-term duration associated with the construction phase and long-term duration during the operation phase of the project. The magnitude of the impacts ranges from high to small depending on the impact being considered and the status thereof. Both positive and negative impacts have been identified for both the construction and operation phases of the development.

During the construction phase, negative impacts include, nuisance impacts (including noise and dust); an influx of construction workers and job seekers to the area and a change in population; safety and security impacts; impacts on daily living and movement patterns; and visual and a sense of place impacts. The significance of the negative construction phase impacts will be low with the implementation of the recommended mitigation measures. The positive social impacts associated with the construction phase of Naledi PV include, an economic multiplier effect, and direct and indirect employment and skills development opportunities. The significance of the positive impacts will be medium with the implementation of the recommended enhancement measures by the specialist.

Impacts associated with the operation of Naledi PV will be both positive and negative. The negative impacts are related to the change in the sense of place and the loss of agricultural land and overall productivity as a result of the operation of the solar PV facility. The significance of the negative impacts will be low with the implementation of the recommended mitigation measures. The positive impacts associated with the operation of the facility relate to the development of non-polluting renewable energy infrastructure, a contribution to Local Economic Development (LED) and social upliftment, and the creation of employment and skill development opportunities for the local economy and the country. The significance of the positive impacts will be low and medium with the implementation of the recommended enhancement measures.

Naledi PV is unlikely to result in permanent damaging social impacts. From a social perspective it is concluded that the project is acceptable subject to the implementation of the recommended mitigation and enhancement measures and management actions identified for the project. Considering the findings of the report and potential for mitigation it is the reasoned opinion of the specialist that Naledi PV can be authorised from a social perspective.

10.2.8 Impacts on Traffic

Traffic impacts are expected with the development of Naledi PV which were identified and assessed as part of a Traffic Impact Assessment (**Appendix K** of the Final BA Report).

During the construction phase, traffic, noise and dust will be generated through the transportation of project components and employees to the development area. The duration of the impacts will be of a very short-term and will have a moderate to low magnitude. The significance of the construction phase

impacts on traffic will be low, with the implementation of the mitigation measures recommended by the specialist.

The traffic generated during the operation phase of Naledi PV will be minimal and of no significance to the existing road network. Therefore, the impacts of traffic for this phase are not considered further.

No fatal flaws and impacts of a high significance are expected, and therefore the development of Naledi PV is considered to be acceptable from a traffic perspective.

10.2.9 Assessment of Cumulative Impacts

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

The Naledi PV facility is located within the Upington REDZ, or REDZ 7. The REDZ areas are zones identified by the DEA as a geographical area of strategic importance for the development of large-scale solar photovoltaic and wind energy development activities. Therefore, the REDZ areas are considered as nodes for the development of renewable energy developments. At present one CSP facility and three (3) PV solar energy facilities are operational and located within the vicinity of the development area for Naledi PV. These include Khi Solar One, Dyasons Klip 1 PV, Dyasons Klip 2 PV and Sirius Solar PV Project One.

Considering all aspects, cumulative impacts associated with Naledi PV 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 Naledi PV**

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	Low or medium (depending on the impact being considered)
Avifauna	Low	Medium
Aquatic resources	Low	Medium
Soil and agricultural potential	Low or medium (depending on the impact being considered)	Medium
Heritage (archaeology and palaeontology)	Low	Low
Visual	Low or medium (depending on the impact being considered)	Low or medium (depending on the impact being considered)
Social	Medium (positive impacts) Low (negative impacts)	Medium (positive impacts) Low (negative impacts)

Traffic	Medium	Medium

Based on the specialist cumulative assessments and findings regarding the development of Naledi PV and its contribution to the overall impact of all existing and proposed solar facilities (including PV and CSP) within

a 30km radius, it can be concluded that there are no impacts or risks identified to be considered as unacceptable with the development of Naledi PV and other solar facilities within the surrounding area. In addition, no impacts that will result in whole-scale change are expected as a result of the Naledi PV facility.

10.3. Environmental Sensitivity Mapping

As part of the specialist investigations undertaken within the development area of Naledi PV, specific environmental features were identified which will be impacted by the placement of the development footprint (i.e. project infrastructure) associated with the facility. The current condition of the features identified (i.e. intact or disturbed) informed the sensitivity of the environmental features and the capacity for disturbance and change associated with the proposed development.

The environmental features identified within and directly adjacent to the development area and development footprint are illustrated in **Figure 10.1** and **Figure 10.2**. The features identified specifically relate to ecological and avifauna habitats, aquatic resources and heritage resources. The following points provide a description of the features present within the development area, as well as the surrounding area:

- Two (2) heritage resources (located to the north and south of the layout, one within the PV panel area and another within a drainage feature) were identified within the development area for Naledi PV. Additional heritage resources were identified; however, these are located outside the development area.
- The eastern boundary of the study area is located within Korhaan habitat associated with the present gravel plains located within this area. This habitat has been at times noted to be used by red-listed avifaunal species, such as the Karoo Korhaan and Kori Bustard. The development area and footprint of Naledi PV is located outside this habitat.
- Drainage features bisect the central, northern, western and south-eastern sections of the development area and their riparian habitat is dominated by *Vachellia erioloba, Vachellia haematoxylon, Boscia foetida* and *Euclea pseudebenus*.
- One pan, measuring less than a 1ha is located within the southern section of the development area of Naledi PV and will be affected by the proposed development. Other pans, larger in size and identified within the study area are located to the north, north-west, south-west and west outside of the development area (refer to **Figure 10.1**).
- Minor washes (refer to **Figure 10.1** and **10.2**) are located within the north-eastern, north-western, south-western, southern and eastern sections of the development area. Some of these washes are located within the PV panel area and are associated with the larger drainage features traversing the development area. The washes located to the east and south of the development area of Naledi PV are located outside the footprint of the facility and will not be impacted on by the proposed development.

» The majority of the development area and development footprint is characterised by a plains habitat which is of low sensitivity and located throughout the entire extent of the development area.

Considering the features identified within the development area, the specialists have provided an indication of the sensitivity of the environmental features for the development of Naledi PV. The features and the sensitivities thereof have been considered by the proponent for the placement of the development footprint within the development area of Naledi PV. The points below describe the sensitivity of the features as

identified and mapped in **Figure 10.1** and **Figure 10.2**. **Figure 10.3** and **Figure 10.4** provide sensitivity maps of the study area and development area overlain with the development footprint.

» A very high sensitivity rating from an ecological, aquatic and avifauna perspective, which is considered to be no-go for the Naledi PV development footprint, has been allocated to the drainage feature bisecting the PV panel area in the southern section of the development area. Major developments, such as the placement of PV panels in this very high sensitivity feature is not considered be acceptable. The development footprint avoids this feature in order to ensure that no detrimental environmental impact occurs. This area is considered unsuitable for development and while it would be necessary for roads to occasionally traverse the feature (which is considered acceptable), there should not be any PV panels in this area.

» The washes or poorly developed drainage features are considered to be to be of a high to medium sensitivity depending on their extent and degree of vegetation extent from an ecological, avifauna and aquatic perspective. Some level of development within these areas is considered acceptable. The development footprint in the high sensitivity areas has been significantly reduced through careful placement of the infrastructure, and as a result, the assessed footprint and associated impact in the high sensitivity areas is considered acceptable. From an avifauna perspective, the development of Naledi PV would potentially result in much of these habitats and their functioning being lost, and therefore, where possible, buffer zones (50 to 100m width) must be implemented around the largest and most significant of these habitats. From an aquatic perspective, the proposed development footprint would seem to have no direct impact on the Helbrandkloofspruit and Helbrandleegte rivers (located outside of the development footprint) and the aquatic environment for the most part, as the Naledi PV layout has avoided the significant high sensitivity watercourses.

» The development area does not infringe into the Karoo Korhaan habitat (i.e. gravel plains) located along the eastern boundary of the study area. The habitat is considered to be of a medium high sensitivity and has been identified as a possible corridor for the Karoo Korhaan species based on their consistent presence. The area extends further east and north of the study area and is therefore associated with a wider distribution in the surrounding area and would not be directly affected by the development of Naledi PV.

» The plains habitat associated with a medium sensitivity from an aquatic perspective also supports the near-threatened Karoo Korhaan, Kori Bustard and the endangered Ludwig's Bustard in favourable years. Other features identified from an ecological and aquatic perspective, where a medium sensitivity has been applied include the minor drainage features, located within the PV panel area, in the southern section and will be lost to the development. Other minor drainage features associated with the medium sensitivity are located to the east outside the development area.

» A low sensitivity rating has been applied to the two (2) heritage resources identified within the development area of Naledi PV, and the others scattered throughout the study area. The low sensitivity rating is based on the small sample sizes and lack of archaeological context which offers little scientific value. These resources are not considered to be conservation worthy.

10.4. Environmental Costs of the solar PV Facility versus Benefits of the solar PV Facility

Environmental costs (including those to the natural environment, economic and social environment) can be anticipated at a local and site-specific level and are considered acceptable provided the mitigation measures, as outlined in the BA 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 solar PV facility* - The cost of loss of biodiversity is considered to be limited due to the placement of infrastructure within vegetation and features considered to be of a low sensitivity.
» *Loss of avifauna habitat* – The cost of the loss of habitat is not considered to be significant as the majority of the avifauna of the surrounding environment appears fairly similar to that found across the Kalahari and the Nama-Karoo bioregions in the Northern Cape Province. There is an absence of communal or solitary roosting and nesting sites for red-listed species within the study area. A number of species do occur in the area primarily for foraging and large tracks of suitable habitat remain within the surrounding environment.
» *Visual impacts associated with the solar PV Facility* - The development of Naledi PV may have a visual impact within an 11.3km radius of the solar PV facility, which will be of a medium or 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* environmental cost is anticipated to be very limited due the fact that the development footprint does not impact on any areas of high agricultural potential.
» *An increase in traffic* - The development of Naledi PV will create an increase in traffic during the construction (and decommissioning) phase of the project. However, the impact is anticipated to be of a low significance on the Naledi due to the surrounding area is rural. As a result, it has been recommended that the main access road alternative 2 be used in order to limit the number of access roads to proposed projects coming off the N14 in the area. Therefore, the proposed development will share a main access road with other proposed projects proposed within the study area (i.e. McTaggarts PV1, PV2, PV3 and Klip Punt PV1).

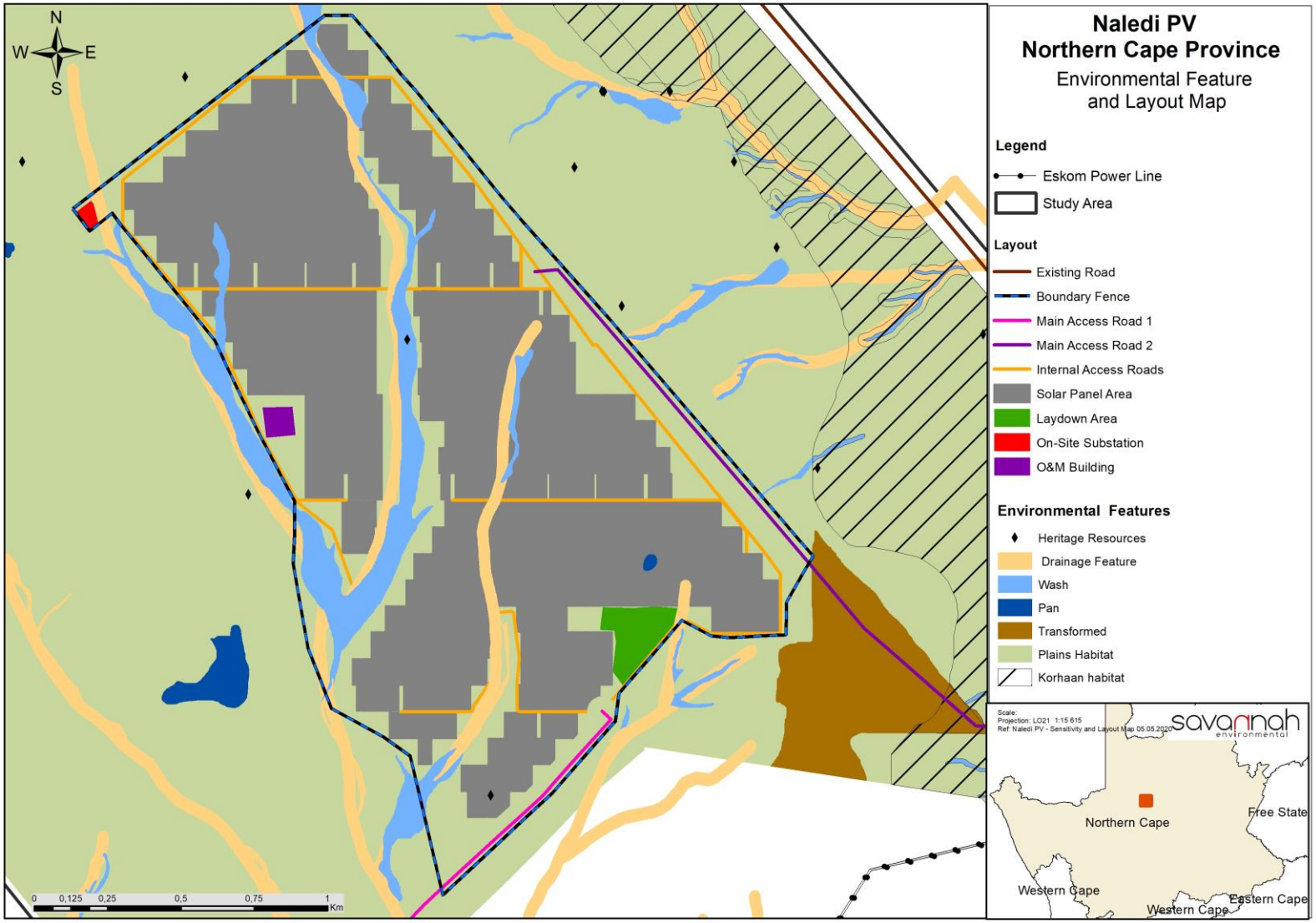

Figure 10.1: Environmental features identified within the development area (including footprint) of Naledi PV (**A3 map is included in Appendix O**).

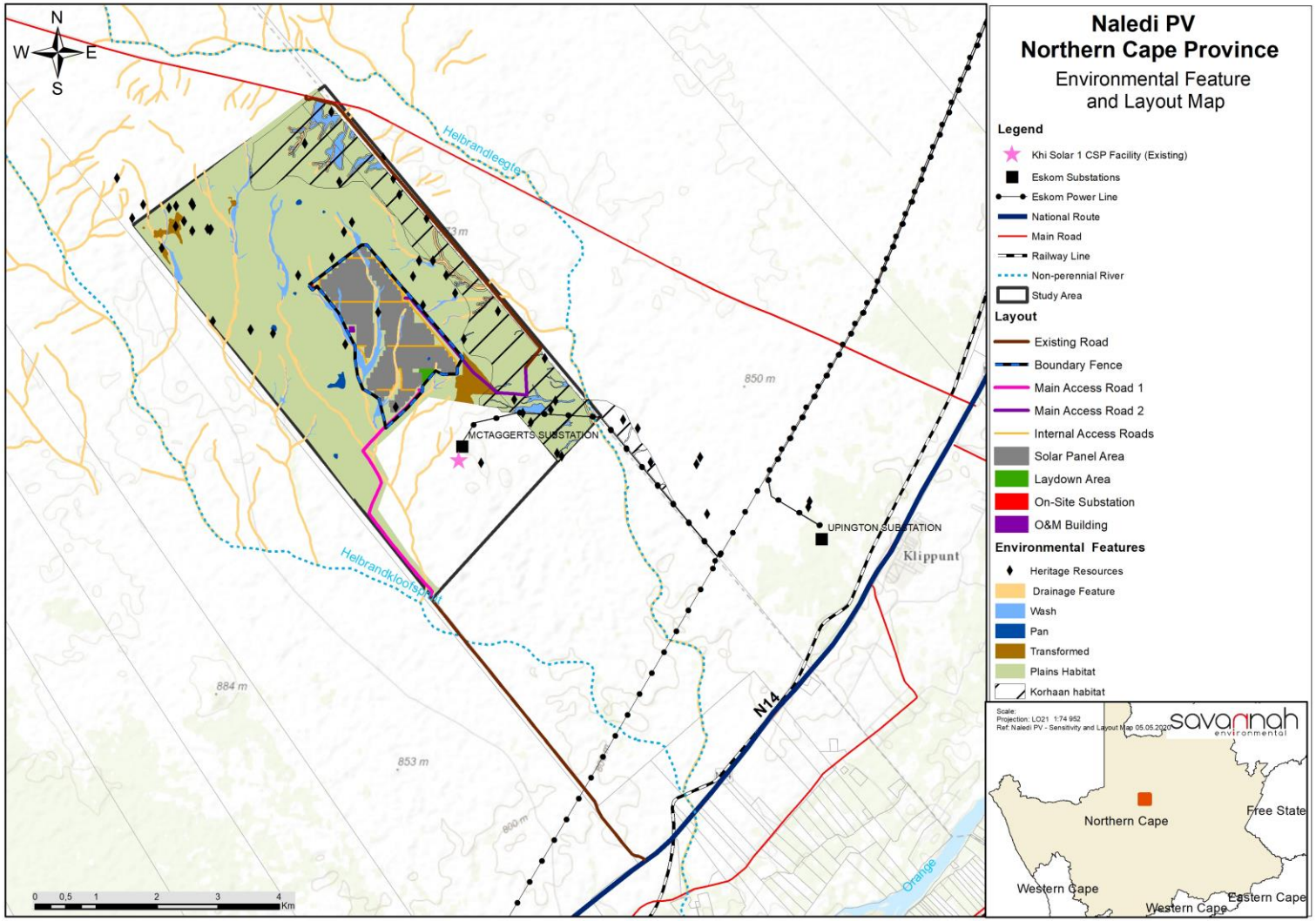

Figure 10.2: Environmental features map of the study area and development area of Naledi PV (**A3 map is included in Appendix O**).

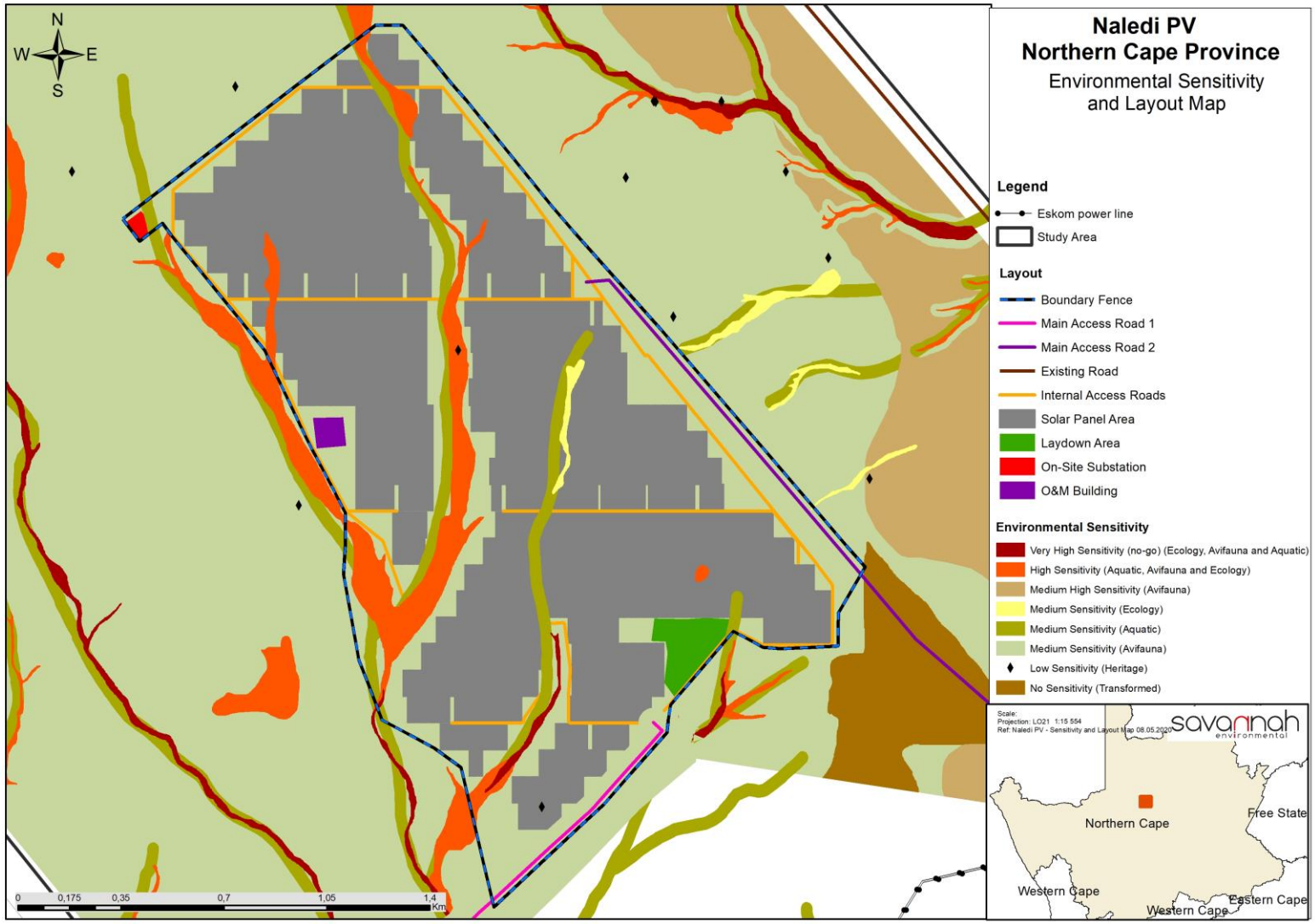

Figure 10.3: Environmental sensitivity and layout map of Naledi PV development footprint (**A3 map is included in Appendix O**).

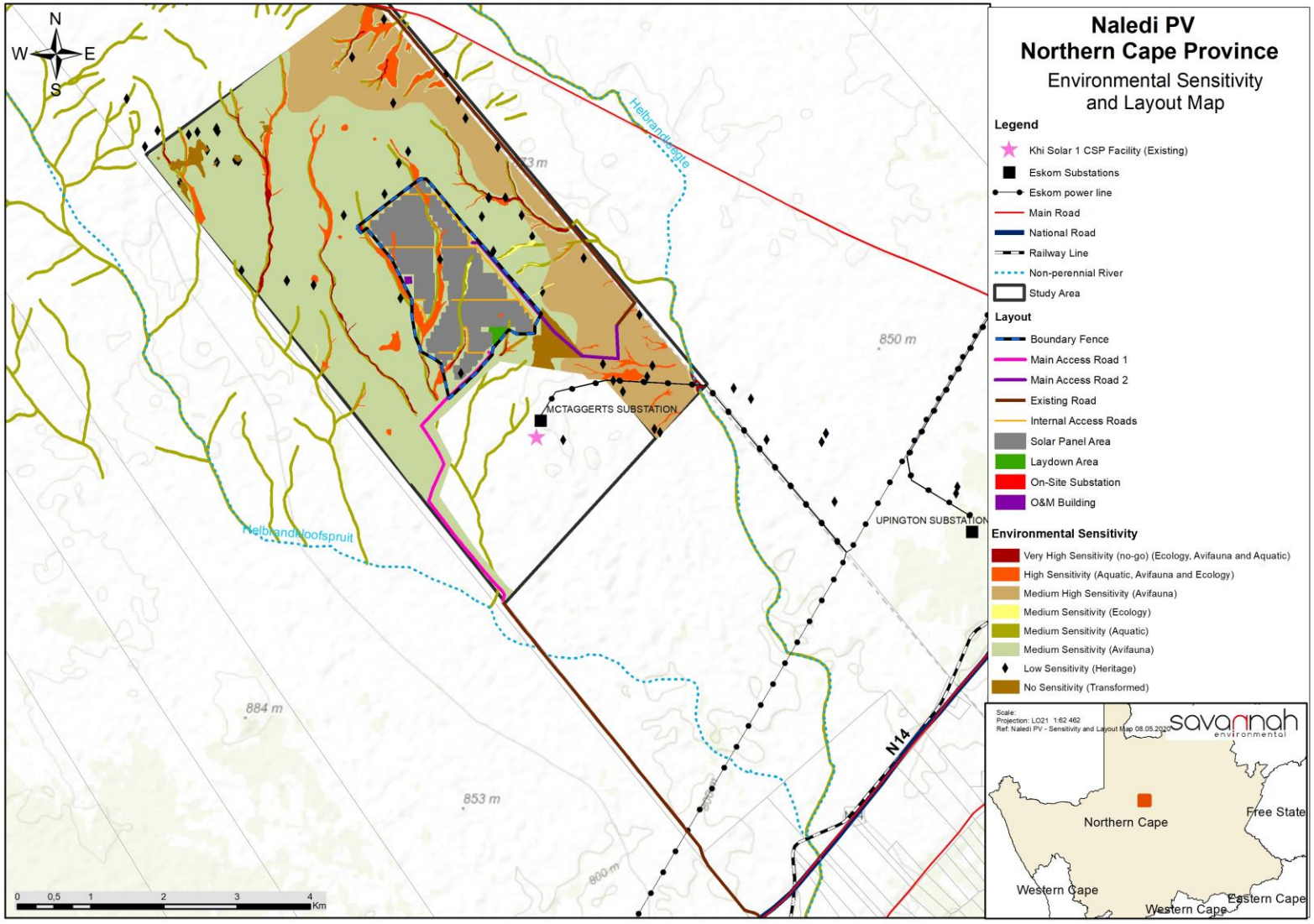

Figure 10.4: Environmental sensitivity and layout map of Naledi PV study area and development area (**A3 map is included in Appendix O**).

Benefits of Naledi PV include the following:

- The project will result in important economic benefits at the local and regional scale through job creation, income and other associated downstream economic development. These will persist during the 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.
- Contribution to the development and growth of the Upington REDZ and the associated benefits in terms of the concentration of solar facilities within a node.
- The water requirement for a solar PV facility is negligible compared to the levels of water used by coal-based technologies and Concentrated Solar Power (CSP). 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. Naledi PV will contribute to achieving goals for implementation of renewable energy and sustaining a 'green' economy within South Africa.

The benefits of Naledi PV 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 in the development area within areas considered to be acceptable for the proposed development, the benefits of the project are expected to outweigh the environmental costs of the solar PV facility.

10.5. Overall Conclusion (Impact Statement)

The construction and operation of a solar PV facility with a contracted capacity of up to 100MW on a study area located near Upington in the Kai !Garib Local Municipality, of the greater ZF Mgcawu District Municipality has been proposed by Naledi PV (Pty) Ltd. A technically viable development area and development footprint was proposed by the proponent and assessed as part of the BA process. The assessment of the development footprint within the development area was undertaken by independent specialists and their findings have informed the results of this BA Report.

The specialist findings have indicated that there are no identified environmental fatal flaws associated with the implementation of Naledi PV within the development area. The facility layout assessed through this BA process is considered as the most appropriate development footprint for Naledi PV and considered to be acceptable within all fields of specialist studies undertaken for the project. The acceptability of the development is based on the avoidance of environmental features considered to be of a very high sensitivity (i.e. no-go areas) and not appropriate for development and disturbance. 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.

Two (2) main access roads have been proposed by the proponent to provide access to the development area of the project. Alternative 1 comes off the N14 and consists of the tarred main access road providing

access to the operational Khi Solar One facility and will be 6m wide and 4.3km long. Alternative 2 (6m wide and 9.5km long) comes off the junction between the N14 and the Lutzputs Road and routes to the development area of Naledi PV. The table below provides a summary of the conclusion of the alternative main access roads assessed by the specialists:

Specialist Study	Alternative 1	Alternative 2
Ecology	Acceptable	Acceptable & Preferred
Avifauna	Acceptable & Preferred	Acceptable
Aquatic	Acceptable & Preferred	Acceptable
Soils, Agricultural Potential & Land Type	Acceptable & Preferred	Acceptable
Heritage (including archaeology & palaeontology)	Acceptable & Preferred	Acceptable
Visual	Acceptable & Preferred	Acceptable
Social	Acceptable & Preferred	Acceptable
Traffic	Acceptable	Acceptable & Preferred

Alternative 1, based on the findings of the specialist studies undertaken and the recommended mitigation measures has been selected as the preferred main access road for the development of Naledi PV. A preferred layout showing the preferred layout of Naledi PV and including the details of the project is included as **Figure 10.5** and **10.6**. Through the assessment of the development of Naledi PV within the study area and development area, it can be concluded that the development of the solar PV facility is environmentally acceptable (subject to the implementation of the recommended mitigation measures).

10.6. Overall Recommendation

Considering the findings of the independent specialist studies, the impacts identified, the development footprint proposed by the proponent, the avoidance of the sensitive environmental features within the development area and development footprint, as well as, the potential to further minimise the impacts to acceptable levels through mitigation, it is the reasoned opinion of the Environmental Assessment Practitioner (EAP) that the development of Naledi PV is acceptable within the landscape and can reasonably be authorised (**Figure 10.5** and **Figure 10.6**). The development of Naledi PV within the Upington REDZ is also supported by the Strategic Environmental Assessment (SEA) undertaken by the CSIR on behalf of DEFF for the determination of the REDZ focus areas.

The following infrastructure would be included within an authorisation issued for the project:

- Fixed-tilt or tracking solar PV panels with a maximum height of 3.5m;
- Centralised inverter stations or string inverters;
- A permanent laydown area;
- Cabling between the panels, to be laid underground where practical;
- A 22kV or 33kV/132kV on-site facility substation of up to 1ha in extent to facilitate the connection between the solar PV facility and the electricity grid;
- Alternative 1 access road to the development area with a maximum width of 6m;
- Internal access roads within the PV panel array area with a maximum width of 5m; and

» Operation and Maintenance buildings including a gate and security building, control centre, offices, warehouses, a workshop and visitors centre.

The following key conditions would be required to be included within the authorisation issued for Naledi PV:

» Alternative 1 access road should be authorised for Naledi PV.
» All mitigation measures detailed within this BA Report, as well as the specialist reports contained within **Appendices D to K**, are to be implemented.
» The EMPr as contained within **Appendix M** of this Final BA Report should form part of the contract with the Contractors appointed to construct and maintain the solar PV facility in order to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of Naledi PV is considered key in achieving the appropriate environmental management standards as detailed for this project.
» Following the final design of Naledi PV, a final layout must be submitted to DEA for review and approval prior to commencing with construction.
» 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. Permits from the relevant national and provincial authorities, i.e. the Northern Cape Department of Agriculture, Environmental Affairs, Rural Development & Land Reform and the Department of Environment, Forestry and Fisheries (DEFF), must be obtained before the individuals are disturbed.
» The necessary water use authorisation must be obtained from the Department of Human Settlements, Water and Sanitation (DWS) for impacts to a watercourse prior to construction.
» A comprehensive rehabilitation plan must be implemented from the project onset within watercourse areas to ensure a net benefit to the aquatic environment. This should from part of the suggested walk down as part of the Final EMPr preparation.
» The project footprint must remain within the assessed development area.
» A Chance Find Protocol (**Appendix L** of the EMPr) 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.
» The environmental authorisation required for Naledi PV is for a 10-year period as facility would need to be selected as Preferred Bidder by the Department of Mineral Resource and Energy (DMRE) in the REIPPP Programmes.

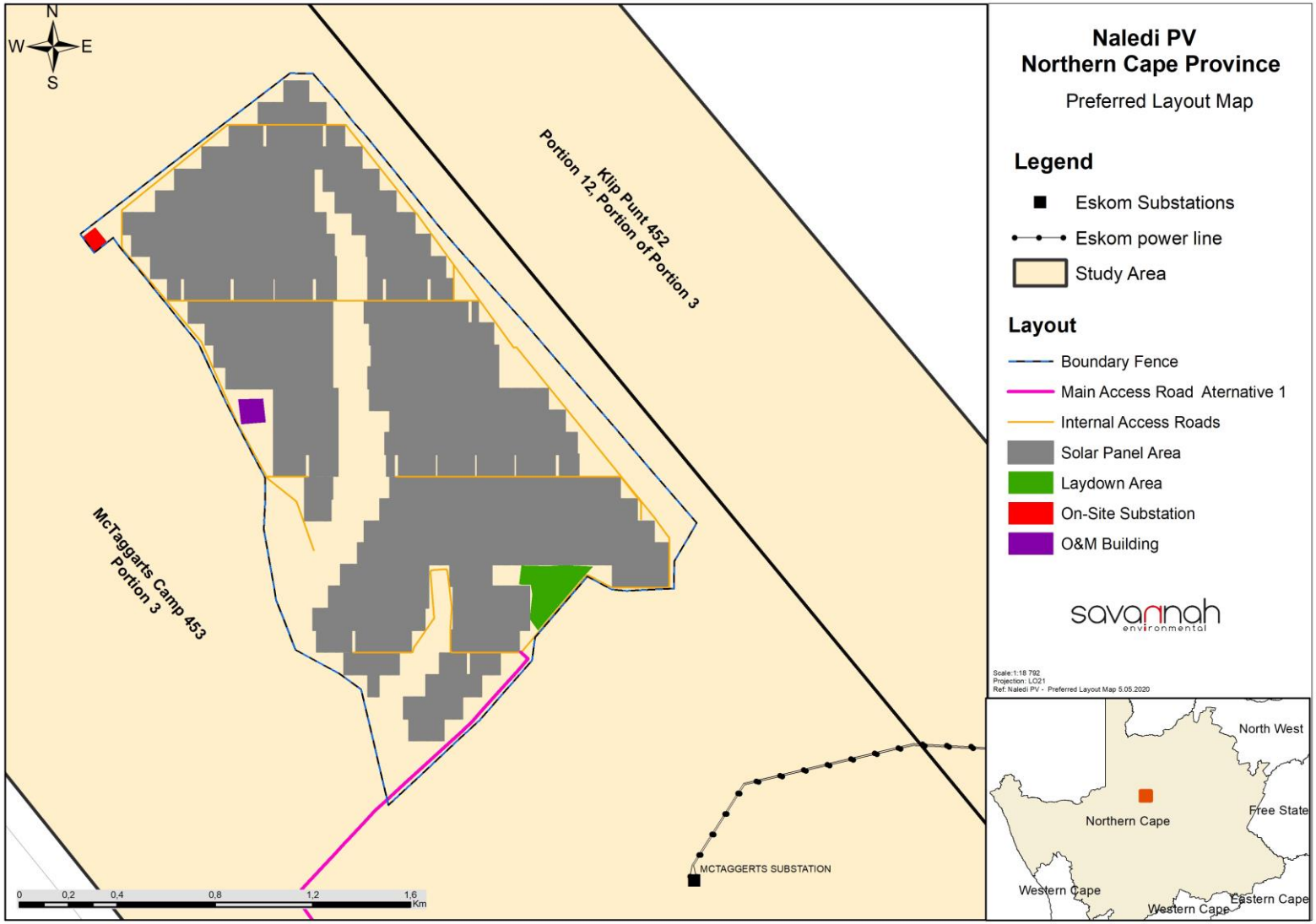

Figure 10.5: Final preferred layout map of the preferred development footprint for Naledi PV, as was assessed as part of the BA process (A3 map included in **Appendix O**)

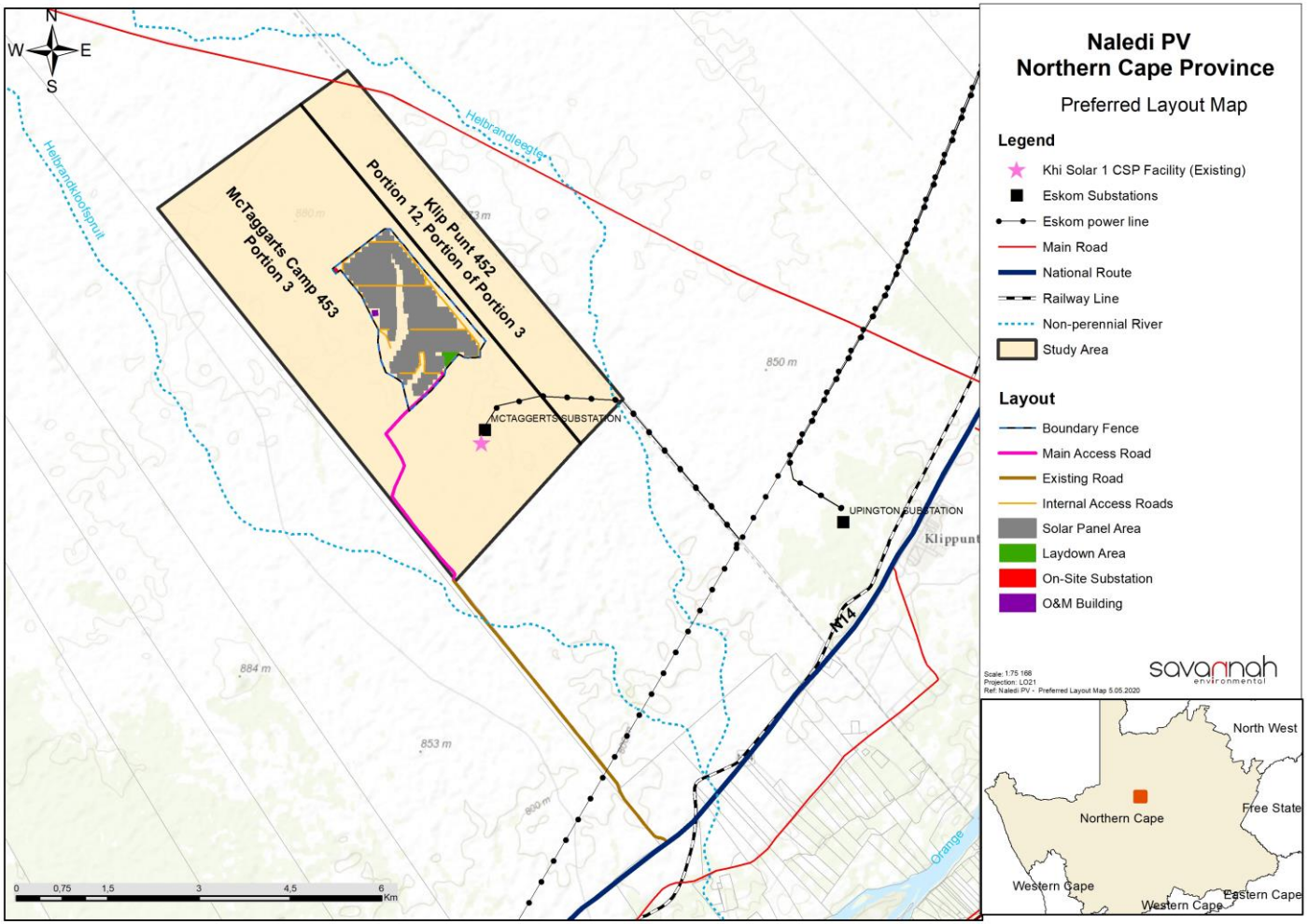

Figure 10.6: Final preferred layout map (as assessed as part of the BA process) of the preferred development footprint for Naledi PV, showing the extent of the preferred access road, Alternative 1 (A3 map included in **Appendix O**)

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