PAARDE VALLEY SOLAR POWER (PTY) LTD

Proposed Development of the Paarde Valley Solar Photovoltaic (PV) Energy Facility and Associated Infrastructure near Middelburg in the Eastern Cape Province

Draft Scoping Report (DSR)

DEA Reference Number: To be Allocated

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Document Title:	Proposed Development of the Paarde Valley Solar Photovoltaic (PV) Energy Facility and Associated Infrastructure near Middelburg in the Eastern Cape Province: Draft Scoping Report (DSR)
Author:	**Stephan Jacobs (EAP)** B.Sc. (Hons) Environmental Management & Analysis (UP) B.Sc. Environmental Sciences (UP)
Version Number:	**1.0**
Checked by:	**Andrea Gibb** B.Sc. (Hons) Environmental Management (UNISA) B.Sc. Landscape Architecture Cum Laude (UP)
Approved:	**Andrea Gibb**
Signature:	
For:	SiVEST Environmental Division

KEY PROJECT INFORMATION

FARM DESCRIPTION	21 DIGIT SURVEYOR GENERAL (SG) CODE
Portion 2 of the Farm Paarde Valley No. 62	C04800000000006200002
Portion 7 of the Farm Leeuw Hoek No. 61*	C04800000000006100007

**Property not included as part of the application site which was assessed during scoping phase but was identified for inclusion following identification of sensitive areas. Due to prohibitive size of the PV development area, after the areas identified as no-go from an environmental perspective were excluded, it was decided that this property would also need to be incorporated into the application site. Property will be assessed by specialists in EIA phase.*

PAARDE VALLEY SOLAR PV ENERGY FACILITY: APPLICATION SITE		
CORNER POINT COORDINATES (DD MM SS.sss)		
POINT	**SOUTH**	**EAST**
A	S31° 23' 12.200"	E24° 40' 18.000"
B	S31° 24' 2.055"	E24° 42' 17.317"
C	S31° 24' 34.180"	E24° 42' 38.180"
D	S31° 25' 5.082"	E24° 41' 56.504"
E	S31° 27' 23.493"	E24° 40' 4.881"
F	S31° 27' 19.619"	E24° 38' 45.155"
G	S31° 27' 7.376"	E24° 38' 9.002"
H	S31° 26' 57.354"	E24° 38' 0.988"
I	S31° 26' 51.530"	E24° 38' 15.162"
J	S31° 26' 12.784"	E24° 38' 47.405"
K	S31° 25' 55.818"	E24° 38' 54.674"
L	S31° 25' 52.186"	E24° 39' 2.364"
CENTRE POINT COORDINATES (DD MM SS.sss)		
POINT	**SOUTH**	**EAST**
P	S31° 25' 23.905"	E24° 40' 22.307"

It should be noted that Portion 7 of the Farm Leeuw Hoek No. 61 was not included as part of the original application site which was assessed during the scoping phase. This property was identified for inclusion into the application site following the identification of sensitive areas. Due to the prohibitive size of the PV development area, after the areas identified as no-go from an environmental perspective were excluded, it was proposed that this property also should be incorporated into the application site to ensure sufficient land is available for the proposed development. This property will be included in the application site and assessed in the EIA phase. Centre and corner point coordinates will therefore be provided in the DEAIr.

PAARDE VALLEY SOLAR PV ENERGY FACILITY: SUBSTATION COORDINATES		
SUBSTATION 5		
CORNER POINT COORDINATES (DD MM SS.sss)		
POINT	**SOUTH**	**EAST**
SUB5_01 (NW)	S31° 24' 22.908"	E24° 39' 45.852"
SUB5_02 (NE)	S31° 24' 25.779"	E24° 39' 53.464"
SUB5_03 (SE)	S31° 24' 31.179"	E24° 39' 50.310"
SUB5_04 (SW)	S31° 24' 28.602"	E24° 39' 43.144"
CENTRE POINT COORDINATES (DD MM SS.sss)		
POINT	**SOUTH**	**EAST**
SUB5_05 (C)	S31° 24' 27.081"	E24° 39' 48.197"
SUBSTATION 6		
CORNER POINT COORDINATES (DD MM SS.sss)		
POINT	**SOUTH**	**EAST**
SUB6_01 (N)	S31° 25' 40.813"	E24° 39' 48.757"
SUB6_02 (E)	S31° 25' 45.881"	E24° 39' 53.881"
SUB6_03 (S)	S31° 25' 49.628"	E24° 39' 48.283"
SUB6_04 (W)	S31° 25' 44.959"	E24° 39' 42.754"
CENTRE POINT COORDINATES (DD MM SS.sss)		
POINT	**SOUTH**	**EAST**
SUB6_05 (C)	S31° 25' 45.282"	E24° 39' 48.389"
SOUTHERN COLLECTOR		
CORNER POINT COORDINATES (DD MM SS.sss)		
POINT	**SOUTH**	**EAST**
SUBSC_01 (N)	S31° 25' 10.792"	E24° 40' 45.392"
SUBSC_02 (E)	S31° 25' 13.611"	E24° 40' 53.262"
SUBSC_03 (S)	S31° 25' 19.395"	E24° 40' 50.023"
SUBSC_04 (W)	S31° 25' 16.777"	E24° 40' 42.750"
CENTRE POINT COORDINATES (DD MM SS.sss)		
POINT	**SOUTH**	**EAST**
SUBSC_05 (C)	S31° 25' 15.106"	E24° 40' 47.877"

Refer to **Appendix 9A** for the full list of coordinates.

TITLE DEEDS: Title Deeds will be included in the Final Scoping Report (FSR).

PHOTOGRAPHS OF SITE:

Figure i: General characteristics of the study area

The entire study area is largely in a natural state but used for animal production. There is well-established farm infrastructure on each landholding, including homesteads, farm buildings, camps, dams, small areas of cultivated lands, and some stands of exotic trees used as shade and windscreens. There are also access roads, narrow gravel roads, jeep tracks and fences. The vegetation in the study area is used primarily for livestock grazing and is affected to some degree by this usage, but not to the extent that any severe degradation was noted on-site. Except for this infrastructure, the vegetation and habitats in the study area appear to be largely in a natural state. This natural pattern extends beyond the study area in all directions and gives the general area a sense of being relatively untransformed and largely natural. The topography within the application site is generally mildly undulating with a few localised ridges and koppies scattered across the site. There are several scattered outcrops/boulders across the site. The north-eastern section of the site is situated on a hilly/mountainous zone with steep slopes.

TYPE OF TECHNOLOGY: Solar Photovoltaic (PV).

STRUCTURE HEIGHT: Each PV panel will be approximately 2m wide and between 1m and 4m in height, depending on the mounting type. It should be noted that final design details are yet to be confirmed. These details will become available during the detailed design phase of the proposed development.

SURFACE AREA TO BE COVERED: The total area of the application site assessed in the scoping phase is approximately 2631 hectares (ha). The proposed solar PV energy facility is however expected to occupy a portion of the application site only. The number of panels, the generation capacity and the layout of the arrays will be dependent on the area available for the erection of PV panels. The proposed on-site and collector substations will each occupy an area of up to approximately 4ha. The two (2) proposed temporary construction laydown/staging areas will occupy an area of approximately 10ha each, while the Operation and maintenance (O&M) buildings will occupy a site of approximately 2 500m^2 (50m x 50m). It should be noted that the final design details are yet to be confirmed. These details will become available during the detailed design phase of the proposed development.

PV DESIGN: The proposed solar PV energy facility will comprise of PV panels which will be either fixed tilt mounting or single axis tracking mounting (**Figure ii**). In addition, the modules will be either crystalline silicon or thin film technology. The modules will be mounted in rows on support structures. Each panel will be approximately 2m wide and between 1m and 4m in height, depending on the mounting type. The on-site substations and collector substations will contain transformers for voltage step up from medium voltage to high voltage. DC power from the panels will be converted into AC power in the inverters and the voltage will be stepped up to medium voltage in the inverter transformers. Medium voltage cabling will link the PV plant to the grid connection infrastructure (on-site substations, collector substations and 132kV overhead power line) (**Figure iii**). These cables will be laid underground wherever technically feasible.

STRUCTURE ORIENTATION: At this stage it is anticipated that the structures will be North-facing. The final orientation will however be confirmed during the detailed design phase of the proposed development.

FOUNDATIONS: The foundations will most likely be either concrete or rammed piles. The final foundation design will be determined at the detailed design phase of the proposed development.

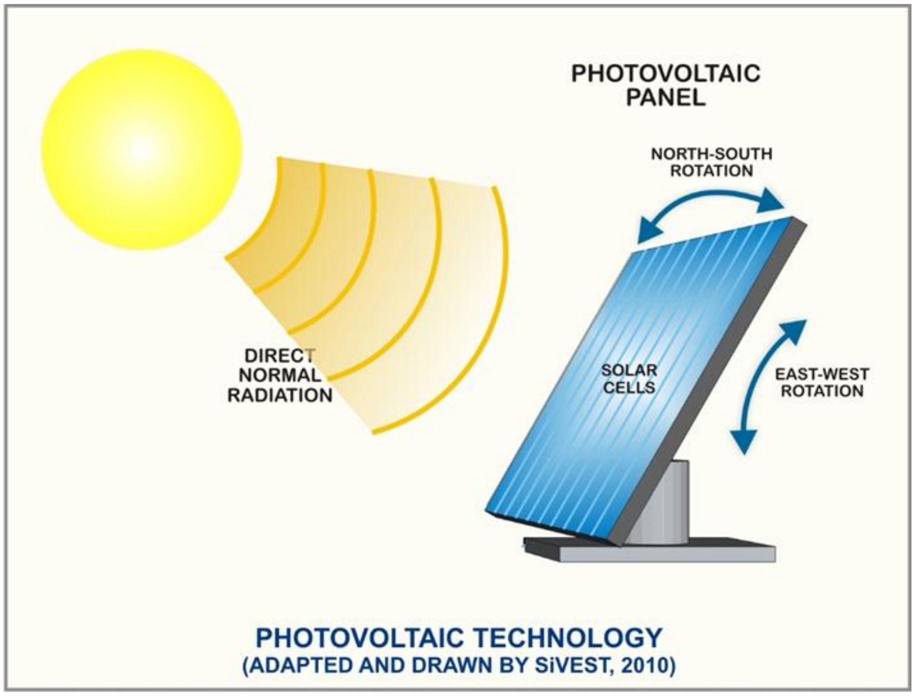

Figure ii: Typical components of a solar PV Panel

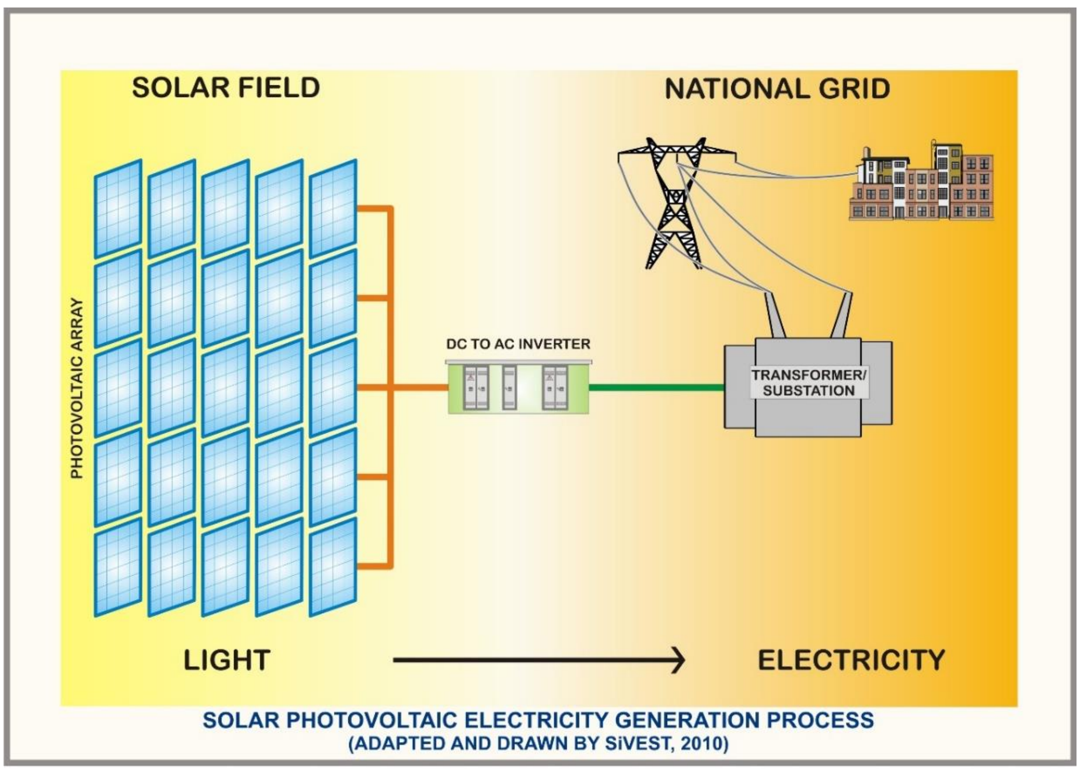

Figure iii: Conceptual PV electricity generation process showing electrical connections

LAYDOWN AREA DIMENSIONS: Two (2) temporary construction laydown/staging areas which will occupy an area of approximately 10ha each are being proposed.

GENERATION CAPACITY: The number of panels, the generation capacity and the layout of the arrays will be dependent on the area available for the erection of PV panels. The generation capacity will thus be provided in the FSR.

TECHNICAL DETAILS:

Component	**Description / Dimensions**
Generation capacity	Generation capacity will be dependent on the outcome of the specialist studies conducted during the EIA process
Capacity of the on-site and collector substation	33/132kV
Number of Panels	Number of panels will be dependent on outcome of specialist studies conducted during EIA process, as well as area available for erection of panels
Area occupied by each panel	Unknown at this stage. Number of panels will be dependent on outcome of specialist studies conducted during EIA process, as well as area available for erection of panels
Dimensions of panels	2m wide and between 1m and 4m in height, depending on mounting type
Max panel height from the ground	Between 1m and 4m
Area of the application site (as assessed in the scoping phase)	Approx. 2631ha
Footprint of on-site and collector substations	Up to approx. 4ha each
Footprint of O&M building(s)	Approx. 2 500m^2 (50m x 50m)
Area of temporary construction laydown/staging areas	Two (2), each occupying an area of approx. 10ha
Width of internal roads	Between 4m and 10m. Existing site roads will be used wherever possible
Length of internal roads	To be confirmed once EPC contractor has been selected and the design is finalised.
Site Access	Access to the facility will be via the existing gravel road (DR2433) which is located ±4km north of the proposed PV facility. Only one (1) access point has been identified and the final position of this access point will be dependent on the location of the PV fields in relation to the DR2433. The proposed development is not located adjacent to the DR2433 and hence will require 'right of way' agreements with the following properties: ▪ Remainder of the farm Wonder Heuvel No. 140

	▪ Remainder of the farm Colletts Kraal No. 131 ▪ Remainder of the farm Paarde Valley No. 62
Proximity to grid connection	**Although the substations form part of this application, the power line is not part of this EIA, and is being applied for as part of a separate on-going Basic Assessment (BA) process.** Grid connection is to the Hydra D Main Transmission Substation (MTS) or the proposed Coleskop Wind Energy Facility (WEF) substation (depending on which option is chosen), both of which will still be constructed. The proposed location for the Hydra D MTS is approx. 12km north-east of the application site, while the proposed location for the Coleskop WEF substation is approx. 8.2km east of the application site.
Height of fencing	Approx. 2m high
Type of fencing	Galvanised steel

The final design details of the proposed solar PV energy facility and associated infrastructure will become available during the detailed design phase of the proposed development, after the proposed development has been selected as a Preferred Bidder project under the Department of Energy's (DoE's) Renewable Energy Independent Power Producers Procurement Programme (REIPPPP).

A3 Maps of all maps included in the report are included in **Appendix 5**.

EXECUTIVE SUMMARY

Paarde Valley Solar Power (Pty) Ltd (hereafter referred to as Paarde Valley Solar Power) is proposing to construct the Paarde Valley Solar PV Energy Facility and associated infrastructure near Middelburg in the Eastern Cape Province of South Africa (hereafter referred to as the 'proposed development') (**DEA Reference Number:** To be Allocated). The generation capacity has not been determined yet and will be dependent on the area available for the erection of PV panels. The overall objective of the proposed development is to generate electricity by means of renewable energy technologies capturing solar energy to feed into the National Grid.

The above-mentioned proposed solar PV energy facility forms one (1) of three (3) solar PV energy facilities that are being proposed on adjacent farms as part of the greater Umsobomvu PV project (**Figure iv**). The proposed developments which form part of the greater Umsobomvu PV project include the following:

- Mooi Plaats Solar PV – **DEA Reference Number:** To be Allocated (part of a separate on-going EIA process); and
- Wonderheuvel Solar PV – **DEA Reference Number:** To be Allocated (part of a separate on-going EIA process).

In addition, a 132kV overhead power line and 33/132kV on-site and collector substations (namely the associated electrical infrastructure) are also being proposed to feed the electricity generated by the proposed Paarde Valley Solar PV Energy Facility into the national grid. The above-mentioned associated electrical infrastructure will however require a separate Environmental Authorisation (EA) and is subject to a separate Basic Assessment (BA) process (**DEA Reference Number:** To be Allocated). The associated electrical infrastructure has been included in the solar PV energy facility EIA for background information but will be authorised under a separate BA to allow for handover to Eskom. The on-site and collector substations will include an Eskom portion and an Independent Power Producer (IPP) portion, hence the substations have been included in the solar PV energy facility EIA and in the associated electrical infrastructure BA to allow for handover to Eskom. Although the solar PV energy facility and associated electrical infrastructure will be assessed separately, a single public participation process is being undertaken for all the proposed developments [i.e. three (3) solar PV energy facility EIAs and three (3) grid connection BAs]. The potential environmental impacts associated with all of the developments will be assessed as part of the cumulative impact assessment.

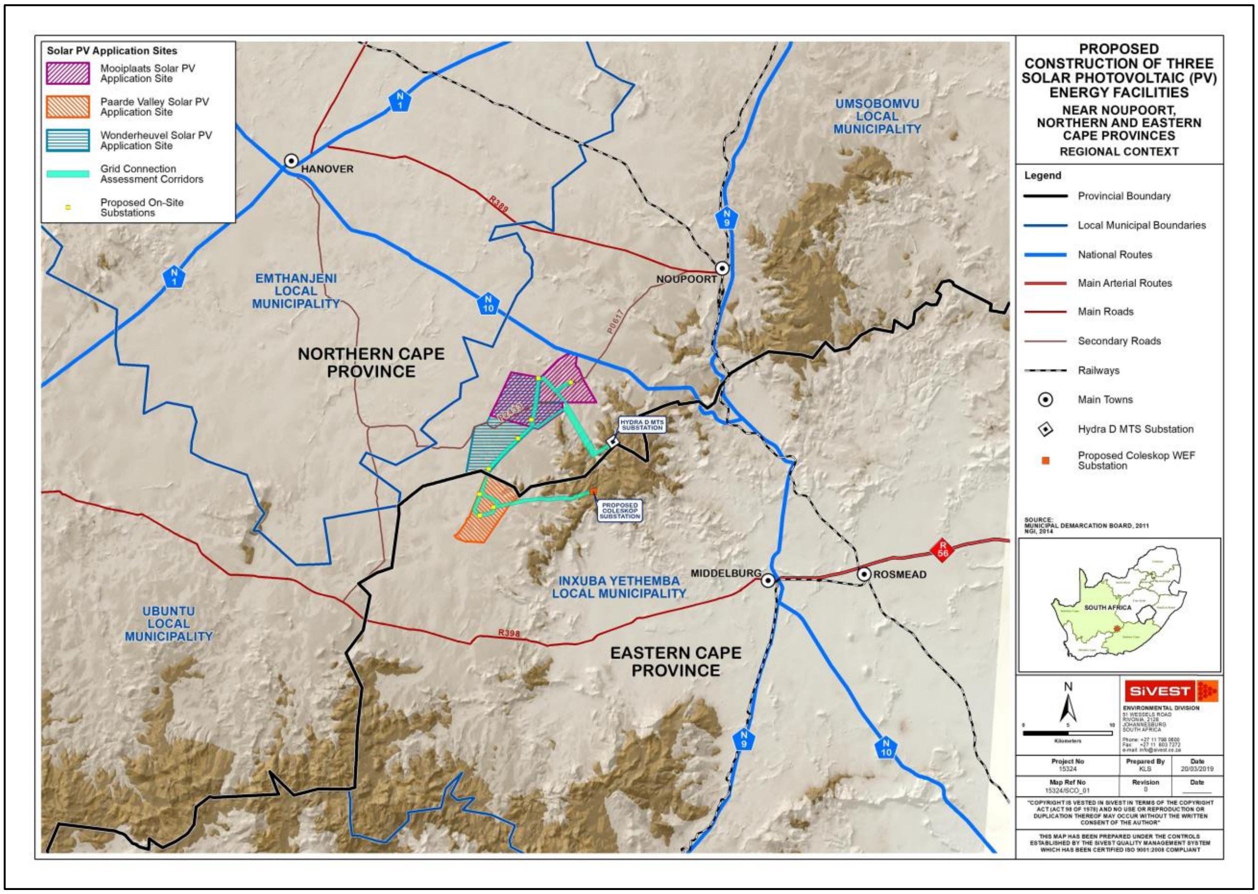

Figure iv: Regional context of greater Umsobomvu PV project

In terms of the EIA Regulations, which were published on 4 December 2014 and amended on 7 April 2017, various aspects of the proposed Paarde Valley Solar PV Energy Facility development are considered listed activities which may have an impact on the environment and therefore require authorisation from the National Department of Environmental Affairs (DEA) prior to the commencement of such activities. However, the provincial authority will also be consulted (i.e. Eastern Cape Department of Economic Development, Environmental Affairs and Tourism - EC DEDEAT).

SiVEST SA (Pty) Ltd Environmental Division has been appointed by Paarde Valley Solar Power as the independent Environmental Assessment Practitioner (EAP) to undertake the EIA process for the proposed construction and operation of the Paarde Valley Solar PV Energy Facility and associated infrastructure.

Due to the fact that the proposed development is not located within any of the Renewable Energy Development Zones (REDZs) formally gazetted[1] in South Africa for the purpose of development of solar and wind energy generation facilities, the Paarde Valley Solar PV Energy Facility will be subject to a full EIA process in terms of the National Environmental Management Act (Act No. 107 of 1998) (NEMA), as amended, and the EIA Regulations, 2014 (as amended).

[1] Formally gazetted on 16 February 2018 (government notice 114).

All relevant legislation and guidelines (including Equator Principles) will be consulted during the EIA process and will be complied with at all times.

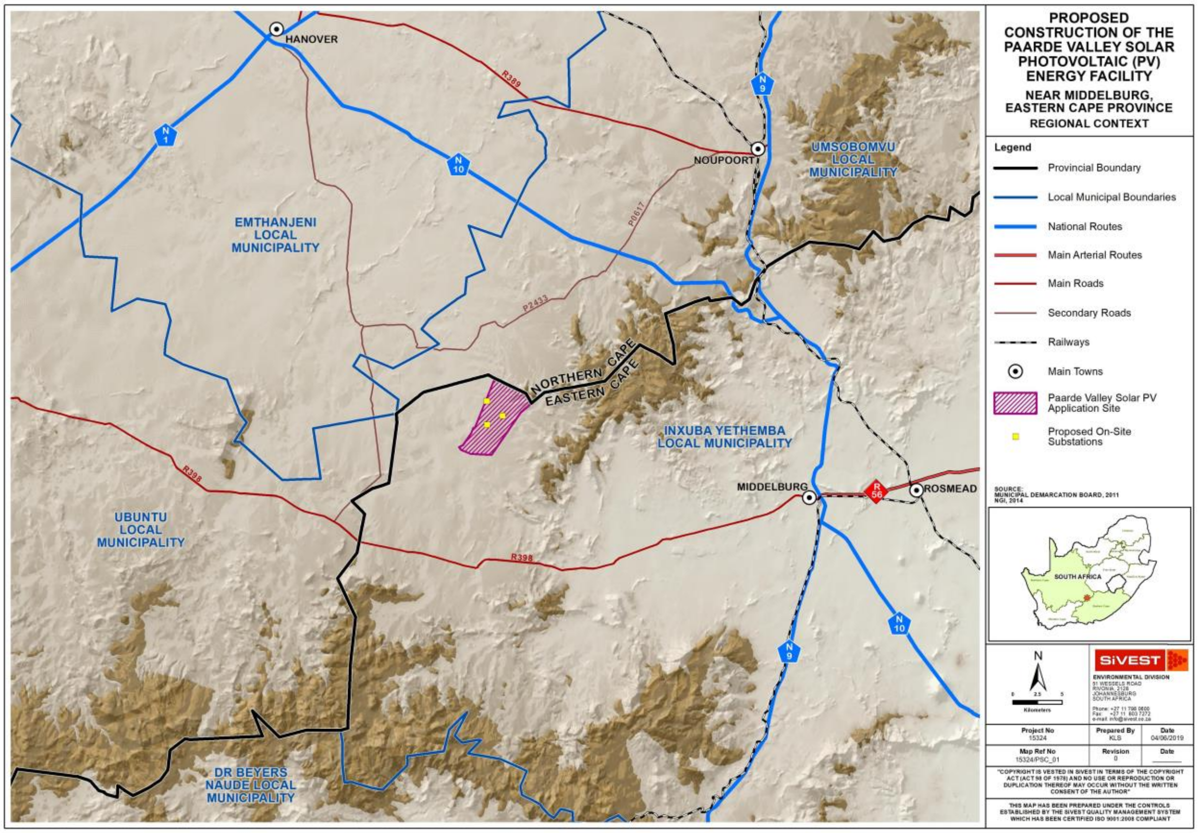

Figure v: Paarde Valley Solar PV Energy Facility in the regional context

PAARDE VALLEY SOLAR PV ENERGY FACILITY: APPLICATION SITE		
CENTRE POINT COORDINATES (DD MM SS.sss)		
POINT	**SOUTH**	**EAST**
P	S31° 25' 23.905"	E24° 40' 22.307"

Refer to **Appendix 9A** for the full project coordinates.

The proposed solar PV energy facility is located approximately 29km north-west of Middelburg, in the Eastern Cape Province. The application site assessed in the scoping phase incorporates one (1) farm portion (namely Portion 2 of the Farm Paarde Valley No. 62) within the Inxuba Yethemba Local Municipality, in the Chris Hani District Municipality, and is approximately 2 631ha in extent. It should be noted that following the identification of sensitive areas, Portion 7 of the Farm Leeuw Hoek No. 61 (property adjacent to application site assessed in scoping phase, to East) was identified for inclusion into the application site which was assessed during the scoping phase. Due to the prohibitive size of the PV development area, after the areas identified as no-go from an environmental perspective were excluded, it was proposed that this property also should be incorporated into the application site to ensure sufficient land is available for the proposed development. This property will be included in the application site and assessed in the EIA phase.

At this stage, it is anticipated that the proposed Solar PV energy facility will include PV fields (arrays) comprising of multiple PV panels. The number of panels, generation capacity and the layout of the arrays will however be dependent on the outcome of the specialist studies conducted during the EIA process, as well as the area available for the erection of PV panels. Hence, the total generation capacity of the Paarde Valley Solar PV Energy Facility is unknown at this stage. As mentioned, the electricity generated by the solar PV energy facility will be fed into the national grid via a 132kV overhead power line (part of a separate BA process). In addition, the proposed Paarde Valley Solar PV Energy Facility and associated infrastructure will include the following components:

- PV panels will be either fixed tilt mounting or single axis tracking mounting, and the modules will be either crystalline silicon or thin film technology. Each panel will be approximately 2m wide and between 1m and 4m in height, depending on the mounting type.
- Internal roads, between 4m and 10m wide, will provide access to the PV arrays. Existing site roads will be used wherever possible, although new site roads will be constructed where necessary.
- Up to two (2) temporary construction laydown/staging areas of approximately 10ha each.
- Operation and maintenance (O&M) buildings will be provided for each PV field, occupying a site of approximately 2 500m^2 (50m x 50m).
- Medium voltage cabling will link the PV facility to the grid connection infrastructure (132kV overhead power line, on-site substations and collector substations). These cables will be laid underground wherever technically feasible.
- New 33/132kV on-site substations and collector substations, each occupying an area of up to approximately 4ha. The proposed substations will be step-up substations and will include an Eskom portion and an IPP portion, hence the on-site and collector substations have been included in the solar PV energy facility EIA and in the grid infrastructure BA to allow for handover to Eskom.

The following assessments were conducted prior to and during the Scoping Phase to identify and assess the issues associated with the proposed development:

- Terrestrial Ecology Impact Assessment;
- Avifauna Impact Assessment (incl. pre-construction monitoring);
- Surface Water Impact Assessment;
- Desktop Agricultural and Soils Impact Assessment;
- Desktop Geotechnical Impact Assessment;
- Visual Impact Assessment;
- Desktop Heritage Impact Assessment; - detailed assessment (incl. ground-truthing) to follow in EIA phase
- Palaeontology Impact Assessment;
- Social Impact Assessment; and

- Transportation Impact Assessment.

These studies were also undertaken to inform the impact assessment to take place in the EIA phase of the proposed development. In the scoping phase, the specialists assessed the entire application site. During the EIA phase, once the layout of the solar PV energy facility has been determined, the above-mentioned specialist assessments will be updated/revised (if required) to focus on specific impacts of the proposed PV array / development area and solar PV energy facility infrastructure in detail. The updates/revisions will include the following:

- a review of the findings of the specialist assessment in accordance with detailed site layouts, including the PV development areas put forward as a result of the identified sensitive areas;
- a comparative assessment of the layout alternatives provided; and
- addressing any comments or concerns arising from the public participation process.

Based on the scoping phase specialist assessments which were conducted, a few potentially sensitive areas have been identified within the application site. These sensitive areas were subsequently used to inform the area for the potential erection of PV panels within the application site (referred to as the proposed PV development area)[2]. The proposed PV development area in relation to the identified environmental sensitive areas is presented in **Figure vi** below.

[2]PV panels will not necessarily be erected in the entire proposed PV development area, particularly where PV panels cannot be placed (e.g. under the existing 400kV transmission lines).

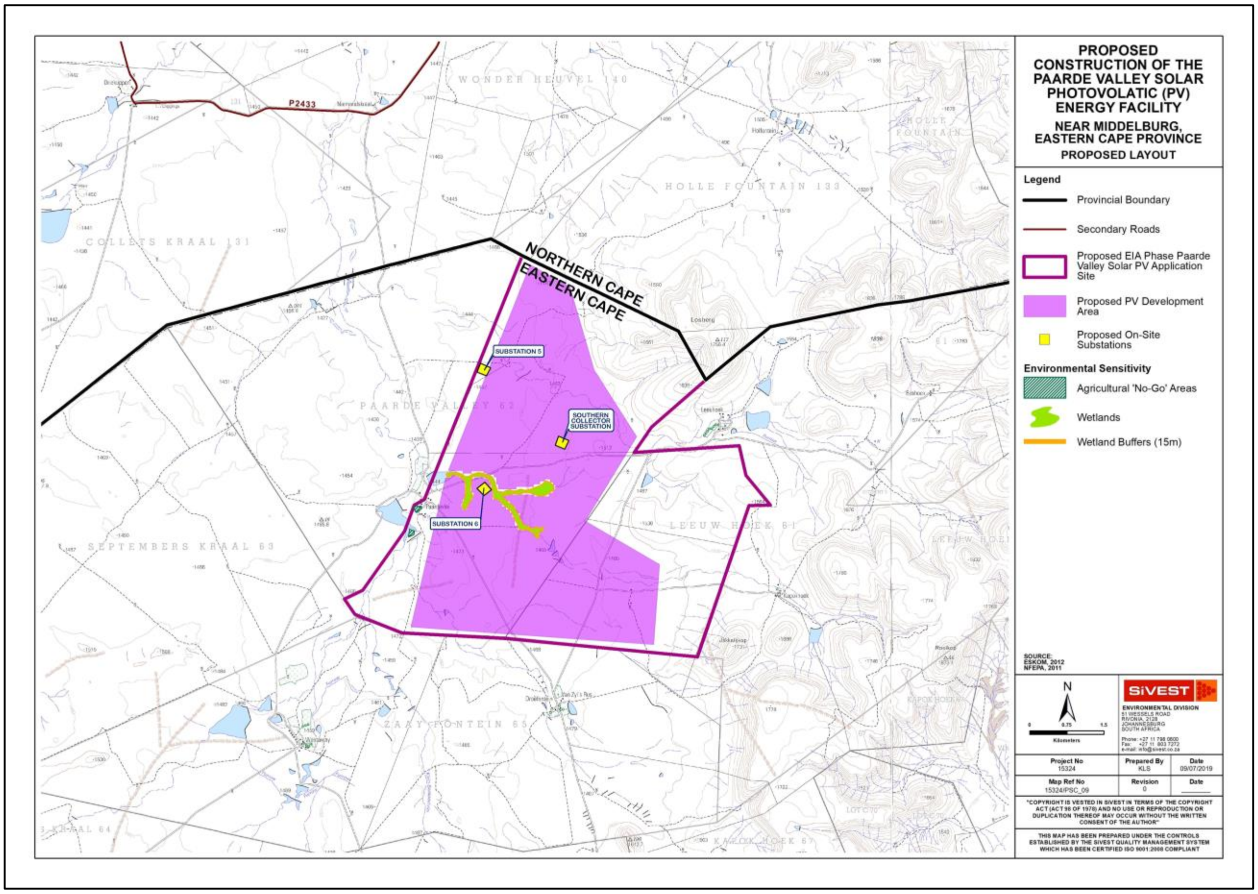

Figure vi: Proposed PV development area in relation to environmental sensitive areas

No layout alternatives for the laydown areas and O&M buildings have been identified or comparatively assessed at this stage. These will be informed by the identified environmental sensitive areas and will be presented and assessed in the EIA phase. Two (2) grid connection infrastructure alternatives (which include on-site and collector substation sites and 132kV power line corridors) have however been comparatively assessed by the respective specialists. These alternatives essentially provide for two (2) different route alignments with associated substations (on-site and collector) contained within an assessment corridor of approximately 400m wide. It should be noted that the substation sites included as part of this application are intrinsically linked to the associated electrical infrastructure project (part of a separate BA process which will be initiated at a later stage). Although the specialists assessed the grid connection infrastructure alternatives as part of their respective assessments, these will be comparatively assessed as part of the associated electrical infrastructure BA and will inform the location of the on-site and collector substation sites (to be presented in EIA phase).

All alternatives will be presented and extensively investigated and assessed in the EIA phase of the proposed development. The alternatives will include alternative locations for the laydown areas and O&M buildings[3]. All alternatives will be assessed against the no-go alternative (i.e. *status quo*).

It should be noted that prior to the submission of the DSR, a preliminary PV development area was considered by the applicant. However, in order to ensure that the proposed development avoids the sensitive areas identified by the specialists, the preliminary PV development area was subsequently amended (presented in **Figure vi** above). During the scoping phase the preliminary PV development area was comparatively assessed with the proposed PV development area, which was informed by the identified sensitive areas, in order to assess and confirm that it would be ‘preferred’ from an environmental perspective. The results of the comparative assessment of the PV areas is provided in **Chapter 7**. A map showing the preliminary PV development area in relation to the identified environmental sensitive areas is provided in **Figure vii** below. As mentioned, all alternatives will be extensively investigated and assessed in the EIA phase of the proposed development.

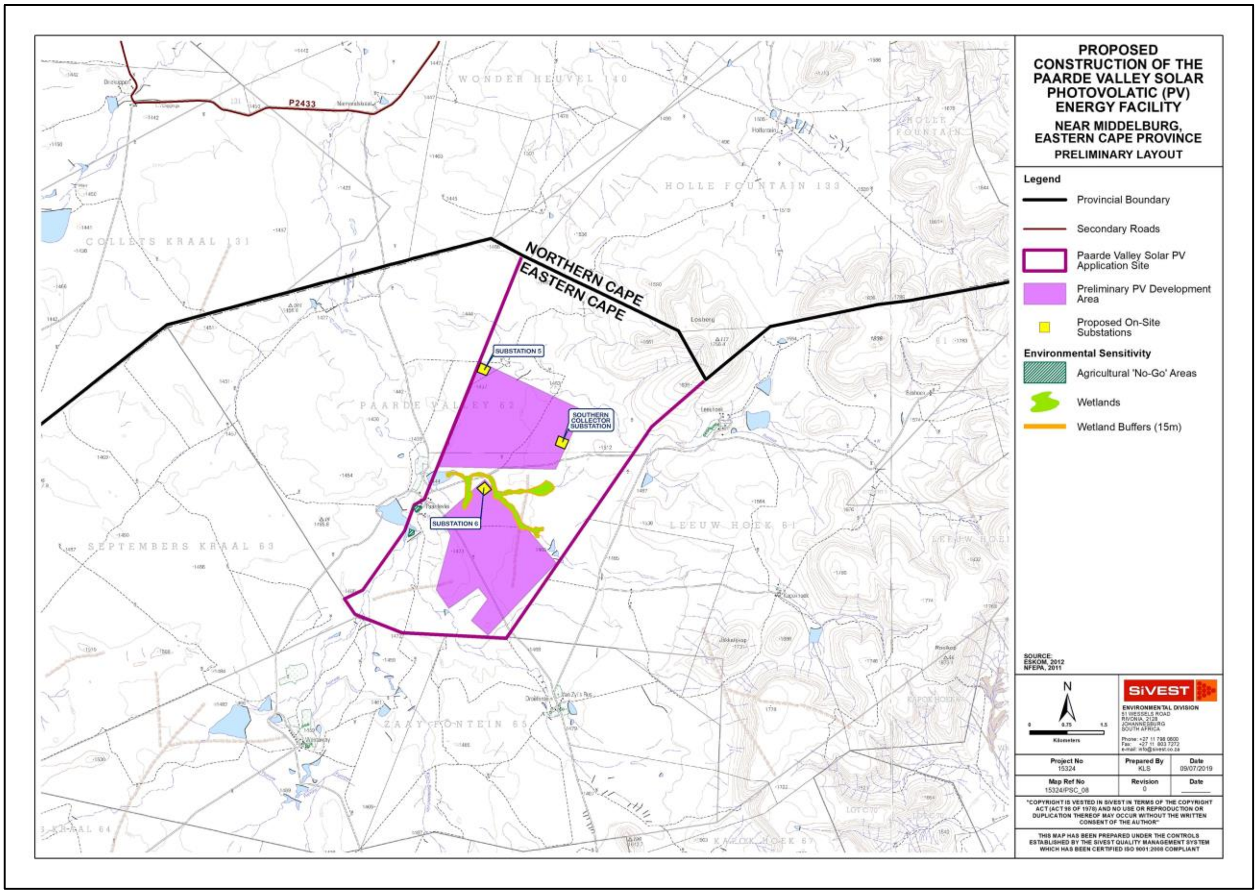

Figure vii: Preliminary PV development area in relation to identified environmental sensitive areas

[3]The on-site and collector substation site alternatives will not be comparatively assessed as part of this EIA as the substation locations are intrinsically linked to the grid connection infrastructure alternatives (which include on-site and collector substation sites and 132kV power line corridors). The preferred alternatives will be informed by the BA process (part of a separate BA process) and will be put forward in the EIA phase.

The table below summarises the specialist findings of the scoping phase for the entire proposed development. It should be noted that based on the pre-application meeting held with the DEA on 19 February 2019, it was confirmed that the specialists could compile one (1) combined report covering all three (3) of the proposed Umsobomvu PV projects and grid infrastructure, provided the findings and impact assessment sections are project specific. A copy of the pre-application meeting minutes is provided in **Appendix 9B**.

Terrestrial Ecology	There are various Acts that limit development or require permits before development can proceed. The most important of these are permits required in terms of protected species that could potentially occur on site, including the National Environmental Management: Biodiversity Act and the National Forests Act. Details of the description of the ecological receiving environment are summarised as follows: 1. The study area is situated in an area that is on the boundary between relatively flat plains and a low mountain range with moderately to steeply sloping topography. Habitat on site is in a largely natural state and is in a rural environment. There is very little transformation or serious degradation on site. 2. There are two (2) regional vegetation types occurring in the project study area, Eastern Upper Karoo (most of the area), and Besemkaree Koppies Shrubland (mountain areas). There are three (3) other national vegetation types in the vicinity, namely Southern Karoo Riviere, Tarkastad Montane Shrubland and Karoo Escarpment Grassland. Floristic components of all five (5) of these units occur in the study area, even though they are not all mapped as occurring within the study area. All these vegetation types are listed in the scientific literature as Least Threatened and none are listed in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011). 3. The Paarde Valley project site is within the Eastern Cape and Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) therefore do not apply to that project for the solar array. 4. Habitats on-site were divided into five (5) units, namely “Mountain Vegetation”, “Lowland Plains Vegetation”, “Low Ridges and Koppies”, “Broad Drainage Areas” and “Mountain Stream”. The vegetation on the plains on site was found to be a karroid dwarf shrubland that resembles the description for Eastern Upper Karoo, but the mountain vegetation was a mixed grassy shrubland that appears to be a floristic mix of Besemkaree Koppies Shrubland and Karoo Escarpment Grassland. The mountain vegetation has the highest local diversity and greatest variation in species composition. A map of natural habitats of the study area was produced by mapping from aerial imagery, based on information collected in the field.

	5. There are no plant species occurring on-site or likely to occur on-site that are protected according to the National Environmental Management: Biodiversity Act (Act No 10. Of 2004) (NEM:BA). 6. There are no protected tree species that are likely to occur in the study area. 7. A total of 79 mammal species have a geographical distribution that includes the general study area in which the sites are found. Of the species currently listed as threatened or protected (see Appendix 5 of Terrestrial Ecology Impact Assessment Report for list of protected species), the following are considered to have a very high, high or medium probability of occurring on-site, based on habitat suitability and evidence collected in the field: the Black-footed Cat (Vulnerable), the Cape Clawless Otter (Near Threatened), the South African Hedgehog (Near Threatened), Grey Rhebok (Near Threatened), White-tailed Rat (Vulnerable), and the Spectacled Dormouse (Near Threatened). There is strong evidence to suggest that the Black-footed Cat and the Cape Clawless Otter both definitely occur on-site. 8. The study area contains habitat that is suitable for a small number of frog species. One (1) protected frog species, the Giant Bullfrog, could potentially occur on-site. 9. A total of 55 reptile species have a geographical distribution that includes the general study area in which the sites are found. No reptile species of conservation concern could potentially occur in the study area. 10. A preliminary sensitivity map of the study area was produced that identifies areas of higher sensitivity that should be taken into account during activities on-site. This includes drainage areas and associated wetland-related habitat, low ridges and parts of the mountain area. The preliminary assessment of impacts indicates that all impacts are of low significance or can be reduced to low significance with mitigation, with the exception of loss of natural vegetation, for which the impact remains of medium significance after mitigation. Proposed mitigation measures include the following: shifting infrastructure positions to avoid sensitive habitats, select infrastructure options that cause the least amount of damage to natural habitats, cross watercourses at right angles, install appropriate structures at watercourse crossings to minimise impacts on these systems, minimise vegetation clearing and disturbance, formalise a rehabilitation programme, undertaking a pre-construction botanical walk-through survey of the footprint of the selected options, obtaining permits for any protected species that may be affected, undertaking a search and rescue of plants for which it is appropriate to rescue, compile an alien plant management plan and undertaking regular monitoring. The report concludes that there are some sensitivities in the study area related to natural habitat and to individual species, but that these can be minimised or avoided

	with the application of appropriate mitigation or management measures. There will be residual impacts, primarily on natural habitat, but the amount of habitat that will be lost to the project is insignificant compared to the area in hectares of the regional vegetation type that occurs on-site and therefore the residual impacts are considered acceptable, on condition local sensitivities of biodiversity importance are avoided. On this basis, it is recommended that the project be authorised.
Avifauna	A total of 185 bird species could potentially occur in the broader area. Of these, 78 species are classified as solar priority solar species. Eighteen (18) solar priority species have a high likelihood of occurring in the study area site itself. The potential impacts of the PV facility on avifauna which were assessed in this report are: ▪ Displacement due to disturbance and habitat transformation associated with the construction of the solar PV plant and associated infrastructure; ▪ Collisions with the solar panels; and ▪ Entrapment in perimeter fences. The proposed PV facility will have some pre-mitigation impacts on avifauna at a site and local level which will range from Medium to Low. The impact of displacement due to disturbance during the construction phase is rated as Medium and will remain at a Medium level after mitigation. The impact of displacement of priority species due to habitat transformation associated with the operation of the plant and associated infrastructure is rated as Medium. This impact can be partially reversed through mitigation, but it will remain at a Medium level, after mitigation. The envisaged impacts in the operational phase, i.e. mortalities due to collisions with the solar panels and entrapment in perimeter fences are both rated as Low pre-mitigation and could be further reduced with appropriate mitigation. The impact of displacement due to disturbance during the decommissioning phase is rated as Medium, and it will remain at a Medium level after mitigation. The cumulative impact of the proposed PV facilities within a 35km radius is rated as Low, both per- and post-mitigation. From an avifaunal impact perspective, there is no objection to the proposed development of the PV facility, provided the proposed mitigation measures are strictly implemented. No further monitoring will be required during the operational phase.
Surface Water	Findings were based on the method for delineating wetlands and riparian habitats as per the **DWAF (2005 & 2008)** guidelines. At a broad level, the study site is located within the Orange Catchment. More specifically, the study area is situated within the quaternary catchments D32B & D32C. In terms of fieldwork findings, it was found that there is one (1) wetland on the Paarde Valley study site. However, a number of watercourses, both perennial and non-perennial, were identified.

	In terms of the Ecological Condition of the watercourses, Ecological Condition was assessed to be a class C – Moderately Modified systems. The Environmental Importance and Sensitivity Class for the watercourses was determined. The results showed that the EISC for the watercourses and wetland were categorised as a Class B (High). The classification of high EISC was primarily due to the condition of the watercourses assessed, as well as the presence of Endangered species. The buffer zone determination findings for the watercourses took into account the type of the proposed development, potential impacts, condition of the habitat as well as other characteristics of the watercourse. As a result, the following buffer zones were assessed and are to be implemented as far as possible: ▪ Construction Phase Buffer: 15m ▪ Operation Phase Buffer: 15m Foreseen potential negative impacts in terms of the proposed development were identified and assessed. The potential construction-related impacts included impacts to watercourses (-20 low pre- and -8 low post-mitigation impact rating), hydrology of the watercourses (-20 low pre- and -9 low post-mitigation impact rating) and water quality impacts (-39 medium pre- and -9 low post-mitigation impact rating). The operational impacts identified included impacts to the hydrology of the watercourse (-36 medium pre- and -18 low post-mitigation impact rating). Overall, all impacts were assessed to be low, post-implementation of mitigation measures. In terms of potentially applicable environmental and water-related legislation, listed activities were identified to be triggered in terms of NEMA (1998) and the EIA Regulations (2014, as amended) from a surface water perspective. With respect to the NWA (1998), water uses (c) and (i) were identified as being potentially applicable. However, the application of the risk assessment matrix protocol as per **Government Notice 509 of 2016 (No. 40229)** was undertaken, the findings show that the risk of potential impacts on the watercourse was assessed to be in the LOW-risk class. Where risks were identified, a number of control measures have been stipulated which will assist in decreasing the level of risk to an even lower level. In accordance with the implementation of control measures, all potential risks are classed as LOW. Therefore, registration for General Authorisation can be undertaken where required and agreed with the DWS. The decision on whether the proposed development is to proceed will rest on environmental and water governmental departments whom will need to make a trade-off between meeting the conservation targets of the province or meeting the energy

	demands of the country. However, it is the opinion of the specialist that the proposed development may proceed where the relevant control measures and mitigation measures stipulated above are implemented. There are a number of recommendations to be implemented for the proposed development. These include the following: ▪ A stormwater management plan for all phases of the proposed development is required to be compiled and implemented which accounts for control of increased run-off, erosion and sedimentation; and ▪ An Alien Eradication and Removal Programme is to be compiled and implemented for the duration of the proposed development. Based on the findings above, with the implementation of the control and mitigation measures stipulated herein, it is the opinion of the specialist that the proposed development may proceed.
Agricultural and Soils (Desktop)	It should be noted that a field investigation was not considered necessary. The assessment was based on a desktop analysis of existing soil and agricultural potential data and other data for the site, which is considered entirely adequate for a thorough assessment of all the agricultural impacts of the proposed development (see section 4.1 of the scoping phase Agricultural and Soils Impact Assessment Report). The key findings of the Agricultural and Soils Impact Assessment are provided below: ▪ The proposed project area is dominated by shallow, loamy sands on underlying rock or less commonly clay. Dominant soil forms are Swartland, Hutton, Mispah, and Valsrivier. ▪ The major limitations to agriculture are the limited climatic moisture availability (low rainfall), the rugged terrain and the shallow, rocky soils. ▪ As a result of these limitations, the agricultural use of the study area is limited to low-intensity grazing only, except for some isolated patches of irrigation land. ▪ The proposed project area is classified with land capability evaluation values between 1 (very low) and 7 (low to moderate), with 6 being most predominant. ▪ The significance of all agricultural impacts is kept low by the limited agricultural potential of the land. ▪ The only parts of the study area that do not have low sensitivity are the small patches of irrigation. These are considered no-go areas for any footprint of development that will exclude cultivation. ▪ Two (2) potential negative impacts of the development on agricultural resources and productivity were identified. These are: o Loss of agricultural land use; and

	o Soil erosion and degradation. ▪ One (1) potential positive impact of the development on agricultural resources and productivity was identified as: o Increased financial security of farming operations through rental income ▪ Soil erosion and degradation was assessed as having medium significance before and after mitigation. The other two (2) impacts were assessed as having low significance before and after mitigation. ▪ The recommended mitigation measures are for implementation of an effective system of stormwater run-off control; maintenance of vegetation cover; and to strip, stockpile and re-spread topsoil. ▪ Due to the low agricultural potential of the site, and the consequent low to medium, negative agricultural impact, there are no restrictions relating to agriculture which preclude authorisation of the proposed development (including all alternatives) and therefore, from an agricultural impact point of view, the development should be authorised.
Visual	Overall, sparse human habitation and the predominance of natural vegetation cover across much of the study area would give the viewer the general impression of a largely natural setting with some pastoral elements. As such, solar PV development would alter the visual character and contrast significantly with the typical land use and/or pattern and form of human elements present across the broader study area. The area is not typically valued for its tourism significance and there is limited human habitation resulting in relatively few potentially sensitive receptors in the area. A total of twenty-six (26) potentially sensitive receptors were identified in the combined study area, three (3) of which are considered to be sensitive receptors as they are linked to leisure/nature-based tourism activities in the area. None of the receptors are however expected to experience high levels of visual impact from the proposed PV facility. An overall impact rating was also conducted as part of the scoping phase in order to allow the visual impact to be assessed alongside other environmental parameters. The assessment revealed that impacts associated with the proposed Paarde Valley solar PV facility would be of low significance during both construction and decommissioning phases. During operation, visual impacts from the solar PV facility would be of medium significance with relatively few mitigation measures available to reduce the visual impact. Although other renewable energy developments and infrastructure projects, either proposed or in operation, were identified within a 35km radius of the Paarde Valley

	solar PV project, it was determined that only one (1) of these would have any significant impact on the landscape within the visual assessment zone, namely Umsobomvu WEF. This proposed WEF, in conjunction with the proposed solar PV facility, will alter the inherent sense of place and introduce an increasingly industrial character into a largely natural, paroral landscape, thus giving rise to significant cumulative impacts. It is however anticipated that these impacts could be mitigated to acceptable levels with the implementation of the recommendations and mitigation measures stipulated for each of these developments by the visual specialists. In light of this and the relatively low level of human habitation in the study area however, cumulative impacts have been rated as medium.
Heritage (Desktop)	Due to the prohibitive size of the application area during the Scoping phase, it was agreed that fieldwork related to the heritage assessment will only be done in the EIA phase when the footprint area has been determined and significantly reduced, based on environmental sensitive areas determined by the other specialists. Heritage resources are unique and non-renewable and as such any impact on such resources must be seen as significant. The Heritage Scoping Report has shown that the proposed site to be developed as a PV facility may have heritage resources present on the property. This has been confirmed through archival research and evaluation of aerial photography of the site. The projected impact assessment indicates that unmitigated impacts during construction can be MEDIUM to HIGH but reduced to LOW with the implementation of management measures. Impacts during the operational and decommissioning phase is projected to be LOW with the implementation of management measures. These findings provide the basis for the recommendation: ▪ further field truthing through an archaeological walk down . The aim of this will be to compile a comprehensive database of heritage sites within the PV development area, with the aim of developing a heritage management plan for inclusion in the Environmental Management Programme (EMPr). It is the specialist’s considered opinion, based on the current data available, that with the consideration of the position of heritage sensitivities during the layout design the project will have an acceptable low impact on heritage resources and can continue.
Palaeontology	The National Heritage Resources Act (No 25 of 1999, section 38) (NHRA), states that a Palaeontological Impact Assessment (PIA) is key to detect the presence of fossil material within the planned development footprint. This PIA is thus necessary to evaluate the effect of the construction on the palaeontological resources.

	These proposed development is underlain by the continental sediments of the Latest Permian sediments of the Balfour Formation (Upper Beaufort Group, Adelaide Subgroup) and earliest Triassic sediments of the Katberg Formation (Upper Beaufort Group, Tarkastad Subgroup, Karoo Supergroup) as well as Jurassic Karoo Dolerite. These sediments are generally mantled by a thick layer of Quaternary to Recent colluvium and alluvium. The uppermost Balfour and Katberg Formations are of extraordinary interest in that they provide some of the best existing information on ecologically-complex terrestrial ecosystems during the catastrophic end-Permian mass extinction. According to the PalaeoMap of South African Heritage Resources Information System (SAHRIS), the Palaeontological Sensitivity of the Tarkastad and Adelaide Subgroups has a Very High Palaeontological Sensitivity, while that of the Quaternary superficial deposits of the Central interior is high and the Karoo dolerite (igneous rocks) is insignificant and rated as zero. A site-specific field survey of the development footprint was conducted on foot and by motor vehicle from the 24th – 28th January 2019. Elsewhere in the Karoo Basin numerous fossils have been uncovered in these geological sediments but only two (2) sites on koppies with fossiliferous outcrops were identified. These fossiliferous sites have been identified as Highly Sensitive and No-go areas. It is recommended that a 50m buffer will be placed around these areas. If construction is a necessity in these sensitive areas, it is recommended that the fossils will be collected by a professional palaeontologist. Preceding excavation of any fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an accredited collection (museum or university collection), while all fieldwork and reports should meet the minimum standards for palaeontological impact studies suggested by SAHRA. With the above-mentioned in consideration, the proposed development, as well as all alternatives have a similar geology and therefore there is no preferences on the grounds of palaeontological fossil heritage for any specific layout among the different options under consideration. As impacts on fossil heritage usually only occur during the excavation phase, no further impacts on fossil heritage are expected during the operation and decommissioning phases of the Solar Energy Facility (SEF). The impact of development on fossil heritage are usually negative but it could also have a positive impact due to the discovery of newly uncovered fossil material that would have been unavailable for scientific research. The SEF could also provide a long-term benefit to the country by supplying renewable energy to the electricity grid. In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by fresh excavations the Chance Find Protocol must be implemented by the Environmental Control Officer (ECO) in charge of these

	developments. These discoveries ought to be protected (if possible in situ) and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that correct mitigation (e.g. recording and collection) can be carried out by a palaeontologist. It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils. From a Palaeontological Heritage view there is no fatal flaws in the proposed SEF development project. However, it is recommended that the mitigation measures are included in the Environmental Management Programme (EMPr) and fully implemented
Social	**<u>APPROACH TO STUDY</u>** Data was gathered using the following techniques. **Collection of data** Data was gathered through: • The project description prepared by the project proponent. • Statistics South Africa, Census 2011 and other relevant demographic data generated by Stats SA such as the Quarterly Labour Force Survey and Mid-year population estimates. • Discussions with the project proponents and Environmental Impact Assessment Consultants. • A literature review of various documents such as the relevant Municipal Integrated Development Plans (IDPs) and other specialist reports and documents. • A broader literature scan. **Impact assessment technique** The assessment technique used to evaluate the social impacts was provided by SiVEST Environmental Division and is attached in Appendix 1 of the Social assessment report (**Appendix 6F**). **<u>IMPACTS IDENTIFIED</u>** The impacts are assessed in respect of the following phases of the project: ▪ Planning and design ▪ Construction ▪ Operational ▪ Decommissioning, and ▪ The ‘no go” option. **Construction phase**

	Most of the impacts discussed above apply over the short-term to the construction phase of the project and include: ▪ Annoyance, dust and noise; ▪ Increase in crime; ▪ Increased risk of HIV infections; ▪ Influx of construction workers and job seekers; ▪ Hazard exposure; ▪ Disruption of daily living patterns; ▪ Disruptions to social and community infrastructure; ▪ Job creation and skills development; and ▪ Socio-economic stimulation. **Operational phase** The social impacts that apply to the operational phase of the project are: ▪ Transformation of the sense of place; and ▪ Economic. o Job creation and skills development. o Socio-economic stimulation. **Decommissioning** If the project were to be completely decommissioned the major social impacts likely to be associated with this would be the loss of jobs and revenue stream that stimulated the local economy and flowed into the municipal coffers. **'No Go' Alternative** The 'no go' option would mean that the social environment is not affected as the status quo would remain. On a negative front it would also mean that all the positive aspects associated with the project would not materialise. Considering that Eskom's coal-fired power stations are a huge contributor to carbon emissions the loss of a chance to supplement the National Grid through renewable energy would be significant at a national, if not at a global level. **Cumulative Impacts** In this regard the following cumulative impacts are addressed below: ▪ Risk of HIV ▪ Sense of place ▪ Service supplies and infrastructure, and ▪ The economic benefit. No fatal flaws associated with the cumulative impacts are evident at a social level. The findings support the recommendations of the various reports undertaken for the different renewable energy projects in the region that, on an overall basis, the social

	benefits of renewable energy projects outweigh the negative benefits and that the negative social impacts can be mitigated. **<u>CONCLUSION AND RECOMMENDATIONS</u>** In assessing the social impact of the solar PV Facility, it was found that in respect of the energy needs of the country and South Africa's need to reduce its carbon emissions that the project fits with national, provincial and municipal policy. Regarding the social impacts associated with the project it was found that most apply over the short term to the construction phase of the project. Of these impacts all can be mitigated to within acceptable ranges and there are no fatal flaws associated with the construction or operation of the project. On a cumulative basis it is evident that the cumulative impacts associated with changes to the social environment of the region are more significant than those attached to the project in isolation. On a negative front there are two (2) issues associated with developments in the region that are of most concern. The first of these issues is the change to the sense of place of an area that was once considered a pristine region of South Africa. The second is the potential, through an influx of labour and an increase in transportation to constructions sites, of the risk for the prevalence of HIV to rise in an area that has a relatively low HIV prevalence rate. In this regard it is important that the relevant authorities recognise these issues and find ways of mitigating them to ensure that they do not undermine the benefit that renewable energy projects bring, both to the region as well as to the country as a whole. These issues are beyond a project-specific basis and as such will need to be addressed at a higher level.
Geotechnical (Desktop)	The desktop geotechnical assessment did not identify any fatal flaws that, from a geological and geotechnical perspective, would prevent the construction of the proposed Paarde Valley Solar PV Energy Facility. The potential impacts the project may have on the geology, relate to soils that could be impacted by the construction activities. There may be a potential for soil erosion, due to removal of vegetation and exposure of the soils to the elements, during construction. The impacts were found to be of "***negative low impact***". From a geological and geotechnical perspective, based on the minimal negative impacts on the geology and soils and the recommendations for mitigation measures, it is recommended that the Paarde Valley Solar PV Energy Facility project receives the go-ahead from the Competent Authority.
Transportation	The following conclusions were made: ▪ During the construction phase an additional ±43 vehicles trips will commute at the peak of the construction phase, transporting staff and labour. Typically,

	these trips will be in the morning between 6:00 – 7:00 and in the afternoons between 16:00 – 17:00. ▪ The heavy construction vehicles and deliveries will contribute an additional ±25 vehicle trips / day, typically occurring during the 'weekday midday' which will equate to ±4 vehicle trips / hour. These additional vehicles will only contribute a small percentage to the existing road network. ▪ The abnormal loads on this development will be negligible and therefore will have no major impact. ▪ The cumulative impact of the area confirms that no significance rating change will be experienced during the construction period of the PV development. ▪ The existing road network can accommodate the proposed development, however, the recommendations below must be considered to mitigate any possible negative impacts. ▪ We recommend a Traffic Management Plan be completed prior to construction in order to form part of the Final Environmental Management Programme (EMPr). The plan must include inter alia the following; o The review of all intersections and routes prior to the project commencing in order to accommodate construction vehicles and staff commuting. o Further discussions with the SANRAL and the respective transport department on access points and route requirements. o The upgrades of intersections and the installation of road traffic signage as per the SARTSM (South African Road Traffic Sign Manual). o The implementation of pedestrian safety initiatives o The implementation of a road maintenance plan under the auspices of the respective transport department. ▪ We recommended that one (1) access point from the N10 freeway be used for the proposed facility to reduce the impact to the area. This access point is located at Km19.92 on section N10-5 and the appropriate axillary lanes and speed reduction measures are to be implemented subsequent to discussions with SANRAL. This study and a revised study, with the all the renewable parties involved in the area at the time, must be submitted to SANRAL and more specifically Ms. Colene Runkel 021 957 4613 for review and comments. ▪ Development of access points to the PV facility is as per the recommendations in Section 9 of the specialist Transportation report (**Appendix 6I**). ▪ The appropriate load permits be obtained from the Department of Transport prior to construction (if required). ▪ This assessment is limited to the impacts the development traffic will have on the network and not on the wider impacts known as background traffic.

		Background traffic includes the cumulative impacts other developments will have on the environment if their programs overlap. Such impacts can only be addressed in a detailed Traffic Impact Study which takes into account actual traffic counts undertaken during the peak periods. We therefore recommend that this study be completed prior to the construction process with all Renewable Energy parties involved in the immediate area.

Way forward

The Draft Scoping Report (DSR) will be circulated for public participation for a period of 30 days (excluding public holidays) from Friday 26 July 2019 until Monday 26 August 2019. Hard copies of the DSR will be made available at a public venue and an electronic copy will also be made available on SiVEST's website (see **section 8.7**). All Interested and/or Affected Parties (I&APs) and key stakeholders, such as Organs of State (OoS) / authorities, which are registered on the project database will be notified of the submission of the DSR and the above-mentioned 30-day public review and comment period accordingly. In addition, all OoS / authorities will be sent electronic copies (on CD) of the DSR. The 30-day public review and comment period is provided for the general public and for the I&APs and key stakeholders, as required by the EIA Regulations, 2014 (as amended). All comments received will be responded to in a Comments and Response Report (C&RR), which will be included prior to sending the Final Scoping Report (FSR) to the decision-making authority, namely the national Department of Environmental Affairs (DEA). Comments received on the DSR will be taken into consideration, incorporated into the report (where possible) and will be used when compiling the FSR. The DEA must accept or reject the scoping assessment or make further recommendations for the assessment. Should the DEA accept the scoping assessment, the project will proceed to the EIA phase.

A Plan of Study for the EIA phase is detailed within this DSR (**Chapter 11**) and outlines the methodology to be implemented during the EIA phase. Based on the specialist studies which were undertaken during the scoping phase, several additional aspects have been identified that warrant further investigation in the EIA Phase. These include the following:

- Terrestrial Ecology Impact Assessment;
- Avifauna Impact Assessment;
- Surface Water Impact Assessment;
- Agricultural and Soils Impact Assessment;
- Geotechnical Impact Assessment:
- Visual Impact Assessment;
- Heritage Impact Assessment (incl. ground-truthing);
- Palaeontology Impact Assessment;
- Social Impact Assessment; and
- Transportation Impact Assessment.

As mentioned, the above-mentioned specialist assessments will be updated/revised to include a review of the findings in accordance with the PV development area determined by the scoping phase sensitive areas;

the detailed site layouts to be identified for assessment in the EIA phase; a comparative assessment of the layout alternatives provided and by addressing any comments or concerns arising from the public participation process.

Following the Desktop Heritage Assessment, it was identified that further field truthing will need to be undertaken through an archaeological walk down. The aim of this will be to compile a comprehensive database of heritage sites within the PV development area, with the aim of developing a heritage management plan for inclusion in the EMPr. This field truthing exercise can however only be undertaken once the layout of the solar PV energy facility and associated infrastructure has been determined, based on the findings of the other specialist studies.

All I&APs and key stakeholders will be provided with a second opportunity to participate in the EIA process through the public participation process which will be undertaken during the EIA phase.

To register as an I&AP and/or to obtain additional information, please submit your name; contact details (telephone number, postal address and email address) and the interest which you have in the application to SiVEST Environmental Division, as per the details below:

Contact: Hlengiwe Ntuli or Stephan Jacobs
📭 PO Box 2921, RIVONIA, 2128
☎ Phone:(011) 798 0600
💻 E-mail:hlengiwen@sivest.co.za / stephanj@sivest.co.za / sivest_ppp@sivest.co.za
📠 Fax:(011) 803 7272
Websites:www.sivest.co.za

Please reference "*Paarde Valley Solar PV*" in your correspondence, should your comments be project specific. SiVEST shall keep all registered I&APs informed of the EIA process.

TABLE OF CONTENTS

Contents **Page**

List of Tables

List of Figures

List of Appendices

Appendix 1: IFC Handbook
Appendix 2: Expertise of the EAP and Project Team
Appendix 3: Declaration of Interest (DoI) Forms and the EAP Affirmation
Appendix 4: Authority Consultation
Appendix 5: Maps
Appendix 6: Specialist Studies
- Appendix 6A: Agricultural and Soils Impact Assessment
- Appendix 6B: Avifauna Impact Assessment
- Appendix 6C: Desktop Geotechnical Impact Assessment
- Appendix 6D: Desktop Heritage Impact Assessment - Detailed assessment (including ground-truthing) to follow in EIA phase
- Appendix 6E: Palaeontology Impact Assessment
- Appendix 6F: Social Impact Assessment;
- Appendix 6G: Surface Water Impact Assessment
- Appendix 6H: Terrestrial Ecology Impact Assessment
- Appendix 6I: Transportation Impact Assessment
- Appendix 6J: Visual Impact Assessment

Appendix 7: Public Participation
- Appendix 7A: Proof of site notices
- Appendix 7B: Written Notices
- Appendix 7C: Proof of advertisements
- Appendix 7D: Correspondence
- Appendix 7E: Comments and Response Report (C&RR) – To be Included in FSR
- Appendix 7F: I&AP Database
- Appendix 7G: Minutes of Meetings – To be Included in FEIAr
- Appendix 7H: Landowner Notifications
- Appendix 7I: Distribution to Organs of State (OoS)

Appendix 8: Environmental Management Programme (EMPr) – To be Included in DEIAr
Appendix 9: Additional Information
- Appendix 9A: Project Coordinates
- Appendix 9B: DEA Pre-Application Meeting Minutes
- Appendix 9C: Specialist Terms of Reference (ToR)

Glossary of Terms

Alluvial: Resulting from the action of rivers, whereby sedimentary deposits are laid down in river channels, floodplains, lakes, depressions etc.

Archaeological resources: This includes:

i. material remains resulting from human activity 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;
ii. rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
iii. wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation;
iv. features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

Biodiversity: The diversity of genes, species and ecosystems, and the ecological and evolutionary processes that maintain that diversity.

Cultural landscape: A representation of the combined worlds of nature and of man illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal (World Heritage Committee, 1992).

Cultural Significance: This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance

Cumulative Impact: In relation to an activity, cumulative impact means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Endemic: Restricted or exclusive to a particular geographic area and occurring nowhere else. Endemism refers to the occurrence of endemic species.

Environmental Impact Assessment: 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 the application.

Environmental Impact Report: In-depth assessment of impacts associated with a proposed development. This forms the second phase of an Environmental Impact Assessment and follows on from the Scoping Report.

Environmental Management Programme: A legally binding working document, which stipulates environmental and socio-economic mitigation measures which must be implemented by several responsible parties throughout the duration of the proposed project.

"Equator Principles": A financial industry benchmark for determining, assessing and managing social & environmental risk in project financing.

Fossil: Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Habitat: The area of an environment occupied by a species or group of species, due to the particular set of environmental conditions that prevail there.

Heritage: That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).

Heritage Resources: This means any place or object of cultural significance, such as the caves with archaeological deposits identified close to both development sites for this study.

Kilovolt (kV): a unit of electric potential equal to a thousand volts (a volt being the standard unit of electric potential. It is defined as the amount of electrical potential between two points on a conductor carrying a current of one ampere while one watt of power is dissipated between the two points).

Mitigate: The implementation of practical measures to reduce adverse impacts or enhance beneficial impacts of an action.

"No-Go" option: The “no-go” development alternative option assumes the site remains in its current state, i.e. there is no construction of a solar PV energy facility and associated infrastructure in the proposed project area.

Palaeontology: Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

Precipitation: Any form of water, such as rain, snow, sleet, or hail that falls to the earth's surface.

PV Development Area: Area for the potential erection of PV panels within the application site

Red Data Species: All those species included in the categories of endangered, vulnerable or rare, as defined by the International Union for the Conservation of Nature and Natural Resources.

Red List: A publication that provides information on the conservation and threat status of species, based on scientific conservation assessments.

Rehabilitation: Less than full restoration of an ecosystem to its pre-disturbance condition.

Restoration: To return a site to an approximation of its condition before alteration.

Riparian: The area of land adjacent to a river or stream that is, at least periodically, influenced by flooding.

Scenic route: A linear movement route, usually in the form of a scenic drive, but which could also be a railway, hiking trail, horse-riding trail or 4x4 trail.

Scoping Report: An “issues-based” report which forms the first phase of an Environmental Impact Assessment process.

Sense of place: The unique quality or character of a place, whether natural, rural or urban. It relates to uniqueness, distinctiveness or strong identity.

Species of Special / Conservation Concern: Species that have particular ecological, economic or cultural significance, including but not limited to threatened species.

Threatened Ecosystems: An ecosystem that has been classified as Critically Endangered, Endangered or Vulnerable, based on analysis of ecosystem threat status. A threatened ecosystem has lost, or is losing, vital aspects of its structure, composition or function. The Biodiversity Act makes provision for the Minister or Environmental Affairs, or a provincial MEC of Environmental Affairs, to publish a list of threatened ecosystems.

Threatened Species: A species that has been classified as Critically Endangered, Endangered or Vulnerable, based on a conservation assessment using a standard set of criteria developed by the IUCN for determining the likelihood of a species becoming extinct. A threatened species faces a high risk of extinction in the near future.

Visual Assessment Zone: The visual assessment zone or study area is assumed to encompass a zone of 10km from the outer boundary of the proposed application site.

List of Abbreviations

AAA	- Astronomy Advantage Area
AP	- Action Plan
APM	- Archaeology, Palaeontology and Meteorites
ATNS	- Air Traffic and Navigation Services Company Limited
AIA	- Archaeological Impact Assessment
BA	- Basic Assessment
BID	- Background Information Document
BLSA	- BirdLife South Africa
BRICS	- Brazil, Russia, India, China and South Africa
CAA	- Civil Aviation Act (Act No. 13 of 2009)
CARA	- Conservation of Agricultural Resources Act (Act No. 43 of 1983)
CBA	- Critical Biodiversity Area
CBD	- Convention on Biodiversity
CR	- Critically Endangered
DEA	- Department of Environmental Affairs
DEIAr	- Draft Environmental Impact Assessment Report
DDD	- Data Deficient: well known but not enough information for assessment
DDT	- Data Deficient: taxonomic problems
DDX	- Data Deficient: unknown species
DM	- District Municipality
DSR	- Draft Scoping Report
DoE	- Department of Energy
DM	- District Municipality
DNI	- Direct Normal Irradiation
DWS	- Department of Water and Sanitation
EAP	- Environmental Assessment Practitioner
ECA	- Environmental Conservation Act (ECA) (Act No. 73 of 1989)
ECPC	- Eastern Cape Planning Commission
ECO	- Environmental Control Officer
ED	- Economic Development
EHS	- Environmental, Health, and Safety
EIA	- Environmental Impact Assessment
EIR	- Environmental Impact Report
EISC	- Ecological Importance and Sensitivity Categorisation
EMPr	- Environmental Management Programme
EMI	- Electromagnetic Interference
EN	- Endangered
ENPAT	- Environmental Potential Atlas
EP	- Equator Principles
ERA	- The Electricity Regulation Act No. 4 of 2006
ESA	- Ecological Support Area
EAS	- Early Stone Ages
ESMP	- Environmental and Social Management Plan

ESMS	- Environmental and Social Management System
EX	- Extinct
FEIAr	- Final Environmental Impact Assessment Report
FSR	- Final Scoping Report
EHS	- Environmental, Health, and Safety
FSR	- Final Scoping Report
GA	- General Authorisation
GDP	- Gross Domestic Product
GHG	- Green House Gases
GHI	- Global Horizontal Irradiation
GIS	- Geographic Information System
GUMP	- Gas Utilisation Master Plan
GW	- Gigawatts
HIA	- Heritage Impact Assessment
I&AP(s)	- Interested and/or Affected Party/Parties
IBA(s)	- Important Bird Area(s)
IDP	- Integrated Development Plan
IEP	- Integrated Energy Plan
IFC	- International Finance Corporation
IKA	- Index of Kilometric Abundance
IPP(s)	- Independent Power Producers
IRP	- Integrated Resource Plan
IUCN	- International Union for the Conservation of Nature and Natural Resources
kV	- Kilo Volt
LM	- Local Municipality
LED	- Local Economic Development
LSA	- Late Stone Age
MSA	- Middle Stone Age
MSL	- Mean Sea Level
MW	- Megawatt
NC DENC	- Northern Cape Department of Environment and Nature Conservation
NC PGDS	- Northern Cape Provincial Growth and Development Strategy
NEA	- The National Energy Act (Act No. 34 of 2008)
NEMA	- National Environmental Management Act No. 107 of 1998
NEM:AQA	- National Environmental Management: Air Quality Act (Act No. of 2004)
NEM:BA	- National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NEM:PAA	- National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
NFA	- The National Forest Act (Act No. 84 of 1998)
NFEPA	- National Freshwater Ecosystem Priority Areas
NHRA	- National Heritage Resources Act (Act No. 25 of 1999)
NPAES	- National Parks Area Expansion Strategy
NRTA	- National Road Traffic Act (Act No. 93 of 1996)
NT	- Near Threatened
NWA	- National Water Act (Act No. 36 of 1998)
OHSA	- Occupational Health and Safety Act (Act No. 85 of 1993)

PDP	- Provincial Development Plan
PES	- Present Ecological Status
PIA	- Palaeontological Impact Assessment
PoS	- Plan of Study
PM	- Public Meeting
PPA	- Power Purchase Agreement
PPP	- Public Participation Process
PV	- Photovoltaic
RDP	- Rural Development Plan
REDZ	- Renewable Energy Development Zone
REIPPP	- Renewable Energy Independent Power Producer Procurement Programme
RE	- Renewable Energy
SA	- South Africa
SACAA	- South African Civil Aviation Authority
SAHRA	- South African Heritage Resources Agency
SAHRIS	- South African Heritage Resources Information System
SALA	- Subdivision of Agricultural Land Act (Act No. 70 of 1970)
SANBI	- South African National Biodiversity Institute
SDF	- Spatial Development Framework
SEF	- Solar Energy Facility
SPVs	- Special Purpose Vehicles
TL	- Terrain Loss
VEGRAI	- Vegetation Response Assessment Index
VIA	- Visual Impact Assessment
VU	- Vulnerable
WETFEPA	- Wetland Freshwater Priority Areas
WEF	- Wind Energy Facility
WMA	- Water Management Area
WUL	- Water Use License
WULA	- Water Use License Application

1 INTRODUCTION

Paarde Valley Solar Power (Pty) Ltd (hereafter referred to as Paarde Valley Solar Power) is proposing to construct the Paarde Valley Solar Photovoltaic (PV) Energy Facility and associated infrastructure (hereafter referred to as the 'proposed development') near Middelburg in the Inxuba Yethemba Local Municipality, which falls within the Chris Hani District Municipality in the Eastern Cape Province of South Africa (**Figure 2**) (**DEA Reference Number**: To be Allocated). The generation capacity of the proposed solar PV energy facility has not been determined yet and will be dependent on the area available for the erection of PV panels. SiVEST Environmental Division has subsequently been appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the EIA process for the proposed construction of the Paarde Valley Solar PV Energy Facility and associated infrastructure. The overall objective of the proposed development is to generate electricity by means of renewable energy technologies capturing solar energy to feed into the National Grid.

The above-mentioned proposed solar PV energy facility forms one (1) of three (3) Solar PV energy facilities that are being proposed on adjacent farms as part of the greater Umsobomvu PV project (**Figure 1**). The proposed developments which form part of the greater Umsobomvu PV project include the following:

- Mooi Plaats Solar PV – **DEA Reference Number:** To be Announced (part of a separate on-going EIA process);
- Wonderheuvel Solar PV – **DEA Reference Number:** To be Announced (part of a separate on-going EIA process); and

In addition, a 132kV overhead power line and 33/132kV on-site and collector substations (namely the associated electrical infrastructure) are also being proposed to feed the electricity generated by the proposed Paarde Valley Solar PV Energy Facility into the national grid. The associated electrical infrastructure will however require a separate Environmental Authorisation (EA) and is subject to a separate Basic Assessment (BA) process (**DEA Reference Number**: To be Allocated). The associated electrical infrastructure has been included in the solar PV energy facility EIA for background information but will be authorised under a separate BA to allow for handover to Eskom. The on-site and collector substations will include an Eskom portion and an Independent Power Producer (IPP) portion, hence the substations have been included in the solar PV energy facility EIA and in the associated electrical infrastructure BA to allow for handover to Eskom. Although the solar PV energy facility and associated electrical infrastructure will be assessed separately, a single public participation process is being undertaken for all the proposed developments [i.e. three (3) solar PV energy facility EIAs and three (3) grid connection BAs]. The potential environmental impacts associated with all of the developments will be assessed as part of the cumulative impact assessment.

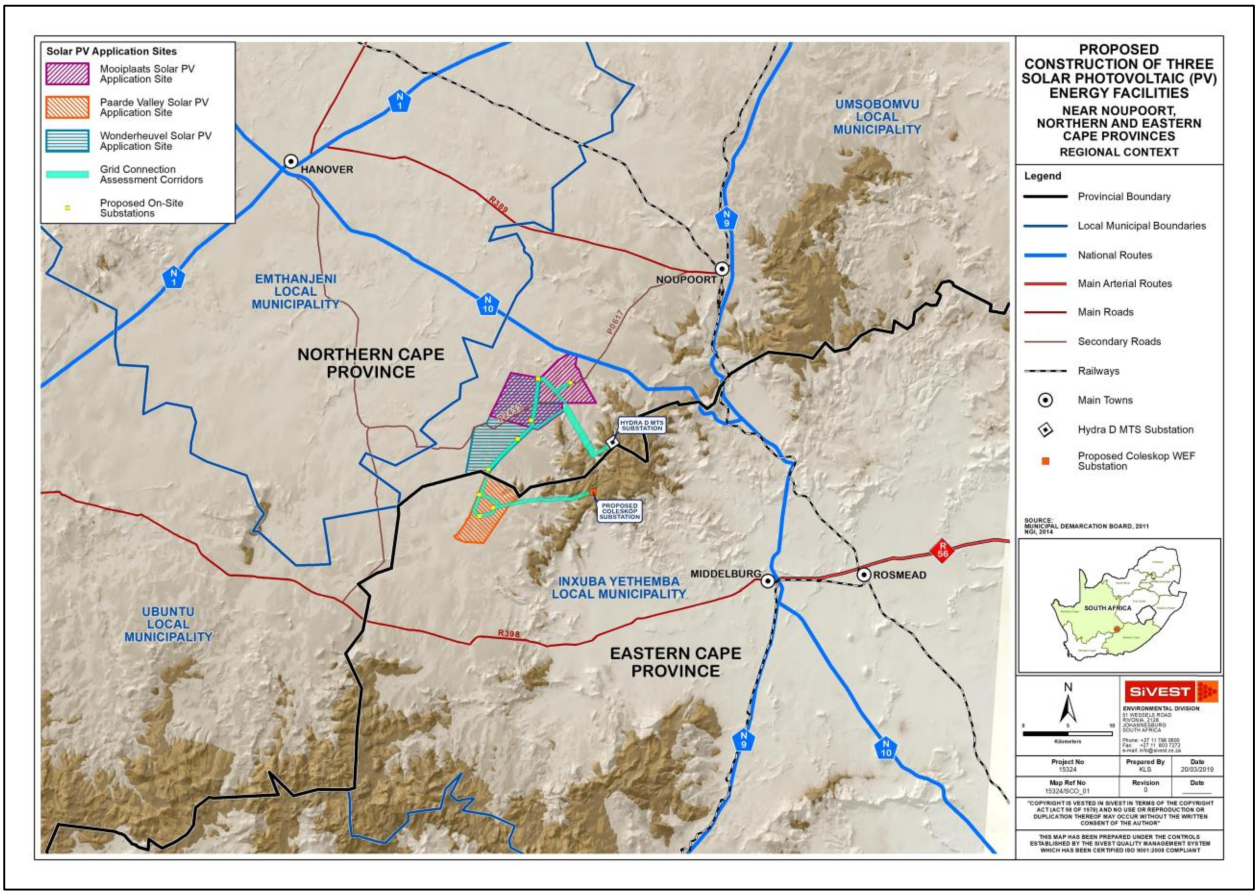

Figure 1: Regional context of greater Umsobomvu PV project

Due to the fact that the proposed development is not located within any of the Renewable Energy Development Zones (REDZs) formally gazetted[4] in South Africa for the purpose of development of solar and wind energy generation facilities, the Paarde Valley Solar PV Energy Facility will be subject to a full EIA process in terms of the National Environmental Management Act (Act No. 107 of 1998) (NEMA), as amended, and the EIA Regulations 2014 (as amended in 2017).

The proposed development requires an EA from the National Department of Environmental Affairs (DEA). However, the provincial authority will also be consulted (i.e. the Eastern Cape Department of Economic Development, Environmental Affairs and Tourism - EC DEDEAT). The EIA for the proposed development will be conducted in terms of the EIA Regulations, 2014 (as amended) promulgated in terms of Chapter 5 of the NEMA. In terms of these regulations, a full EIA process is required for the proposed development. All relevant legislation and guidelines (including Equator Principles) will be consulted during the EIA process and will be complied with at all times.

[4] Formally gazetted on 16 February 2018 (government notices 113 and 114).

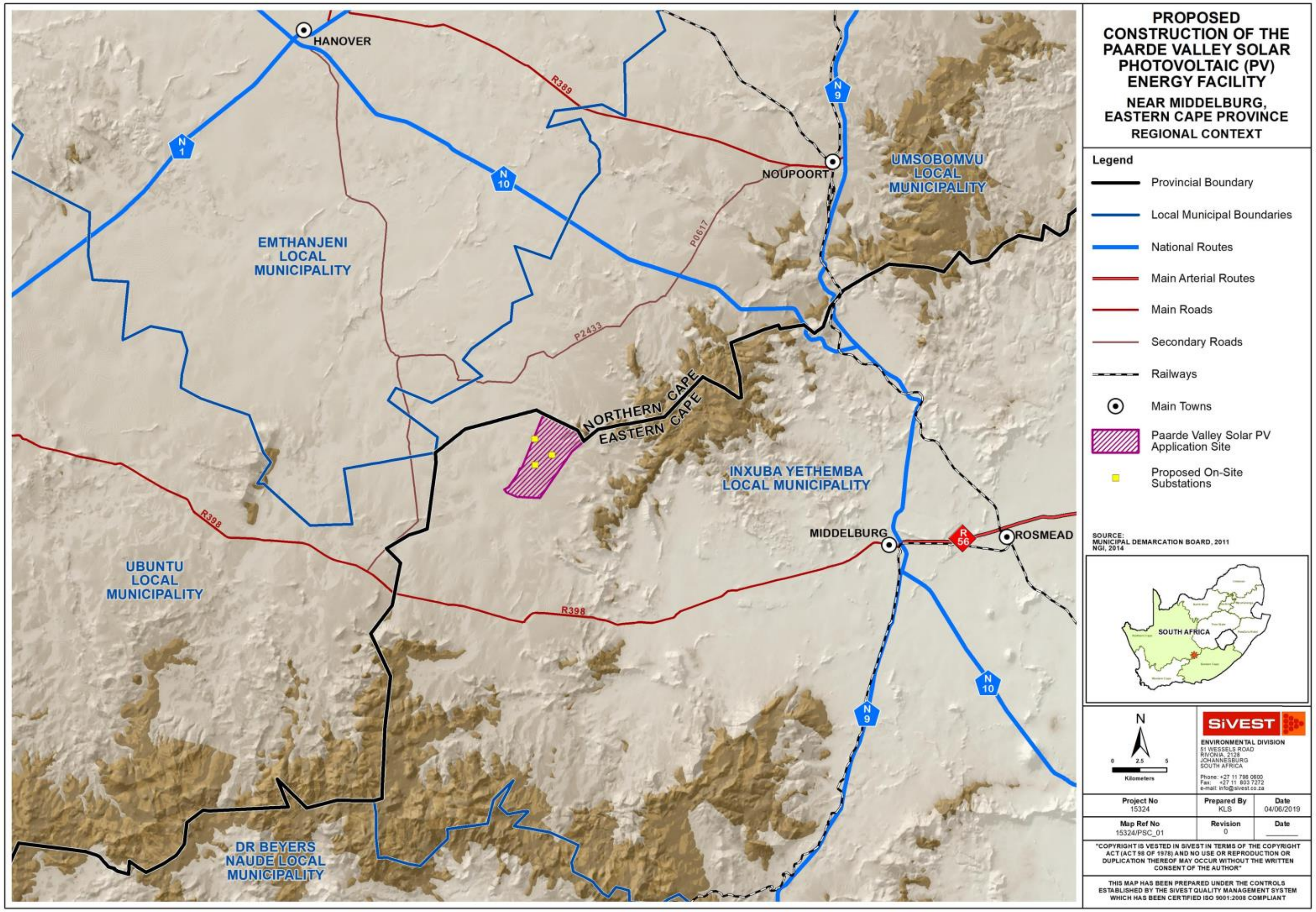

Figure 2: Paarde Valley Solar PV Energy Facility in the regional context.

1.1 Objectives of the Scoping Phase

The NEMA EIA Regulations, 2014 (as amended), state that the objective of the Scoping Phase is to, through a consultative process:

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

A Scoping Report must contain the information that is necessary for a proper understanding of the process, informing all preferred alternatives, including location alternatives, the scope of the assessment, and the consultation process to be undertaken through the EIA process. The content requirements for a Scoping Report (as provided in Appendix 2 of the EIA Regulations 2014, as amended), as well as details of which section of the report fulfils these requirements, are shown in **Table 1** below.

Table 1: Content requirements for a Scoping Report

Content Requirements	Applicable Section
(a) details of- (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae;	Details of the EAP and full project team are included in **section 1.4** on **page 9**. The expertise (including curriculum vitae) of the EAP and full project team are included in **Appendix 2**.
(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;	The location (including 21-digit Surveyor General codes) of the proposed project is detailed on **page *iii*** of the report, as well as in **section 2.1** and **section 5.2** on **page 13** and **page 74** respectively. Coordinates (corner points and centre points) of

Content Requirements	Applicable Section
(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	the application site are provided on **page *iii*** of the report, as well as in **Appendix 9A**.
(c) a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is- (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	A map of the regional locality is shown in **section 1** and **section 5.1** on **page 3** and **page 73** respectively, and the site locality is shown in **section 5.2** on **page 74**. Additionally, all project maps are included in **Appendix 5**. Coordinates are provided on **page *iii*** of the report, as well as in **section 5.2** on **page 74**. Additionally, all coordinates are included in **Appendix 9A**.
(d) a description of the scope of the proposed activity, including- (i) all listed and specified activities triggered; (ii) a description of the activities to be undertaken, including associated structures and infrastructure;	The listed and specified activities triggered as per NEMA are detailed in **section 3.1.3** on **page 25**. The technical project description is included in **section 2** on **page 12**. This includes a description of activities to be undertaken, including associated structures and infrastructure.
(e) a description of the policy and legislative context within which the development is proposed including an identification of all 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;	A description of all legal requirements and guidelines is provided in **section 3** on **page 24**. This includes key legal and administrative requirements as well as key development strategies and guidelines.
(f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	The need and desirability of the proposed project is discussed in **section 4** on **page 46**.
(g) a full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including - (i) details of all the alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	A description of the alternatives considered in terms of the Regulations is included in **section 2.3** on **page 19**. A preliminary assessment of layout alternatives is included in **section 7** on **page 255**. The public participation process followed is detailed in **section 8** on **page 260** Additionally, all public participation documents are included in **Appendix 7**. This will include a summary of issues raised by I&AP's

Content Requirements	Applicable Section
(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) the impacts and risks which have informed the identification of each alternative, including the nature, significance, consequence, extent, duration and probability of such identified impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated; (vi) the methodology used in identifying and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives; (vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (viii) the possible mitigation measures that could be applied and level of residual risk; (ix) the outcome of the site selection matrix; (x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such and (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;	and key stakeholders, and the responses to their comments. A full description of the environmental attributes within the application site is included in **section 5** on **page 73**. The impacts, risks and mitigation associated with each alternative are assessed in **section 6.2** on **page 162**. The methodology used in identifying the impacts and risks associated with each alternative is included in **section 6.1** on **page 158**. The positive and negative impacts, along with the proposed mitigation measures related to the proposed activity will have on the environment are discussed in **section 6.2** and **6.3** on **page 162**. The outcome of the site selection matrix is included in **section 4.4** on **page 68**. A concluding statement indicating the preferred alternatives is contained in **section 7.1** on **page 256** and **11.7** on **page 304.**
(h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including- (i) a description of the alternatives to be considered and assessed within the preferred site, including the option of not proceeding with the activity; (ii) a description of the aspects to be assessed as part of the environmental impact assessment process; (iii) aspects to be assessed by specialists; (iv) a description of the proposed method of assessing the environmental aspects, including aspects to be assessed by specialists; (v) a description of the proposed method of assessing duration and significance; (vi) an indication of the stages at which the competent authority will be consulted;	The plan of study for the EIA phase is included in **section 11** on **page 299**. A description of alternatives to be considered is included in **section 7 and 11.7** on **page 255** and **page 304** respectively. A summary of the aspects to be assessed is included in **section 11.3** on **page 300**. The description of the proposed EIA phase methodology is in **section 11** on **page 300**. An indication of planned authority consultation is contained in **section 11.2** on **page 300**. The particulars of the planned public participation process are

Content Requirements	Applicable Section
(vii) particulars of the public participation process that will be conducted during the environmental impact assessment process; and (viii) a description of the tasks that will be undertaken as part of the environmental impact assessment process; (ix) identify suitable measures to avoid, reverse, mitigate or manage identified impacts and to determine the extent of the residual risks that need to be managed and monitored.	included in **section 11.9** on **page 304**. All tasks to be undertaken during the EIA phase are described in **section 10** on **page 281**.
(i) an undertaking under oath or affirmation by the EAP in relation to- (i) the correctness of the information provided in the report; (ii) the inclusion of comments and inputs from stakeholders and interested and affected parties; and (iii) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	The EAP affirmation is included in **Appendix 3**.
(j) an undertaking under oath or affirmation by the EAP in relation to the level of agreement between the EAP and interested and affected parties (I&APs) on the plan of study for undertaking the environmental impact assessment;	The plan of study will be included within this DSR which will be made available for review and comment by I&APs and key stakeholders. Should any I&APs or key stakeholders identify any issues or concerns with respect to the plan of study for undertaking the EIA, it will be updated accordingly.
(k) where applicable, any specific information required by the competent authority; and	At this stage, there is no specific information required by the competent authority. However, a record of authority consultation is kept in **section 1.3** on **page 9**, and should there be any specific information requested, this will be detailed in the same section.
(l) any other matter required in terms of section 24(4)(a) and (b) of the Act.	All requirements in terms of section 24(4)(a) and (b) of the Act have been met in this report.
(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a scoping report, the requirements as indicated in such notice will apply.	The EIA process has been based on the findings of the Initial Site Sensitivity Verification which was undertaken by majority of the

Content Requirements	Applicable Section
	specialists during the Scoping Phase. In addition, all specialist assessments which have been undertaken as part of the EIA process comply with Appendix 6 of the EIA Regulations promulgated under sections 24(5) and 44 of NEMA. The specialist assessments which have been undertaken are listed in **section 1.2** on **page 8**, and the summary of the findings are detailed in **section 10.1** on **page 281**.

1.2 Specialist Studies

Specialist studies have been conducted in terms of the stipulations contained within **Appendix 6** of the 2014 NEMA EIA Regulations, as amended.

The following specialist studies have been conducted prior to and during the Scoping Phase to identify and assess the issues associated with the proposed development, as well as to comparatively assess all project alternatives:

- Terrestrial Ecology Impact Assessment;
- Avifauna Impact Assessment;
- Surface Water Impact Assessment;
- Desktop Agricultural and Soils Impact Assessment;
- Desktop Geotechnical Impact Assessment;
- Visual Impact Assessment;
- Desktop Heritage Impact Assessment; - detailed assessment (including ground-truthing) to follow in EIA phase
- Palaeontology Impact Assessment;
- Social Impact Assessment; and
- Transportation Impact Assessment.

The above-mentioned specialist studies were also undertaken to inform the impact assessment to take place in the EIA phase of the proposed development. In the scoping phase, the specialists assessed the entire application site. The specialist assessments also included the identification of sensitive areas. These sensitive areas were subsequently used during the scoping phase to inform the area for the potential erection of PV panels within the application site (referred to as the PV development area)[5]. During the EIA phase, once the layout of the solar PV energy facility has been determined, the above-mentioned specialist assessments will be updated/revised (if required) to focus on specific impacts of

[5] PV panels will not necessarily be erected in the entire proposed PV development area, particularly where PV panels cannot be placed (e.g. under the existing 400kV transmission lines).

the proposed PV array / development area and solar PV energy facility infrastructure in detail. The updates/revisions will include the following:

- a review of the findings of the specialist assessment in accordance with detailed site layouts, including the PV development areas put forward as a result of the identified sensitive areas;
- a comparative assessment of the layout alternatives provided; and
- addressing any comments or concerns arising from the public participation process.

Key issues relating to the proposed site are discussed in **section 5** and **section 6**.

It should be noted that based on the pre-application meeting held with the DEA on 19 February 2019, it was confirmed that the specialists could compile one (1) combined report covering all three (3) of the proposed Umsobomvu PV projects and grid infrastructure, provided the findings and impact assessment sections are project specific. A copy of the pre-application meeting minutes is provided in **Appendix 9B**.

1.3 Decision-Making Authority Consultation

The DEA is the competent authority on this project. As such, an application for EA for the proposed development was submitted to the DEA on Friday the 26th of July 2019. The proof of payment for the application fee, details of the EAP and declaration of Independence, declaration signed by the Applicant, the project schedule, details of landowners, landowner consents, and locality map formed part of the application form. This DSR was submitted to the DEA on the same day that the application for EA was submitted. Following the allocation of the DEA reference number, this will be included in the FSR.

It should be noted that a Pre-Application Meeting was undertaken on the 19th of February 2019 (prior to the submission of the application for EA and DSR) with representatives from the EAP, Applicant and the DEA. This meeting was undertaken in order to provide the DEA with an overview of the proposed development, to discuss details regarding the proposed EIA process, to confirm whether the DEA is in agreement with the approach proposed and to ascertain any specific requirements regarding report writing. In addition, the EAP also sought to understand the DEA's approach and policy should the proposed development uncover environmental issues during the EIA process. The pre-application meeting minutes were sent to all attendees for review and the final minutes are included in **Appendix 9B**.

1.4 Expertise of Environmental Assessment Practitioner (EAP)

SiVEST has considerable experience in the undertaking of EIAs. Staff and specialists who have worked on this proposed development and contributed to the compilation of this DSR are detailed in **Table 2** below.

Table 2: Project Team

Name	Organisation	Role
Andrea Gibb	SiVEST	Lead Project Coordinator and Visual Reviewer
Stephan Jacobs	SiVEST	Environmental Consultant / EAP
Hlengiwe Ntuli	SiVEST	Public Participation Consultant
Kerry Schwartz	SiVEST	GIS, Mapping and Visual*
Stephen Burton	SiVEST	Surface Water*
Merchandt Le Maitre	SiVEST	Transportation*
Richard Hirst	SiVEST	Transportation Reviewer
Johann Lanz	Private	Agriculture & Soils
Chris van Rooyen	Chris van Rooyen Consulting	Avifauna
Wouter Fourie	PGS Heritage	Heritage, Archaeology & Cultural Landscape
Elize Butler	Banzai Environmental for PGS Heritage	Palaeontology
Neville Bews	Dr Neville Bews & Associates	Social
David Hoare	David Hoare Consulting	Terrestrial Ecology
Salversan Kullen	JG Afrika	Geotechnical

**Specialist assessments undertaken by SiVEST's in-house specialists. Assessments will be externally reviewed by suitably qualified specialists during the EIA phase prior to the Draft Environmental Impact Assessment Report (DEIAr) being released for public review. Details regarding the specialists (including CVs) who will be appointed to undertake the external reviews of the in-house specialist assessments will be provided in the DEIAr.*

As per the requirements of the NEMA (2014, amended in 2017), the details and level of expertise of the persons who prepared the DSR are provided in **Table 3** below. The EAP Affirmation and Declaration of Independence is contained in **Appendix 3**.

Table 3: Expertise of the EAP

Environmental Assessment Practitioner	SiVEST SA (Pty) Ltd - Stephan Jacobs
Contact Details	stephanj@sivest.co.za
Qualifications	B.Sc. Environmental Sciences (undergraduate) and B.Sc. (Hons) Environmental Management and Analysis
Expertise	Stephan joined SiVEST in May 2015 and holds the position of Environmental Consultant in the Johannesburg and Pretoria offices. Stephan specialises in the field of Environmental Management and has been extensively involved in Environmental Impact Assessment (EIA) and Basic Assessment (BA) processes for various types of projects / developments, particularly energy generation and electrical distribution projects. Stephan thus has vast experience with regards to the compilation of EIAs and BAs. Additionally,

	Stephan has extensive experience in undertaking public participation and stakeholder engagement processes. Stephan has also assisted extensively in the undertaking of fieldwork and the compilation of reports for specialist studies such as Surface Water and Visual Impact Assessments. Stephan also has experience in Environmental Compliance and Auditing and has acted as an Environmental Control Officer (ECO) for several infrastructure projects.
Lead Project Coordinator	SiVEST SA (Pty) Ltd - Andrea Gibb
Contact Details	andreag@sivest.co.za
Qualifications	B.Sc. Landscape Architecture and B.Sc. (Hons) Environmental Management
Expertise	Andrea has 11 years' work experience and specialises in undertaking and managing Environmental Impact Assessments (EIAs) and Basic Assessment (BAs), primarily related to energy generation and electrical distribution projects. She has extensive experience in overseeing public participation and stakeholder engagement processes and has been involved in environmental baseline assessments, fatal flaw / feasibility assessments and environmental negative mapping / sensitivity analyses.

Please refer to attached CV's in **Appendix 2** for more information. Declarations of Independence of each specialist are contained in **Appendix 3**.

1.5 Draft Scoping Report (DSR) Structure

This Draft Scoping Report (DSR) is structured as follows:

- **Chapter 1** introduces the proposed development and explains the objectives of the Scoping Phase. The chapter also outlines the relevance of the Equator Principles as well as the IFC Performance Standards and points out the specialist studies for the proposed development. It also describes the authority consultation thus far. Furthermore, the chapter discusses the experience of the EAP as well as specialists who have contributed to the report.
- **Chapter 2** presents the technical description of the proposed development, including a description of alternatives being considered.
- **Chapter 3** expands on the relevant legal ramifications applicable to the proposed development and describes relevant development strategies and guidelines.
- **Chapter 4** provides explanation to the need and desirability of the proposed development.
- **Chapter 5** provides a description of the region in which the proposed development is intended to be located. Although the chapter provides a broad overview of the region, it is also specific to the application. It contains descriptions of the site and the specialist studies are also summarised.
- **Chapter 6** identifies potential impacts associated with the proposed solar PV energy facility. The chapter further identifies these impacts per specialist study and discusses potential cumulative impacts.
- **Chapter 7** discusses layout alternatives, including how they relate to sensitive areas identified by specialists and provides a preliminary comparison of alternatives.

- **Chapter 8** describes the Public Participation Process (PPP) undertaken during the Scoping Phase and tables issues and concerns raised by Interested and/or Affected Parties (I&APs) and key stakeholders.
- **Chapter 9** provides an assessment of the report in terms of the Equator Principles.
- **Chapter 10** provides a conclusion to the DSR and recommendations to be addressed in further assessment.
- **Chapter 11** describes the environmental impact reporting phase of the EIA (i.e. the way forward for this study) and includes the Plan of Study for EIA.
- **Chapter 12** lists references indicated in the DSR.

2 TECHNICAL DESCRIPTION

The proposed development will encompass the installation of a solar PV field and associated components, which includes on-site and collector substations, in order to generate and feed electricity into the national grid. At this stage, it is anticipated that the proposed solar PV energy facility will include PV fields (arrays) comprising multiple PV panels. The number of panels, generation capacity and the layout of the arrays will however be dependent on the outcome of the specialist studies conducted during the EIA process, as well as the area available for the erection of PV panels. Hence, the total generation capacity of the Paarde Valley Solar PV Energy Facility is unknown at this stage. The total area of the application site assessed in the scoping phase is approximately 2631ha, however, a smaller area (namely the PV development area) will be required for the solar PV arrays. This proposed PV development area has been informed by environmental sensitive areas which were identified by the respective specialists during the scoping phase, however, it will be refined and updated in the EIA phase, as required.

The PV panels being proposed will be either fixed tilt mounting or single axis tracking mounting, and the modules will be either crystalline silicon or thin film technology. Each panel will be approximately 2m wide and between 1m and 4m in height, depending on the mounting type.

Internal roads, between 4m and 10m wide, are also being proposed and will provide access to the PV arrays. Existing site roads will be used wherever possible, although new site roads will be constructed where necessary.

Up to two (2) temporary construction laydown/staging areas of approximately 10ha each will also be required. In addition, Operation and maintenance (O&M) buildings will be provided for each PV field, occupying a site of approximately 2 500m^2 (50m x 50m).

Medium voltage cabling will link the PV plant to the grid connection infrastructure (132kV overhead power line, on-site substations and collector substations). These cables will be laid underground wherever technically feasible.

New 33/132kV on-site substations and collector substations, each occupying an area of up to approximately 4ha, will be constructed. The proposed substations will act as step-up substations and will include an Eskom portion and an IPP portion, hence the substations have been included in the solar PV energy facility EIA and in the grid infrastructure BA to allow for handover to Eskom.

As mentioned, the electricity generated by the solar PV energy facility will be fed into the national grid via a 132kV overhead power line. This power line will however be assessed as part of a separate BA process.

It should be noted that the final design details are yet to be confirmed. These details will become available during the detailed design phase of the proposed development. During the scoping phase the entire application site has been assessed in order to inform the preliminary comparison of the PV development area alternatives. No layout alternatives have been identified or comparatively assessed at this stage, as these will be presented and assessed in the EIA phase once the preferred PV development area has been confirmed. As mentioned, the layout of the arrays will be dependent on the outcome of the specialist studies conducted during the EIA process, as well as the area available for the erection of PV panels. The layout alternatives have been discussed in **Chapter 7** and are presented in the Plan of Study for the EIA Phase (**Chapter 11**).

2.1 Project Location

The proposed solar PV energy facility is located approximately 29km north-west of Middelburg, within the Inxuba Yethemba Local Municipality, in the Chris Hani District Municipality of the Eastern Cape Province.

The application site which was assessed in the scoping phase is approximately 2631ha in extent and includes the following property:

- Portion 2 of the Farm Paarde Valley No. 62.

The project site has been identified based on solar resource, grid connection suitability, competition, topography, land availability and site access.

The proposed development location is shown in the locality map (**Figure 3**) below.

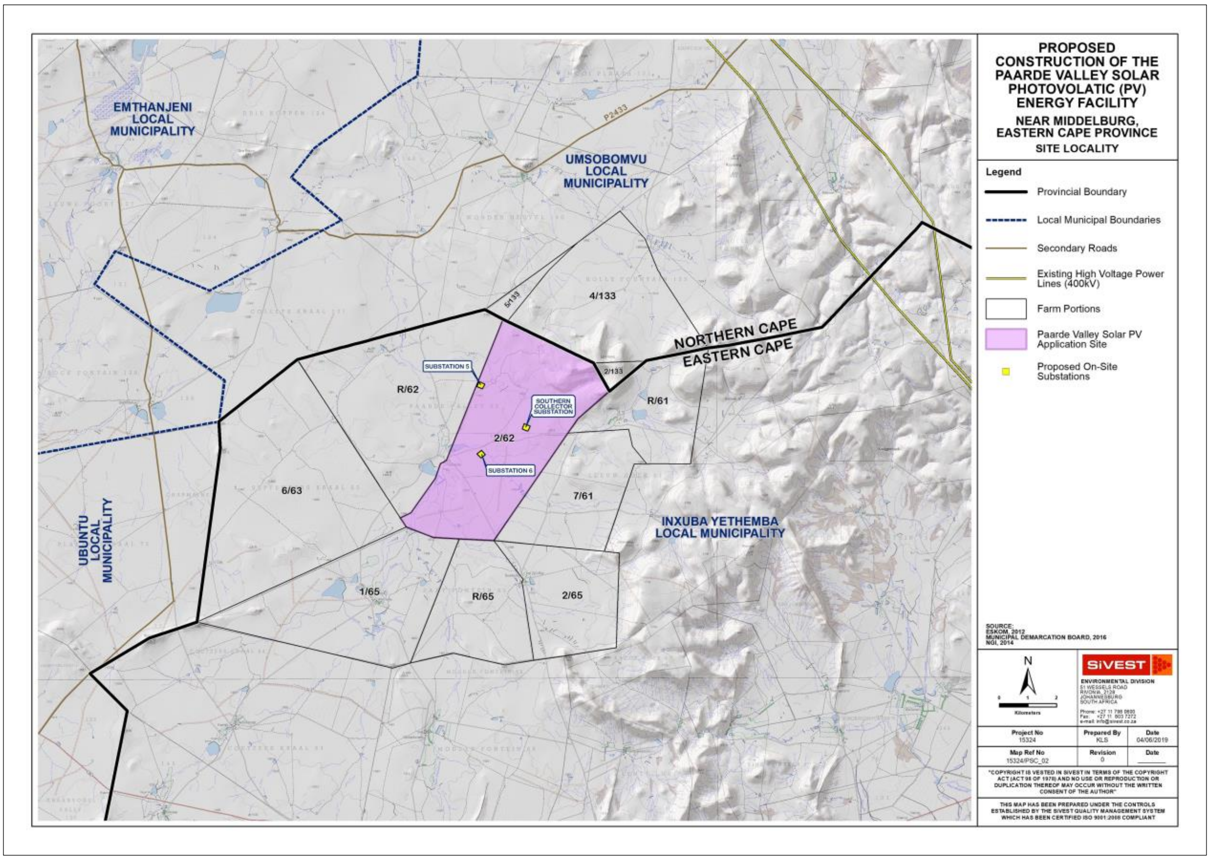

Figure 3: Proposed solar PV energy facility site locality map

It should be noted that following the identification of sensitive areas, Portion 7 of the Farm Leeuw Hoek No. 61 (property adjacent to application site assessed in scoping phase, to East) was identified for inclusion into the application site which was assessed during the scoping phase. Due to the prohibitive size of the PV development area, after the areas identified as no-go from an environmental perspective were excluded, it was proposed that this property also should be incorporated into the application site to ensure sufficient land is available for the proposed development. This property will be included in the application site and assessed in the EIA phase.

2.2 Solar PV Energy Facility Technical Details

Paarde Valley Solar Power is proposing the construction of a solar PV energy facility and associated infrastructure, which includes on-site and collector substations, on the development site near Middelburg. As mentioned, the overall objective of the proposed development is to generate electricity by means of renewable energy technologies capturing solar energy to feed into the National Grid. The generation capacity of the proposed solar PV energy facility has not been determined yet and will be dependent on the outcome of the specialist studies conducted during the EIA process, as well as the area available for the erection of PV panels. The proposed on-site and collector substations will have a voltage capacity of up to 33/132kV and will be step-up substations.

The key technical details and infrastructure required are presented in the table below (**Table 4**).

Table 4: Paarde Valley Solar PV Energy Facility summary of key components

PROJECT	DEA REFERENCE	FARM NAME AND AREA
Paarde Valley Solar PV Energy Facility	To be Allocated	▪ Portion 2 of the Farm Paarde Valley No. 62. **Area of Application Site Assessed in Scoping Phase = 2631 hectares (ha)** *Following the identification of sensitive areas, Portion 7 of the Farm Leeuw Hoek No. 61 (property adjacent to application site assessed in scoping phase, to East) was identified for inclusion into application site which was assessed during the scoping phase. This property will be included in the application site and assessed in the EIA phase. The area of the new application site will thus be provided in the DEIAr.*
TECHNICAL DETAILS OF ASSOCIATED INFRASTRUCTURE		
	PV field (array)	▪ PV field (array) will comprise of multiple PV panels ▪ Number of panels and layout of arrays will be dependent on outcome of specialist studies conducted during EIA process, as well as area available for erection of PV panels
	PV panels	▪ PV panels will be either fixed tilt mounting or single axis tracking mounting, and modules will be either crystalline silicon or thin film technology ▪ Each panel will be approx. 2m wide and between 1m and 4m in height, depending on mounting type
	Access roads	▪ Internal roads, between 4m and 10m wide, will provide access to PV arrays ▪ Existing site roads will be used wherever possible, although new site roads will be constructed where necessary
	Substations	▪ New 33/132kV on-site substations and collector substations, each occupying an area of up to approx. 4ha ▪ Will be step-up substations which will include an Eskom portion and an IPP portion
	Temporary construction laydown/staging area	▪ Up to two (2) areas of approx. 10ha each
	Operation and maintenance (O&M) buildings	▪ O&M buildings will be provided for each PV field, occupying a site of approx. 2 500m^2 (50m x 50m)
	On-site IPP Electrical infrastructure	▪ On-site IPP substations and IPP collector substations ▪ Medium voltage cabling will link PV facility to grid connection infrastructure ▪ Cables will be laid underground wherever technically feasible, and overhead power lines will be used if required

As mentioned, the proposed solar PV energy facility forms one (1) of three (3) solar PV energy facilities that are being proposed on adjacent farms as part of the greater Umsobomvu PV project. The proposed developments which form part of the greater Umsobomvu PV project include the following:

- Mooi Plaats Solar PV – **DEA Reference Number:** To be Announced (part of a separate on-going EIA process); and
- Wonderheuvel Solar PV – **DEA Reference Number:** To be Announced (part of a separate on-going EIA process).

In addition, a 132kV overhead power line and 33/132kV on-site and collector substations (namely the associated electrical infrastructure) are also being proposed to feed the electricity generated by the proposed solar PV energy facility into the national grid. The associated electrical infrastructure will however require a separate EA and is subject to a separate BA process (**DEA Reference Number:** To be Allocated). The associated electrical infrastructure has been included in the solar PV energy facility EIA for background information but will be authorised under a separate BA to allow for handover to Eskom. The on-site and collector substations will be step-up substations and will include an Eskom portion and an IPP portion, hence the substations have been included in the solar PV energy facility EIA and in the associated electrical infrastructure BA to allow for handover to Eskom.

2.2.1 Solar Field

At this stage, it is anticipated that the proposed Solar PV energy facility will include PV fields (arrays) comprising multiple PV panels. Solar PV panels are usually arranged in rows consisting of a number of PV modules. The area required for the PV arrays will likely need to be entirely cleared or graded.

As mentioned, the number of panels, generation capacity and the layout of the arrays will be dependent on the outcome of the specialist studies conducted during the EIA process, as well as the area available for the erection of PV panels. The PV panels will be either fixed tilt mounting or single axis tracking mounting, and the modules will be either crystalline silicon or thin film technology. Each PV panel will be approximately 2m wide and between 1m and 4m in height, depending on the mounting type. The solar PV modules are variable in size and are dependent on advances in technology between project inception and project realisation. The actual size of the PV modules to be used will be determined in the final design stages of the proposed development. The PV modules are mounted on metal frames. Rammed piles are commonly used for the support of such structures.

The typical components of a solar PV panel are illustrated in **Figure 4** below.

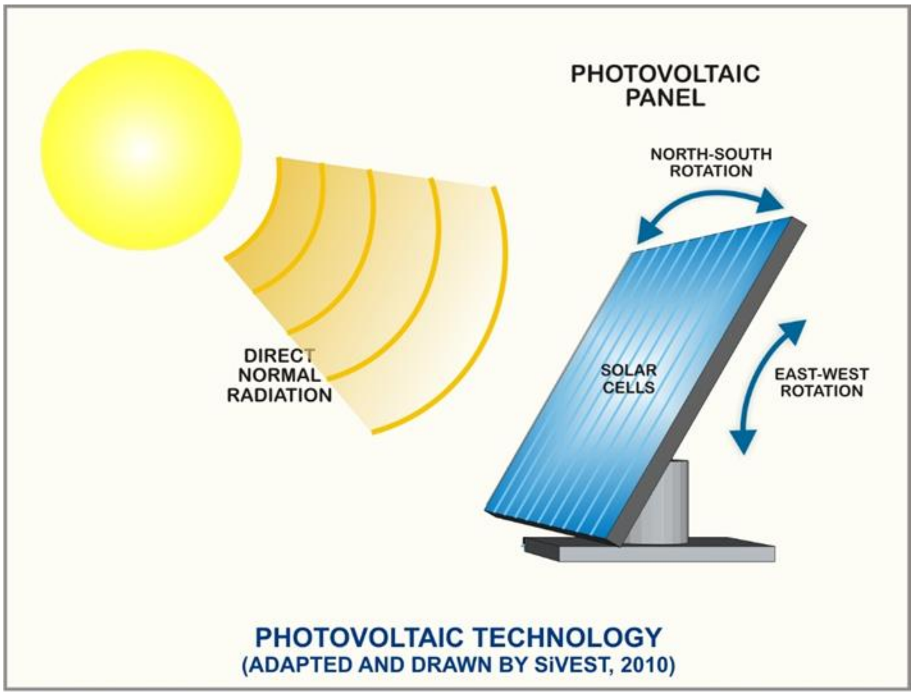

Figure 4: Typical components of a solar PV Panel

2.2.2 On-site / Collector Substations

The proposed development will include the construction of new on-site substations and collector substations, each occupying an area of up to approximately 4ha. The substations will be step-up substations which will have a capacity of 33/132kV. In addition, the substations will include an Eskom portion and an IPP portion, hence the on-site and collector substations have been included in the solar PV energy facility EIA and in the grid infrastructure BA to allow for handover to Eskom.

2.2.3 Underground Cabling

Medium voltage cabling will be utilised to link the proposed solar PV energy facility to the grid connection infrastructure (132kV overhead power line, on-site substations and collector substations). These cables will be laid underground wherever technically feasible.

2.2.4 Electrical Infrastructure

The solar arrays are usually connected in strings, which are in turn connected to inverters. DC power from the panels will be converted into AC power in the inverters and the voltage will be typically stepped up to a medium voltage in the transformers. As mentioned, medium voltage cabling will link the solar PV energy facility to the grid connection infrastructure (132kV overhead power line and 33/132kV on-site and collector substations). The medium voltage cables will be run underground (wherever technically feasible) in the facility before being fed to the on-site and/or collector substation, where the voltage will typically be stepped up. An on-site overhead power line with a voltage capacity of 132kV will run from the on-site and/or collector substation to the proposed connection point at the Hydra D Main Transmission Substation (MTS) or the proposed Coleskop Wind Energy Facility (WEF) substation (depending on which option is chosen as 'preferred'), both of which will still be constructed (part of a separate BA process).

The solar PV electricity generation process is illustrated in **Figure 5** below.

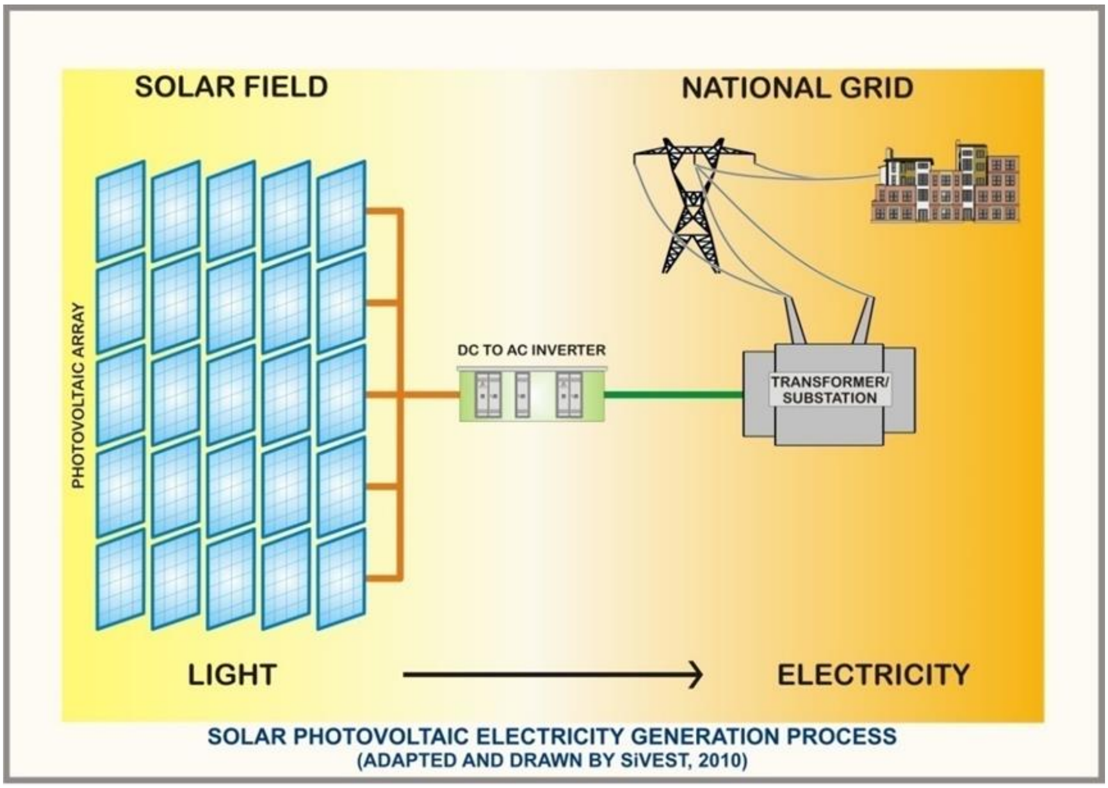

Figure 5: Solar PV electricity generation process

2.2.5 Roads

Internal roads, between 4m and 10m wide, will provide access to the PV arrays. Existing site roads will be used wherever possible, although new site roads will be constructed where necessary.

2.2.6 Temporary Infrastructure

Temporary infrastructure in the form of construction laydown/staging areas will be required for the construction phase of the proposed development. Up to two (2) temporary construction laydown/staging areas of approximately 10ha each will be used during the construction phase.

2.2.7 Other Associated Infrastructure

Other infrastructure includes the following:

- Operation and maintenance (O&M) buildings for each PV field, occupying a site of approximately 2 500m^2 (50m x 50m).

2.3 Alternatives

As per the 2014 EIA Regulations (as amended), feasible and reasonable alternatives are required to be considered during the EIA process. Alternatives are defined in Chapter 1 of the 2014 EIA Regulations (as amended) as "*different means of meeting the general purpose and requirements of the activity*". These alternatives may include:

(a) The property on which or location where it is proposed to undertake the activity;
(b) The type of activity to be undertaken;
(c) The design or layout of the activity;
(d) The technology to be used in the activity;
(e) The operational aspects of the activity; and
(f) The option of not implementing the activity.

Each of the alternatives in relation to the proposed development is discussed in the sections below.

2.3.1 The property on which or location where it is proposed to undertake the activity

No site alternatives for this proposed development are being considered as the placement of solar PV installations is dependent on several factors, all of which are favourable at the proposed site location. These include solar resource, climate, topography, grid connections and access to the site. The project site has been identified through a pre-feasibility desktop analysis based on the estimation of the solar energy resource as well as weather, dust and dirt effects. The Eastern Cape Province in South Africa has favourable solar irradiation potential. The project site receives an annual Global Horizontal Irradiation (GHI) ranging from approximately 1534 to 1972kWh/m^2/year and higher (**Figure 6**). It should be noted that more accurate results from on-site measurements will be provided during the EIA phase (if available).

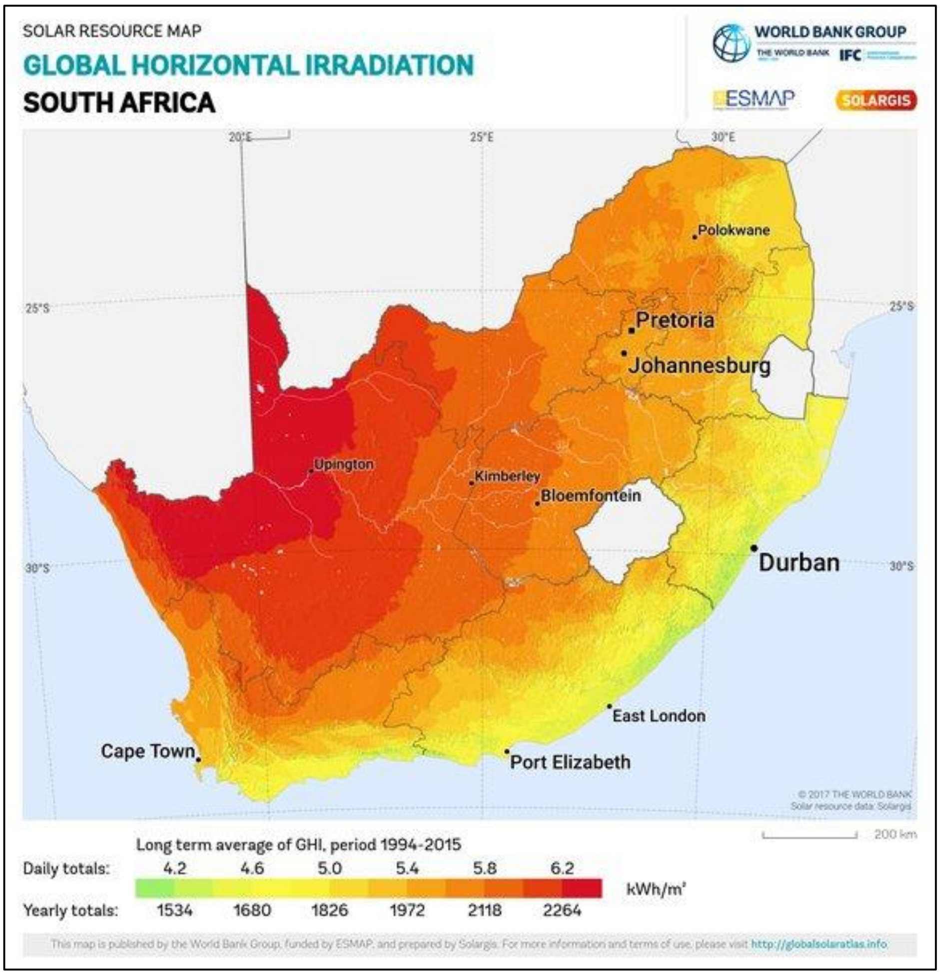

Figure 6: Global Horizontal Irradiation (GHI) map (Source **-** 2017 The World Bank, Solar resource data: SolarGis)

The project site will have access to the national grid via the Hydra D MTS or the proposed Coleskop WEF substation (depending on which option is chosen as 'preferred'), both of which will still be constructed. There are two (2) operational projects which are located within a 35km radius of the proposed site, namely the Linde SEF and Noupoort Wind Farm, in addition to several other renewable energy developments which are being proposed or have already received approval. The project site has a relatively flat topography which is suitable for the development of a solar PV energy facility. The project site is easily accessible via an existing dirt secondary road which connects to the tarred N10 national road. The proposed site is therefore considered highly suitable for the proposed development and no other locations are being considered.

2.3.2 The type of activity to be undertaken

No other activity alternatives are being considered. Renewable energy development in South Africa is highly desirable from a social, environmental and development point of view. Based on the relatively flat terrain, the climatic conditions and current land use being agricultural, it was determined that the proposed site would be best-suited for a solar PV energy facility, instead of any other type of renewable energy technology. The proposed site was selected due to the terrain being in the lower flat areas, instead of the adjacent mountainous areas. Wind energy installations are not feasible on the site as it is generally preferred to install wind energy facilities on elevated ground. In addition, concentrated solar power (CSP) installations are not feasible because they have a high water requirement and the project site is located in an arid area. There is also not enough rainfall in the area to justify a hydro-electric plant. Therefore, no technology alternatives are feasible for assessment at this stage of the proposed development other than a solar PV energy facility.

One (1) type of activity is therefore considered (namely a solar PV energy facility) in order to generate energy from a renewable source of energy, solar energy.

2.3.3 The design or layout of the activity

No layout alternatives for the laydown areas and O&M buildings have been identified or comparatively assessed at this stage. These will be informed by the identified environmental sensitive areas and will be presented and assessed in the EIA phase. Two (2) grid connection infrastructure alternatives (which include on-site and collector substation sites and 132kV power line corridors) have however been comparatively assessed by the respective specialists. These alternatives essentially provide for two (2) different route alignments with associated substations (on-site and collector) contained within an assessment corridor of approximately 400m wide. It should be noted that the substation sites included as part of this application are intrinsically linked to the associated electrical infrastructure project (part of a separate BA process which will be initiated at a later stage). Although the specialists assessed the grid connection infrastructure alternatives as part of their respective assessments, these will be comparatively assessed as part of the associated electrical infrastructure BA and will inform the location of the on-site and collector substation sites (to be presented in EIA phase).

All alternatives will be presented, extensively investigated and assessed in the EIA phase of the proposed development (see the plan of study for the EIA phase in **Chapter 11**). The alternatives will include alternative locations for the laydown area and O&M buildings[6]. The layout alternatives will be based on both environmental constraints and design factors.

It should be noted that prior to the submission of the DSR, a preliminary PV development area was considered by the applicant. However, in order to ensure that the proposed development avoids the sensitive areas identified by the specialists, the preliminary PV development area was subsequently amended. During the scoping phase the preliminary PV development area was comparatively assessed with the proposed PV development area, which was informed by the identified sensitive areas, in order to assess and confirm that it would be 'preferred' from an environmental perspective. The results of the comparative assessment of the PV areas is provided in **Chapter 7**.

[6] The on-site and collector substation site alternatives will not be comparatively assessed as part of this EIA as the substation locations are intrinsically linked to the grid connection infrastructure alternatives (which include on-site and collector substation sites and 132kV power line corridors). The preferred alternatives will be informed by the BA process (part of a separate BA process) and will be put forward in the EIA phase.

2.3.4 *The technology to be used in the activity*

There are very few technological alternatives for PV technology. For the Paarde Valley Solar PV Energy Facility the PV panels will be either fixed tilt mounting or single axis tracking mounting, and the modules will be either crystalline silicon or thin film technology. Each panel will be approximately 2m wide and between 1m and 4m in height, depending on the mounting type. The impacts on the environment of the different types of PV technology are the same during construction, operation and decommissioning. Therefore, no technology alternatives will be considered during the EIA process. The choice of technology used will ultimately be determined by technological and economic factors at a later stage.

2.3.5 *The operational aspects of the activity*

No operational alternatives were assessed in the EIA, as none are available for solar PV installations.

2.3.6 *'No-go' alternative*

The '*No-go*' alternative is the option of not implementing the proposed development. Should the proposed development not be implemented, the current agricultural land uses would continue including rural agriculture (small stock grazing) and limited tourism.

On a regional scale, the '*No-go*' alternative is also not preferred. Renewable energy facilities are key to the success of South Africa's plan to build resilience against climate change. South Africa currently relies almost completely on fossil fuels as a primary energy source (approximately 90%). Coal combustion in South Africa is the main contributor to carbon dioxide emissions, which is one (1) of the main greenhouse gasses that has been linked to climate change. With the global focus on climate change, the government is under pressure to explore alternative energy sources in addition to coal-fired power stations.

An emphasis has therefore been placed on securing South Africa's future power supply through the diversification of power generation sources. Furthermore, South Africa would have to invest in a power generation mix, and not solely rely on coal-fired power generation, to honour its commitments made under the Copenhagen Accord and subsequent Paris Agreement (ratified during November 2016) to mitigate climate change challenges. Under the Paris Agreement, the country committed to working towards the goal of holding the increase in global average temperature to well below 2 degrees Celsius and pursuing efforts to limit the global temperature increase to 1.5 degrees Celsius.

The DEA acknowledges the risks posed to South Africa by climate change confirming that '*South Africa has been experiencing the severe effects of drought conditions catalysed by the worst El Nino event in decades. The rising sea temperatures in the Pacific Ocean that resulted in increased temperatures and reduced rainfall in many parts of the world, was exacerbated by rising global temperatures associated with climate change. South African scientists and weather forecasters warn that this is what can be expected in the decades to come, if ambitious global action is not taken urgently to reduce the concentration of greenhouse gases in the atmosphere'* (DEA, 2016b).

The current South African plan to achieve the goal set under the Paris Agreement, is rated as Highly Insufficient due to an unresolved strategy to secure a ‘just transition’ from coal to renewables, successfully and timeously implement a carbon tax and update the Integrated Resource Plan (Refer to **Section 2.3.2** for more information). In December 2011, Climate Action Tracker rated South Africa’s plan as Medium as at the time we committed to increasing renewable energy to enable our emissions to peak between 2020 and 2025. Based on the dismal performance to date downgrading our climate action plan from medium to highly insufficient, it is clear that the trajectory South Africa is on is insufficient to reach the goals set to avoid catastrophic climate change.

With an increasing demand in energy predicted and growing environmental concerns about fossil fuel-based energy systems, the development of large-scale renewable energy supply schemes is strategically important for increasing the diversity of domestic energy supplies and avoiding energy imports in the country.

Although solar power is not the only solution to solving the energy crisis in South Africa, not establishing the proposed solar PV energy facility and associated infrastructure would be detrimental to the mandate that the government has set to promote the implementation of renewable energy. It is a suitable sustainable solution to the energy crisis and this project could contribute to addressing the problem. This proposed development will aid in achieving South Africa’s goals in terms of sustainability, energy security, mitigating energy cost risks, local economic development and national job creation. It is a suitable sustainable solution to the energy crisis and this proposed development could contribute to addressing the problem. This proposed development will aid in achieving South Africa’s goals in terms of sustainability, energy security, mitigating energy cost risks, local economic development and national job creation.

From a social perspective, the ‘no go’ option would mean that the social environment is not affected as the status quo would remain. On a negative front it would also mean that all the positive aspects associated with the proposed development would not materialise. Consequently, there would be no job creation, no revenue streams into the local economy and municipal coffers and a lost opportunity to enhance the national grid with a renewable source of energy. Considering that Eskom’s coal-fired power stations are a huge contributor to carbon emissions the loss of a chance to supplement the National Grid through renewable energy would be significant at a national, if not at a global level. The Intergovernmental Panel on Climate Change (6 October 2018, p. 15) has warned that that Co_2 emissions need to be reduced by 45% from 2010 levels by 2030 and to zero by 2050, which basically means that coal must go.

From an avifaunal perspective, the ‘no-go’ alternative will result in the current status quo being maintained as far as the avifauna is concerned. The low human population in the area is definitely advantageous to avifauna. The ‘no-go’ option would therefore eliminate any additional impact on the ecological integrity of the proposed development area as far as avifauna is concerned.

The ‘*No-go*’ option is a feasible option, however, this would prevent the proposed development from contributing to the significant environmental, social and economic benefits associated with the development of the renewables sector.

3 LEGAL REQUIREMENTS AND GUIDELINES

3.1 Key Legal and Administrative Requirements Relating to the Proposed Development

3.1.1 Constitution of South Africa

The Constitution of South Africa (No. 108 of 1996) provides environmental rights and includes implications for environmental management. Section 24 of the Constitution 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 is the overarching legislation for South Africa. Although it provides for certain rights and obligations, the NEMA has been promulgated in order to manage the various spheres of both the social and natural environment.

3.1.2 National Environmental Management Act (NEMA) (Act No. 107 of 1998) – NEMA EIA Requirements

The National Environmental Management Act (NEMA) (Act No. 107 of 1998) was promulgated in 1998 but has since been amended on several occasions from this date. This Act replaces parts of the Environment Conservation Act (ECA) (Act No. 73 of 1989) with exception to certain parts pertaining to Integrated Environmental Management.

The act intends to provide for:

- co-operative environmental governance by establishing principles for decision-making on matters affecting the environment;
- institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by organs of state;
- to provide for the prohibition, restriction or control of activities which are likely to have a detrimental effect on the environment; and
- to provide for matters connected therewith.

The NEMA is the overarching legislation which governs the EIA process and environmental management in South Africa. Sections 24 and 44 of the NEMA make provision for the promulgation of regulations that identify activities which may not commence without an EA. Activities that may significantly affect the environment must be considered, investigated and assessed prior to implementation. Comprehensive lists of such activities were gazetted and it the proposed Paarde Valley Solar PV Energy Facility triggers activities from all three (3) listing notices (namely GN R. 324, 325 and

327 as published on 7 April 2017) gazetted on 7 April 2017 (Government Gazette 326) (the "EIA Regulations").

Therefore, a full EIA process is required for the proposed development in terms of Section 21 to 24 of the 2014 EIA Regulations (as amended).

3.1.3 NEMA EIA Regulations, 2014 (as amended)

In terms of these Regulations, a full EIA is required for the proposed development based on triggered activities. However, several activities which trigger a BA were also identified and also need to be specified. Ultimately, these activities will not form a separate assessment, but will fall into the greater EIA.

The following Schedules of the Government Notice No. R. 983, 984 and 985 of 4 December 2014 (as amended) are of relevance to the proposed development in question. All of the Listed Activities identified in terms of Sections 24(2) and 24D include:

Table 5: Listed activities in terms of the NEMA Regulations

Activity No(s):	Provide the relevant Basic Assessment Activity(ies) as set out in Listing Notice 1 (GN R. 983) (as amended)	Describe the portion of the proposed project to which the applicable listed activity relates.
11 (i)	**GN R. 983 Item 11:** *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.*	**New on-site substations and collector substations will be constructed as part of the proposed development. The proposed substations will be located outside an urban area and will have a capacity of 33/132 kilovolts (kV). In addition, the substations will likely each occupy a footprint of approximately 4ha.**
12 (ii) (a) (c)	**GN R. 983 Item 12:** *The development of:* *ii) infrastructure or structures with a physical footprint of 100 square metres or more;* *where such development occurs-* *(a) within a watercourse;* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.*	**The proposed Solar PV Energy Facility will likely entail the construction of buildings and other infrastructure with a physical footprint of approximately 2 500m^2 (50m x 50m). The Solar PV infrastructure will likely avoid the identified surface water features where possible, although some structures may occur within a watercourse and/or within 32m of a watercourse.**
19	**GN R. 983 Item 19:** *The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;*	**The surface water impact assessment revealed that there are surface water features located within the application site. The proposed development will thus likely involve the excavation, removal, infilling, depositing and moving of more than 10m^3 of soil, sand,**

		pebbles or rock from some of the identified watercourses. **Although the layout of the proposed development will be designed to avoid the identified surface water features / watercourses as far as possible, some of the internal and access roads may need to traverse the identified surface water features and during construction of these roads, soil may need to be removed from some of the identified watercourses.**
24 (ii)	**GN R. 983 Item 24:** *The development of a road –* *ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;*	**Internal access roads will be required to access the PV panels and substations. It is proposed that these internal access roads will be between 4m and 10m wide. Existing roads will be used wherever possible, although new roads will be constructed where necessary.**
28 (ii)	**GN R. 983 Item 28:** *Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:* *(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;*	**The proposed development site is currently used and zoned for agricultural purposes and will result in special zoning being required, as an area greater than 1ha will likely be transformed into industrial / commercial use.**
Activity 48 (i) (a) (c)	**GN R. 983 Item 48:** The expansion of *(i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more;* *where such expansion occurs—* *(a) within a watercourse; or* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;*	**The proposed development will most likely entail the expansion (upgrading) of roads and other infrastructure by 100m^2 or more within a watercourse or within 32m from the edge of a watercourse.** **Although the layout of the proposed development will be designed to avoid the identified surface water features / watercourses as far as possible, some of the internal and access roads to be upgraded will likely need to traverse the identified surface water features and construction will likely occur within some of the watercourses and/or be within 32m of some of the watercourses.**
56 (ii)	**GN R. 983 Item 56:** *The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre -*	**As mentioned, internal access roads will be required to access the PV panels and the substations. Existing roads will**

	(ii) where no reserve exists, where the existing road is wider than 8 metres –	**be used wherever possible, although new roads will be constructed where necessary. The existing access roads might thus need to be upgraded by widening them more than 6m, or by lengthening them by more than 1km.**
Activity No(s):	**Provide the relevant Scoping and EIR Activity(ies) as set out in Listing Notice 2 (GN R. 984) (as amended)**	**Describe the portion of the proposed project to which the applicable listed activity relates.**
1	**GN R. 984 Item 1:** *The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more,*	**The proposed development will entail the development of a Solar PV Energy Facility where the electricity output will be 20MW or more. The proposed development will be located outside an urban area.**
15 (i) (ii)	**GN R. 984 Item 15:** *The clearance of an area of 20 hectares or more of indigenous vegetation*	**The proposed solar PV development will involve the clearance of more than 20ha of indigenous vegetation. Clearance will also be required for the proposed substations, internal access roads and other associated infrastructure.** **An ecology impact assessment was undertaken to assesses the impacts of the proposed development on vegetation.**
Activity No(s):	**Provide the relevant Basic Assessment Activity(ies) as set out in Listing Notice 3 (GN R. 985) (as amended)**	**Describe the portion of the proposed project to which the applicable listed activity relates.**
Activity 18 a. i. (ii) (kk)	**GN R. 985 Item 18:** *The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre-* ***a. Eastern Cape*** *i. Outside urban areas:* *(ii) Areas on the watercourse side of the development setback line or within 100 metres from the edge of a watercourse where no such setback line has been determined* *(kk) A watercourse;*	**As mentioned, internal access roads will be required to access the PV panels and the substations. Existing roads will be used wherever possible, although new roads will be constructed where necessary. It is likely that existing access roads will need to be upgraded. Internal access roads will likely be widened by more than 4m, or lengthened by more than 1km. These roads will occur within the Eastern Cape Province, outside an urban area. In addition, this widening of the roads will occur within a watercourse and/or within 100m from the edge of a watercourse.** **A surface water impact assessment was undertaken to assesses the impacts of this infrastructure on the identified watercourses.**

3.1.4 Environmental Impact Assessment (EIA) Guideline for Renewable Energy Projects, DEA Notice 989 of 2015

The purpose of this document is primarily to provide guidance on the environmental management legal framework applicable to renewable energy operations and all the role players in the sector. The guideline is principally intended for use by the following stakeholder groups:

- Public Sector Authorities (as regulator and/or competent authority);
- Joint public sector authorities and project funders (e.g., Eskom, IDC, etc.);
- Private Sector Entities (as project funder/developer/consultant); and
- Other interested and affected parties (as determined by the project location and/or scope).

This guideline seeks to identify activities requiring authorisation prior to commencement of that activity and provide an interface between national EIA regulations and other legislative requirements of various authorities.

The guidelines are applicable for the construction, installation and/or development of the following renewable energy projects:

- Concentrating Solar Power (CSP) Plant;
- Wind Energy Facility;
- Hydropower Station; and
- Photovoltaic (PV) Power Plant.

As the proposed development is for a solar PV energy facility, it is subject to the recommendations proposed in the guidelines.

3.1.5 National Energy Act (Act No. 34 of 2008)

South Africa has two (2) acts that direct the planning and development of the country's electricity sector, namely:

i. The National Energy Act of 2008 (Act No. 34 of 2008); and
ii. The Electricity Regulation Act (ERA) of 2006 (Act No. 4 of 2006) (see **section 3.1.6**).

The National Energy Act (Act No. 34 of 2008), promulgated in 2008, has, as one (1) of its key objectives, the promotion of diversity of supply of energy and its sources. From this standpoint, the Act directly references the importance of the RE sector, with a mention of the solar energy sector included. The aim is to ensure that the South African economy is able to grow and develop, fast-tracking poverty alleviation, through the availability of a sustainable, diverse energy mix. Moreover, the goal is to provide for the increased generation and consumption of RE (Republic of South Africa, 2008).

3.1.6 Electricity Regulation Act (Act No. 4 of 2006)

In 2011, the electricity regulation on new generation capacity was published under Section 35(4) of the Electricity Regulation Act (ERA) (Act No. 4 of 2006). These regulations apply to the procurement of new generation capacity by organs of state.

The objectives of the regulations include:

- To facilitate planning for the establishment of new generation capacity;
- The regulation of entry by a buyer and a generator into a Power Purchase Agreement (PPA);
- To set minimum standards or requirements for PPAs;
- The facilitation of the full recovery by the buyer of all costs efficiently incurred by it under, or in connection with, a PPA including a reasonable return based on the risks assumed by the buyer thereunder and to ensure transparency and cost reflectivity in the determination of electricity tariffs; and
- The provision of a framework for implementation of an IPP procurement programme and the relevant agreements concluded.

The Act establishes a National Energy Regulator as the custodian and enforcer of the National Electricity Regulatory Framework. The Act also provides for licenses and registration as the manner in which generation, transmission, distribution, trading and the import and export of electricity are regulated.

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

This Act requires investigation to determine the impact of heritage resources when developments exceed the thresholds listed in section 38(1) of the act:

(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 5000m^2 in extent; or
(ii) involving three (3) or more existing erven or subdivisions thereof; or
(iii) involving three (3) or more erven or divisions thereof which have been consolidated within the past five (5) years; or
(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
(d) the re-zoning of a site exceeding 10000m^2 in extent; or
(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,

The proposed development would involve; (a) the construction of linear infrastructure exceeding 300m in length, (c) the development of a solar PV energy facility that will change the character of more than 0.5ha and (d) the rezoning of a site that will exceed 1ha.

The law ensures community participation in the protection of national heritage resources and will involve all three (3) levels of government in the management of the country's national heritage. The South African Heritage Resources Agency (SAHRA) will establish and maintain a national policy, strategy plans and standards for heritage resources management and will monitor the system as a whole.

A Desktop Heritage Impact Assessment has been conducted to explore how the proposed development may impact on heritage resources as protected by the Act. It should be noted that further field truthing will need to be undertaken through an archaeological walk down. The aim of this will be to compile a comprehensive database of heritage sites within the PV development area, with the aim of developing a heritage management plan for inclusion in the EMPr. This field truthing exercise can however only be undertaken once the layout of the solar PV energy facility and associated infrastructure has been determined, based on the findings of the other specialist studies.

In addition, the Eastern Cape Provincial Heritage Resources Agency (ECPHRA) will be consulted throughout the EIA process in order to obtain comments on the proposed development from a heritage perspective. SAHRA confirmed that the ECPHRA has been assessed to be competent to perform all function of the NHRA and therefore all section 38(1) and 38(8) applications in the Eastern Cape are processed by them (refer to correspondence from SAHRA included in **Appendix 7D**).

3.1.8 National Water Act (NWA) (Act No. 36 of 1998, as amended)

The National Water Act (NWA) (Act No. 36 of 1998), as amended, was promulgated on the 20th of August 1998. This Act was created in order to ensure the protection and sustainable use of water resources (including wetlands) in South Africa. This Act is important in that it provides a framework to protect water resources against over-exploitation and to ensure that there is water for socio-economic and economic development, human needs and to meet the needs of the aquatic environment. The Act also recognises that water belongs to the whole nation for the benefit of all people.

It is important to note that water resources (including wetlands) are protected under the Act. Under the NWA, a 'water resource' includes a watercourse, surface water, estuary, or aquifer. Specifically, a watercourse is defined as (*inter alia*):

- A river or spring;
- A natural channel in which water flows regularly or intermittently; and
- A wetland, lake or dam into which, or from which, water flows.

One (1) of the main aims of the Act is the protection of water resources. 'Protection' in relation to a water resource entails:

- Maintenance of the quality of the water resource to the extent that the water use may be used in a sustainable way;

- Prevention of degradation of the water resource; and
- The rehabilitation of the water resource.

In the context of the proposed development and any potential impact on water resources, the definition of pollution and pollution prevention contained within the Act is relevant. 'Pollution', as described by the Act, is the direct or indirect alteration of the physical, chemical or biological properties of a water resource, so as to make it (*inter alia*):

- less fit for any beneficial purpose for which it may reasonably be expected to be used; or
- harmful or potentially harmful to the welfare of human beings, to any aquatic or non-aquatic organisms, or to the resource quality.

This definition of pollution is quite wide-ranging, and it applies to all types of water resource. The inclusion of physical properties of a water resource within the definition of pollution entails that any physical alterations to a water body (for example, the excavation of a wetland or changes to the morphology of a water body) can be considered to be pollution. Activities which cause alteration of the biological properties of a watercourse (i.e. the fauna and flora contained within that watercourse) are also considered pollution.

In terms of section 19 of the Act, owners / managers / people occupying land on which any activity or process undertaken which causes / or is likely to cause pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring. These measures may include measures to (*inter alia*):

- measures to cease, modify, or control any act or process causing the pollution;
- comply with any prescribed waste standard or management practice;
- contain or prevent the movement of pollutants;
- remedy the effects of the pollution; and
- remedy the effects of any disturbance to the bed and banks of a watercourse.

From a licensing perspective, according to the NWA, the following are considered 'water uses' and will require a water use license application (WULA):

a) Taking water from a water resource;
b) Storing water;
c) Impeding or diverting the flow of water in a watercourse;
d) Engaging in stream flow reduction activity contemplated in Section 36 of the NWA;
e) Engaging in a controlled activity identified as such in Section 37 (1) or declared under Section 38(1) of the NWA;
f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
g) Disposing of waste in a manner which may detrimentally impact on a water resource;
h) Disposing of waste in a manner of water which contains waste from, or which has been heated in any industrial or power generation process;
i) Altering the bed, banks, course or characteristics of a watercourse;

j) Removing, discharging or disposing of water found underground if it is necessary for efficient continuation of an activity or for the safety of people; and
k) Using water for recreational purposes.

In light of the above, there are a number of stipulations within the NWA that are relevant to the potential impacts on rivers, streams and wetlands that may be associated with the proposed development. A Surface Water Impact Assessment has however been conducted to explore how the proposed development may impact on identified water resources as protected by the Act.

3.1.9 National Environmental Management: Biodiversity Act (NEM:BA) (Act No. 10 of 2004, as amended)

The overarching aim of the National Environmental Management: Biodiversity Act (NEM:BA) (Act No. 10 of 2004), within the framework of the NEMA, is to provide for:

- The management and conservation of biological diversity within South Africa, and of the components of such biological diversity;
- The use of indigenous biological resources in a sustainable manner; and
- The fair and equitable sharing among stakeholders of benefits arising from bio-prospecting involving indigenous biological resources.

In terms of this Act, the developer has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations);
- Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development within the area are in line with ecological sustainable development and protection of biodiversity; and
- Limit further loss of biodiversity and conserve endangered ecosystems.

The South African National Biodiversity Institute (SANBI) was established in terms of the NEM:BA, its purpose being (*inter alia*) to report on the status of the country's biodiversity and the conservation status of all listed threatened or protected species and ecosystems.

The NEM:BA provides for a range of measures to protect ecosystems and for the protection of species that are threatened or in need of protection to ensure their survival in the wild, including a prohibition on carrying out a '*restricted activity'* involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7 of the Act. According to Section 57 of the Act, '*Restricted activities involving listed threatened or protected species'*:

- A person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7.

Such activities include any that are '*of a nature that may negatively impact on the survival of a listed threatened or protected species*'. Lists of critically endangered, endangered, vulnerable and protected species have been published and a permit system for listed species has been established.

The NEM:BA is relevant to the proposed development as the construction of the solar PV energy facility and other components (such as the substations and O&M buildings) may impact negatively on biodiversity. The project proponent is therefore required to take appropriate reasonable measures to limit the impacts on biodiversity, to obtain permits if required and to also invite the SANBI to provide commentary on any documentation resulting from the proposed development.

It should be noted that a Terrestrial Ecology Impact Assessment has been undertaken to explore how the proposed development may impact on biodiversity as protected by the Act.

3.1.10 National Environmental Management: Protected Areas Act (NEM: PAA) (Act No. 57 of 2003, as amended)

The overarching aim of the National Environmental Management: Protected Areas Act (NEM: PAA) (Act No. 57 of 2003, as amended), within the framework of NEMA, is to:

- provide for the declaration and management of protected areas;
- provide for co-operative governance in the declaration and management of protected areas;
- affect a national system of protected areas in South Africa as part of a strategy to manage and conserve its biodiversity;
- provide for a representative network of protected areas on state land, private land and communal land;
- promote sustainable utilisation of protected areas for the benefit of people, in a manner that would preserve the ecological character of such areas;
- promote participation of local communities in the management of protected areas, where appropriate; and
- provide for the continued existence of South African National Parks.

The proposed development falls **outside** any formally protected areas and outside the areas earmarked as part of the National Protected Areas Expansion Strategy (NPAES).

3.1.11 National Forests Act (NFA) (Act No. 84 of 1998)

The National Forest Act (NFA) (Act No. 24 of 1998) was enacted to:

- Provide for the protection, management and utilisation of forests;
- The protection of certain plant and animal life;
- The regulation of trade in forest produce;
- The control and management of a national hiking way system and National Botanic Gardens.

The NFA enforces the necessity for a license to be obtained prior to destroying any indigenous tree in a natural forest and, subject to certain exemptions, cutting, disturbing, damaging, destroying or removing any protected tree. The list of protected trees is currently contained in GN 908 of 21 November 2014. Licenses are issued by the Minister and are subject to periods and conditions as may be stipulated.

Protected trees

According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. 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*'.

Forests

Prohibits the destruction of indigenous trees in any natural forest without a licence.

The NFA is relevant to the proposed development as the removal and/or disturbance and/or clearance of indigenous vegetation will be required and a license in terms of the NFA may be required for this to be done.

It should be noted that the Ecologist confirmed that there are no plant species occurring on-site or likely to occur on site that are protected according to the NEM:BA. There are however a number of plant species occurring on site that are protected according to the Northern Cape Nature Conservation Act (Act No. 9 of 2009). It is also likely that additional protected species occur on a site that were not observed during the field survey. None of these are of conservation concern, but a permit is required from the Provincial authorities to destroy them. Lastly, it was confirmed that there are no protected tree species that are likely to occur in the study area.

3.1.12 Conservation of Agricultural Resources Act (CARA) (Act No. 43 of 1983)

The Conservation of Agricultural Resources Act (CARA) (Act No. 43 of 1983) controls the utilisation of natural agricultural resources in South Africa. The Act promotes the conservation of soil, water sources and vegetation as well as the combating weeds and invader plants.

The primary objective of the Act is to conserve natural agricultural resources by:

- maintaining the production potential of land;
- combating and preventing erosion and weakening or destruction of the water resources;
- protecting vegetation; and
- combating weeds and invaders plants.

Rehabilitation after disturbance to agricultural land is managed by this Act. The CARA is relevant to the proposed development as the construction of a solar PV energy facility as well as other components (such as the substations and O&M buildings) may impact on agricultural resources and vegetation on the site. The Act prohibits the spreading of weeds and prescribes control measures that need to be complied with in order to achieve this. As such, measures will need to be taken to protect agricultural resources and prevent weeds and exotic plants from invading the site as a result of the proposed development.

An Agricultural and Soils Impact Assessment has been conducted to explore how the proposed development may impact on the agricultural production potential of the proposed site. According to this assessment, no application is required in terms of the CARA. The EIA process covers the required aspects of this.

3.1.13 Subdivision of Agricultural Land Act (SALA) (Act No. 70 of 1970, as amended)

The Subdivision of Agricultural Land Act (SALA) (Act No. 70 of 1970, as amended) controls the subdivision of all agricultural land in South Africa; prohibiting certain actions pertaining to agricultural land. Under the Act, the owner of agricultural land is required to obtain consent from the Minister of Agriculture in order to subdivide agricultural land. This Act thus requires that an application for the solar PV development be approved by the Department of Agriculture, Forestry and Fisheries (DAFF). Despite the name of the Act, it does not apply only to subdivision, and its purpose is to ensure productive use of agriculturally zoned land. Therefore, even if land is not being subdivided or leased, the SALA approval is required to develop agriculturally zoned land for non-agricultural purposes.

DAFF reviews and approves the above-mentioned application according to their *Guidelines for the evaluation and review of applications pertaining to renewable energy on agricultural land*, dated September 2011.

The purpose of the Act is to prevent uneconomic farming units from being created and degradation of prime agricultural land. To achieve this purpose, the Act also regulates leasing and selling of agricultural land as well as registration of servitudes.

The Act is of relevance to the proposed development as any portion of land within the study area that is zoned for agricultural purposes that will need to be leased for a period exceeding ten (10) years, will be regulated by this Act.

3.1.14 National Road Traffic Act (NRTA) (Act No. 93 of 1996, as amended)

The National Road Traffic Act (NRTA) (Act No. 93 of 1996, as amended) provides for all road traffic matters and is applied uniformly throughout South Africa. The Act enforces the necessity of registering and licensing motor vehicles. It also stipulates requirements regarding fitness of drivers and vehicles as well as making provision for the transportation of dangerous goods.

All the requirements stipulated in the NRTA will need to be complied with during the construction and operational phases of the proposed solar PV energy facility.

3.1.15 Civil Aviation Act (CAA) (Act No. 13 of 2009)

The Civil Aviation Act (CAA) (Act No. 13 of 2009) controls and regulates aviation within South Africa. It provides for the establishment of a South African Civil Aviation Authority (SACAA) and independent Aviation Safety Investigation Board in compliance with Annexure 13 of the Chicago Convention. It gives effect to various conventions related to aircraft offences, civil aviation safety and security, and provides for additional measures directed at more effective control of the safety and security of aircrafts, airports and matters connected thereto.

Although the Act is not directly relevant to the proposed development, it should be considered as the establishment of a solar PV energy facility may impact on aviation and air traffic safety if located directly within aircraft flight paths.

Air Traffic and Navigation Services Company Limited (ATNS) and the SACAA will be consulted throughout the EIA process and the required approvals will be obtained where necessary.

3.1.16 Nature and Environmental Conservation Ordinance 19 of 1974

Due to the fact that the Eastern Cape Province does not have its own environmental legislation, the province still operates under the Nature and Environmental Conservation Ordinance 19 of 1974. The Nature and Environmental Conservation Ordinance 19 of 1974 was developed to protect both animal and plant species within the province. These may be species which are under threat or which are already considered to be endangered. The provincial environmental authorities are responsible for the issuing of permits in terms of this legislation.

Despite the fact that there is a conservation plan available for the Eastern Cape Province there are no CBAs or ESAs affecting the application site and thus this conservation is not relevant to the proposed development.

3.1.17 Astronomy Geographic Advantage Act (Act No. 21 of 2007)

The Astronomy Geographic Advantage Act (Act No. 21 of 2007) provides for:

- The preservation and protection of areas that are uniquely suited for optical and radio astronomy; and
- Intergovernmental cooperation and public consultation on matters concerning nationally significant astronomy advantage areas and matters connected therewith.

Under Section 22(1) of the Act, the Minister has the authority to protect the radio frequency spectrum for astronomy observations within a core or central astronomy advantage area. As such, the Minister may under section 23(1) of the Act, declare that no person may undertake certain activities within a core or central Astronomy Advantage Area (AAA). These activities include the construction, expansion or operation; of any fixed radio frequency interference source, facilities for the generation, transmission or distribution of electricity, or any activity capable of causing radio frequency interference or which may detrimentally influence the astronomy and scientific endeavours.

In terms of section 7(1) and 7(2) of this Act, national government established the following AAAs:

- Central Karoo AAA (GN 198 of 2014) – proposed development falls outside this AAA
- Sutherland Central AAA – proposed development falls outside this AAA
- Northern Cape AAA (GN 115 of 2010) – proposed development falls outside of this AAA

It should be noted that the proposed development is located approximately 145km from the nearest Central Karoo AAA. In addition, the Sutherland Central AAA only applies to areas within 75km of the Sutherland Observatory (situated in the town of Sutherland) and will not be affected as the proposed development is located almost 400km from the town of Sutherland.

Due to the fact that the proposed development is not situated within any of the established AAAs, the Astronomy Geographic Advantage Act is not relevant. The relevant authorities, including the Square Kilometre Array (SKA), will however be consulted throughout the EIA process and comments will be obtained with regards to the acceptability of the proposed development. Any correspondence received from these authorities will be included throughout the Scoping and EIA phases.

3.1.18 Renewable Energy Development Zones (REDZs)

The Strategic Environmental Assessment (SEA) for Wind and Solar PV Energy in South Africa (CSIR, 2015) has identified eight (8) Renewable Energy Development Zones (REDZs) that are of strategic importance for large-scale wind and solar PV development in terms of *Strategic Integrated Project 8: Green Energy in Support of the South African Economy*, as well as associated strategic transmission corridors, including the rollout of its supporting transmission and distribution infrastructure, in terms of *Strategic Integrated Project 10: Electricity Transmission and Distribution*.

- Renewable Energy Development Zones (REDZs) for large-scale wind and solar photovoltaic development;
- associated Strategic Transmission Corridors which support areas where long-term electricity grid will be developed;
- process of basic assessment to be followed and reduced decision-making timeframe for processing of applications for environmental authorisation in terms of NEMA; and
- acceptance of routes which have been pre-negotiated with all landowners as part of applications for environmental authorisations for power lines and substations.

Table 6: The Council for Scientific and Industrial Research (CSIR) identified the following eight (8) geographic areas for REDZ following the SEA

REDZ Number	Name	Applicability of REDZ
REDZ 1	Overberg	Large-scale wind and solar photovoltaic energy facilities
REDZ 2	Komsberg	Large-scale wind and solar photovoltaic energy facilities
REDZ 3	Cookhouse	Large-scale wind and solar photovoltaic energy facilities

REDZ 4	Stormberg	Large-scale wind and solar photovoltaic energy facilities
REDZ 5	Kimberley	Large-scale solar photovoltaic energy facilities
REDZ 6	Vryburg	Large-scale solar photovoltaic energy facilities
REDZ 7	Upington	Large-scale solar photovoltaic energy facilities
REDZ 8	Springbok	Large-scale wind and solar photovoltaic energy facilities

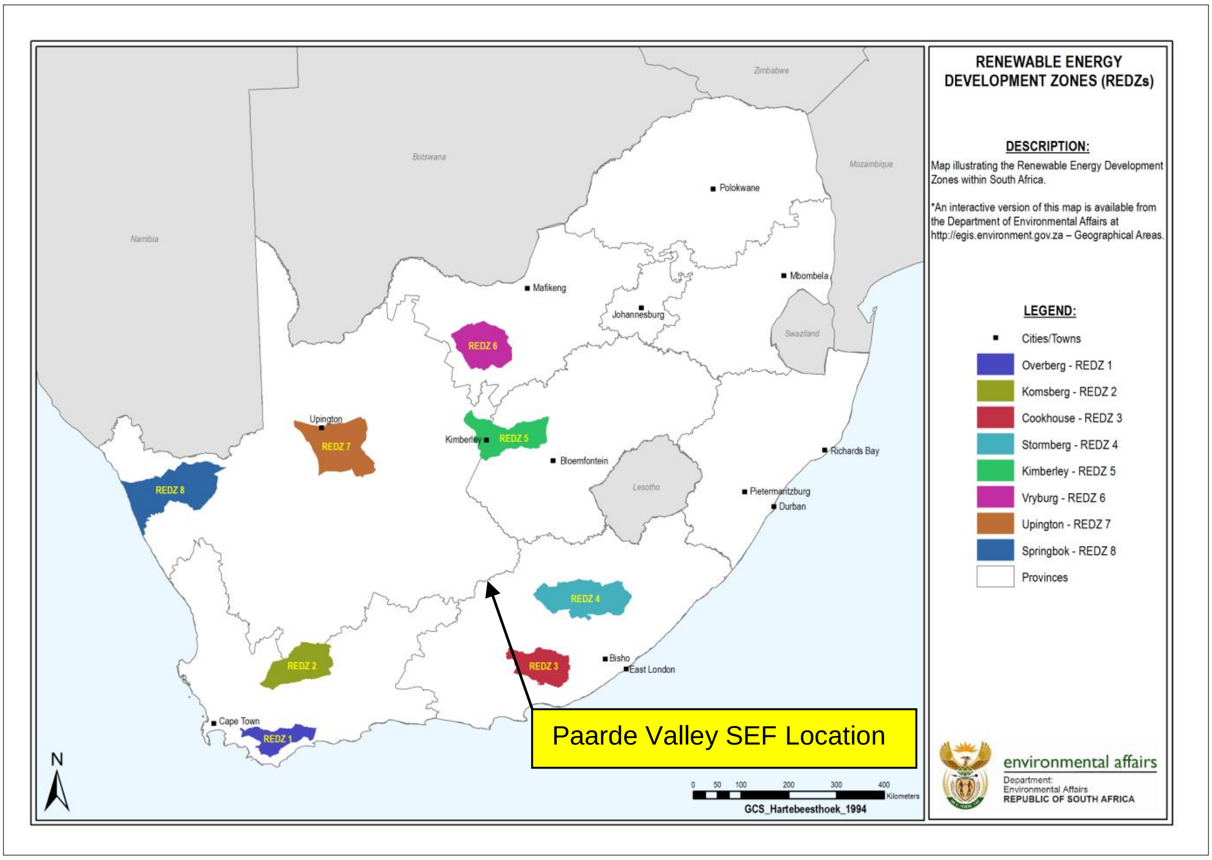

Figure 7: Formally gazette REDZs in South Africa and the proposed Paarde Valley SEF location in relation to the REDZs

It should be noted that the proposed facility is not located within any of the above-mentioned REDZs formally gazetted[7] in South Africa for the purpose of development of solar and wind energy generation facilities (**Table 6** and **Figure 7**). Considering this, the proposed Paarde Valley Solar PV Energy Facility will be subject to a full EIA process in terms of the NEMA, as amended, and the EIA Regulations 2014 (as amended in 2017).

Although the project falls outside of these zones, it will nevertheless contribute towards the requirement of renewable energy highlighted by the development of these zones.

3.1.19 Additional Relevant Legislation

- Occupational Health and Safety Act (OHSA) (Act No. 85 of 1993);

[7] Formally gazetted on 16 February 2018 (government notice 114).

- Road Safety Act (Act No. 93 of 1996);
- National Road Traffic Regulations Act (Act No. 22 of 2000);
- National Environmental Management: Air Quality Act (NEM:AQA) (Act No. 39 of 2004);
- National Environmental Management: Waste Act (NEM:WA) (Act No. 59 of 2008, as amended);
- Development Facilitation (Act No. 67 of 1995);
- The Hazardous Substances Act (Act No. 15 of 1973);
- Water Services Act (Act No. 108 of 1998);
- Electricity Regulation Act (ERA) (Act No. 4 of 2006, as amended);
- Municipal Systems Act (Act No. 32 of 2000);
- Mineral and Petroleum Resource Development Act (Act No. 28 of 2002, as amended); and
- Eastern Cape Planning and Development Bill 2012.

3.2 Key Development Strategies and Guidelines

3.2.1 Integrated Development Plan (IDP)

An Integrated Development Plan (IDP) is defined in the Local Government: Municipal Systems Act (Act No. 32 of 2000), as an inclusive and strategic plan that:

- Links, integrates and co-ordinates plans and takes into account proposals for the development of the municipality;
- Aligns the resources and capacity of the municipality with the implementation of the plan
- Forms the policy framework on which annual budgets must be based; and
- Is compatible with national and provincial development plans and planning requirements binding on the municipality in terms of legislation.

Considering the nature and location of the proposed development, there is a clear fit with international, national, provincial and local, at both district and municipal levels, policy and legislation. The IDP for the Chris Hani District Municipality is aligned with the National Development Plan, which has identified various central development challenges.

In September 2015 the world's governments signed a historic agreement to eradicate poverty, improve the living standards and well-being of all people, promote peace and more inclusive societies and reverse the trend of environmental degradation. The 2030 Agenda for Sustainable Development commits to promoting development in a balanced way—economically, socially and environmentally—in all countries of the world, leaving no one behind and paying special attention to those people who are poorest or most excluded. It contains 17 Sustainable Development Goals with associated targets to assess progress.

The 17 goals, ranging from alleviating poverty and reducing inequality through job creation and economic growth, as well as ensuring access to affordable, reliable, sustainable and modern energy for all, are in many ways interrelated and cross-cutting in nature. The role of Namakwa DM in the electricity distribution industry, including consideration of renewable energy, reticulation, and municipal debt and tariff structures will be critical.

In his 2015/16 State of the Nation Address, former President Jacob Zuma announced the Nine Point Plan with a purpose of growing the economy and at the same time fast-tracking the implementation of the NDP.

The first key priority area identified for the Nine Point Plan is resolving the energy challenge. The Province is moving ahead with the implementation of the nine-point plan, which amongst others include coordinating high impact projects such as the Renewable energy projects and facilitate the forging of partnerships to ensure that these key priorities reach their full potential but more specifically that the people of the Northern Cape people benefit from these.

The proposed Paarde Valley Solar PV Energy Facility is located within the Inxuba Yethemba Local Municipality and greater Chris Hani District Municipality. On a municipal level, wide support is evident across the affected municipalities. According to the Chris Hani District Municipality's IDP, the greatest challenge facing government and local government in particular is how to minimise harmful environmental practices that contribute to global warming and ultimately climate change. The Chris Hani District Municipality has subsequently produced an Environmental Management Plan (EMP) in order to point out areas of concern. The plan highlights areas of the environment which should be conserved and protected. This includes present and future environmental problems which were identified per local municipality as well as all renewable resources. In addition, the IDP states the following: ' *…we can see that CHDM is now ready to address the scourge of climate change and make it beneficial to the citizens of this region through greening, recycling, and renewable energy initiatives'* (Chris Hani District Municipality, 2019). In line with the approach of attempting to direct development according to the Guidelines of the National Spatial Development Perspective, the Spatial Development Framework Review extended the identification of Special Development Areas (SDAs). These SDAs focus more specifically on defining spatial areas where certain forms of development potential have been identified and include the following:

1. Areas of Local Economic Development Potential;
2. Areas of Priority Basic Needs; and
3. Land Reform & Settlement Zones.

It should be noted that the Manufacturing, Industry Mining and more importantly Renewable Energy Sectors have been identified as Areas of Local Economic Development Potential. In terms of Environmental Management, it has been stated that the Chris Hani District Municipality is ready to address climate change and make it beneficial to the citizens of this region through greening, recycling, and renewable energy initiatives (Chris Hani District Municipality, 2019).

Upon reviewing the spatial planning component, the Chris Hani District Municipality as well as the Inxuba Yethemba Local Municipality spatial development frameworks do not suggest any potential conflicts between the planned spatial development visions and the proposed solar PV energy development. In addition, the site where the proposed development will be constructed is not located near any settlement or significant tourist attraction that might be sensitive to the environmental effects of the proposed development. Although the proposed development is located within relatively close proximity to small patches of agricultural land, it is not expected to affect these areas significantly and the current agricultural activities can thus continue.

After considering the reviewed documentation, the proposed development is in alignment with national, provincial and local objectives, plans and strategies relating to socio-economic development of the areas under analysis. There were no fatal flaws or contraventions identified as all spheres of government prioritise the development of RE projects. The proposed development fits well with the plans to diversify the provincial, district and local economies through investment in RE projects.

It can be suggested that the proposed development does not conflict with any of the identified developmental priorities of the local governments in question but is also in alignment with the identified means to stimulate the local economy. Policy decisions taken in the next decade will largely determine the dimension of the impact of climate change. Local government is in the front line of implementation and service delivery, and thus needs to pursue adequate mitigation and adaptation strategies which should include participation from the public sector, the private sector and NGOs. Therefore, it is evident that the proposed development is aligned with the goals of the municipal IDPs in the study area.

3.2.2 Draft Integrated Energy Plan (IEP) for the Republic of South Africa, 2016

The Draft Integrated Energy Plan (IEP), developed by the Department of Energy (DoE), is anchored in the National Energy Act (Act No. 34 of 2008). The purpose of the Draft IEP is to provide a roadmap of the future energy landscape for South Africa which guides future energy infrastructure investments and policy development, while:

- Maintaining control over economic costs;
- Serving national imperatives such as job creation and poverty alleviation; and
- Minimising the adverse impacts of the energy sector on the environment.

The Draft IEP takes into consideration the crucial role that energy plays in the entire economy and is informed by the output of analyses founded on a solid fact base. It is a multi-faceted, long-term energy framework which has multiple objectives, some of which include:

- To guide the development of energy policies and, where relevant, set the framework for regulations in the energy sector;
- To guide the selection of appropriate technologies to meet energy demand (i.e. the types and sizes of new power plants and refineries to be built and the prices that should be charged for fuels);
- To guide investment in and the development of energy infrastructure in South Africa; and
- To propose alternative energy strategies which are informed by testing the potential impacts of various factors such as proposed policies, introduction of new technologies, and effects of exogenous macro-economic factors.

The Draft IEP considers the national supply and demand balance and proposes alternative capacity expansion plans based on varying sets of assumptions and constraints. While infrastructural matters are briefly discussed, the Draft IEP does not explicitly consider supply and demand at specific geographical locations within the country, nor does it take into account infrastructure bottlenecks at specific locations. These are, or will be, covered in detail as follows:

- Electricity infrastructure (transmission and distribution) is dealt with in other plans and the Integrated Resource Plan (IRP) should assess these in detail, taking into consideration the grid planning currently conducted by Eskom;
- Electricity supply is dealt with in the IRP;
- Liquid fuels will be dealt with in the 20-Year Liquid Fuel Infrastructure Roadmap which will cover logistical matters relating to pipelines and storage facilities for petroleum products; and
- The Gas Utilisation Master Plan (GUMP) will take into consideration the bottlenecks and capacity constraints of the current natural gas infrastructure. All the above will inform the integrated energy planning process and will enable overall enhancement through ongoing periodic iterations to ensure alignment.

3.2.3 Integrated Resource Plan, 2010 and updated draft 2018

The Integrated Resource Plan (IRP) was created in order to plan for projected national electricity demand. The IRP (2010-30) was promulgated in March 2011 and was planned to be a '*living plan*', as it needs to consider changes in the macro-economic environment, developments in new technologies and changes in national priorities and imperatives, amongst other factors. Since the promulgation of the IRP (2010-30) there have been a number of developments in the energy sector in South and Southern Africa. In addition, the electricity demand outlook has changed from that expected in 2010. As a result, the DoE is in the processing of updating the IRP and has recently published a Draft IRP for 2018.

While the IRP (2010-30) remains the official government plan for new generation capacity until it is replaced by an updated plan, there are a number of assumptions that have changed, including:

- The changed landscape over the past years, in particular in electricity demand and the underlying relationship with economic growth;
- Electricity demand projection that did not increase as envisaged;
- Technology costs;
- Existing Eskom plant performance that is way below the 80% availability factor; and
- Additional capacity committed to and commissioned, as well as technology costs that have declined significantly.

The Draft IRP 2018 recommends that 10.5% of the generation capacity should be from solar PV energy by 2030, as indicated below in **Figure 8** below.

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

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

Figure 8: Proposed updated generation plan for the period ending 2030 (draft IRP, 2018)

3.2.4 Renewable Energy Independent Power Producer Procurement Program (REIPPPP)

The following information was extracted from the Eskom website: Guide to Independent Power Procurement (IPP) processes in South Africa and Eskom, June 2010 (http://www.eskom.co.za/live/content.php?Item_ID=14324).

The objective of this section is to provide an overview of the processes in the country and within Eskom relating to Independent Power Producers (IPPs). It is important that certain enabling policies, rules and regulations are in place to provide certainty and transparency in the introduction of IPPs.

- Country Process

In August 2009, the DoE gazetted the Electricity Regulations on New Generation Capacity under the ERA. The New Generation Regulations establish rules and guidelines that are applicable to the undertaking of an IPP Bid Programme and the procurement of an IPP for new generation capacity. They also facilitate the fair treatment and non-discrimination between IPPs and the buyer of the energy. In terms of the New Generation Regulations, the IRP developed by the DoE sets out the new generation capacity requirement per technology, taking energy efficiency and the demand-side management projects into account. This required, new generation capacity must be met through the technologies and projects listed in the IRP and all IPP procurement programmes will be executed in accordance with the specified capacities and technologies listed in the IRP.

A decision that additional capacity be provided by an IPP must be made with the concurrence of the Minister of Finance. Once such a decision is made, a procurement process needs to be embarked upon to procure that capacity in a fair, equitable and transparent process.

The New Generation Regulations set out the procurement process. The stages within a bid programme are prescribed as follows:

i. Request for Qualifications
ii. Request for Proposals
iii. Negotiation with the preferred bidder(s).

A successful bidder will be awarded a Power Purchase Agreement (PPA) subject to signature by the Regulator, namely Eskom.

3.2.5 Department of Energy (DoE) White Paper on Renewable Energy, 2003

The DoE gazetted its White Paper on Renewable Energy in 2003 and introduced it as a '*policy that envisages a range of measures to bring about integration of renewable energies into the mainstream energy economy*.' At that time, the national target was fixed at 10 000GWh (0.8Mtoe) renewable energy contribution to final energy consumption by 2013. The White Paper proposed that this would be produced mainly from biomass, wind, solar and small-scale hydropower. It went on to recommend that this renewable energy should to be utilised for power generation and non-electric technologies such as solar water heating and biofuels. Since the White Paper was gazetted, South Africa's primary and secondary energy requirements have remained heavily fossil-fuel dependent, both in terms of indigenous coal production and use, as well as the use of imported oil resources. Alongside this, the projected electricity demand of the country has led the National utility Eskom, to embark upon an intensive build programme to secure South Africa's longer-term energy needs, together with an adequate reserve margin.

3.2.6 Eastern Cape Provincial Development Plan (PDP)

The Eastern Cape's Provincial Development Plan (PDP) aims to provide creative responses to the province's challenges. The PDP states that one (1) of the challenges which the Province faces is that the economy is overly and unsustainably resource intensive. There is an over-reliance of the provincial economy on the motor manufacturing industry and small manufacturing sector. Based on the challenges faced, as well a brief regional analysis, a number of development opportunities have been identified which need careful attention across different parts of the Province. Some of the developments largely focus on developing the rural regions of the province. It has also been noted that the Eastern Cape is endowed with a number of resources that give it a competitive edge, including energy resources. However, the PDP has identified the western region of the Province, namely Cacadu and Nelson Mandela Bay, as a region which holds potential for the generation of renewable wind and solar energy (Eastern Cape PDP, 2014).

The PDP draws from the 2010 BRICS Rural Transformation Conference's resolutions to present a rural development agenda. It has been identified that this rural development agenda should be cognizant of the climate and environmental challenge, enhance environmental resilience and sustainability, use scarce natural resources efficiently, promote renewable sources of energy and leverage a green agenda for new jobs and income for the poor. Additionally, strategic objectives have been identified which will assist in achieving the five (5) related goals which inform the PDP. One (1) of these strategic objectives (namely *Strategic action 1.1.6*) is aimed at positioning the Province as a key investment hub in the energy sector and ensuring reliable energy supply to high-potential sectors. In this sense, the province is positioning itself as an investment hub in the energy sector. This will provide opportunities to develop the capital goods sector and heavy industries. This new investment could become a major catalyst for provincial economic development, as regional and local benefits are expected to accrue from new investment in the energy sector. Approved wind energy projects already account for 63% of the average provincial energy demand. However, according to the PDP, there are serious institutional hindrances to wind-farm developments. It has been stated that pre-authorisation arrangements in 'renewable energy zones' (to be located in Cacadu and Chris Hani districts) will allow this industry to expand to its full potential. As part of *Strategic action 1.5.4* (which is aimed at growing and developing the manufacturing industry), nine (9) manufacturing industries have been identified which have potential for expansion. One (1) of these industries includes Green/renewables (Eastern Cape PDP, 2014). Additionally, *Strategic action 4.3.2* is aimed at ensuring adequate energy infrastructure for household and public facility access. New investments in the electricity transmission and distribution networks are required to accommodate new generation capacity and strengthen grid capacity. This will improve network performance, network flexibility and the quality of supply for both economic and social activities. The following interventions have been proposed:

- Ensure universal access to energy by 2030:
  - Economics may dictate that off-grid solutions are necessary. Renewable energy hubs for remote rural areas are a potential solution, using solar, wind and biomass/biogas as a resource.

3.2.7 Convention on Biodiversity (CBD)

South Africa became a signatory to the United Nations Convention on Biological Diversity (CBD) in 1993, which was ratified in 1995. The CBD requires signatory states to implement objectives of the Convention, which are the conservation of biodiversity; the sustainable use of biological resources and the fair and equitable sharing of benefits arising from the use of genetic resources. According to Article 14(a) of the CBD, each Contracting Party, as far as possible and as appropriate, must introduce appropriate procedures, such as environmental impact assessments of its proposed projects that are likely to have significant adverse effects on biological diversity, to avoid or minimize these effects and, where appropriate, to allow for public participation in such procedures.

3.2.8 National Veld and Forest Fire Act (Act No. 101 of 1998)

Provides requirements for veldfire prevention through firebreaks and required measures for fire-fighting. Chapter 4 of the Act places a duty on landowners to prepare and maintain firebreaks. Chapter 5 of the Act places a duty on all landowners to acquire equipment and have available personnel to fight fires.

3.2.9 Heritage

The identification, evaluation and assessment of any cultural heritage site, artefact or find in the South African context is required and governed by the following legislation:

- National Environmental Management Act (NEMA) (Act No. 107 of 1998);
- National Heritage Resources Act (NHRA) (Act No. 25 of 1999); and
- Mineral and Petroleum Resources Development Act (MPRDA) (Act No. 28 of 2002).

The following sections in each Act refer directly to the identification, evaluation and assessment of cultural heritage resources.

- National Environmental Management Act (NEMA) (Act No. 107 of 1998)
    - Basic Environmental Assessment (BEA) – Section (23)(2)(d);
    - Environmental Scoping Report (ESR) –Section (29)(1)(d);
    - Environmental Impact Assessment (EIA) – Section (32)(2)(d); and
    - Environmental Management Plan (EMP) – Section (34)(b).
- National Heritage Resources Act (NHRA) (Act No. 25 of 1999)
    - Protection of Heritage Resources – Sections 34 to 36; and
    - Heritage Resources Management – Section 38.
- Mineral and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
    - Section 39(3).

The NHRA stipulates that cultural heritage resources may not be disturbed without authorisation from the relevant heritage authority. Section 34(1) of the NHRA states that, '*no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority…*' The NHRA is utilised as the basis for the identification, evaluation and management of heritage resources and in the case of Cultural Resource Management (CRM) those resources specifically impacted on by development as stipulated in Section 38 of the NHRA. This study falls under s38(8) and requires comment from the relevant heritage resources authority.

4 PROJECT NEED AND DESIRABILITY

It is an important requirement in this EIA Process to review the need and desirability of the proposed development. Guidelines on Need and Desirability were published in the Government Gazette of 20 October 2014. These guidelines list specific questions to determine need and desirability of proposed developments. This checklist is a useful tool in addressing specific questions relating to the need and desirability of a proposed development and assists in explaining that need and desirability at the provincial and local context. Need and desirability answer the question of whether the activity is being proposed at the right time and in the right place. **Table 7** includes a list of questions based on the DEA's Guideline to determine the need and desirability of the proposed development. It should be noted this table was informed by the outcomes of the EIA Process.

Current energy supply in South Africa is primarily coal-based and, although these resources will last for more than a century if used at current rates, large power plants will need to be replaced over the next 30 years. Coal and other fossil fuels, including oil, produce Carbon Dioxide when burned to produce energy. It is now widely accepted that climate change, partially caused by human-generated Carbon Dioxide, is to blame for the higher-than-usual incidence of extremely damaging weather experiences (e.g. storms, droughts, melting polar ice-caps). Local air pollution is strongly related to energy supply options, with coal and oil products being major contributors to urban and rural air pollution and acid rain. One (1) of the primary reasons for promoting renewable energy developments is the desire to make South Africa compliant with international treaties regarding climate-change effects.

Renewable energy options are a sustainable energy supply option that can significantly reduce reliance on fossil fuels. Other advantages include employment creation, proximity to point-of-use, minimal demand for water and less reliance on concentrated sources of energy. Greater use of renewable energy would also reduce South Africa's economic vulnerability to the variable costs of imported fuels. International and local communities are increasingly trying to find ways to shift economies towards greater reliance on renewable energy. Greater uptake of renewable energy would furthermore reduce the global risk of climate change, one (1) of the factors taken into account in designing the conservation network in South Africa.

The combined generation capacity of all the renewable energy developments considered here in this EIA (35km buffer) is just less than 1 600 MW, which is more than the average size of one (1) of the 14 coal power stations in South Africa (Eskom's Generation Division has 14 coal-fired power stations with an installed capacity of 38 548 MW: www.eskom.co.za).

Table 7: The guideline on the Need and Desirability's list of questions to determine the 'Need and Desirability' of a proposed development.

NEED	
Question	**Response**
1. How will this development (and its separate elements/aspects) impact on the ecological integrity of the area)?	
1.1. How were the following ecological integrity considerations taken into account?: 1.1.1. Threatened Ecosystems, 1.1.2. Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are	**The environmental sensitivities present on site were assessed within the scoping phase Terrestrial Ecological Assessment undertaken as part of this EIA Process, including CBAs and ESAs. It should be noted that a detailed site walkthrough of the entire project footprint was undertaken during the scoping phase in order to inform the impact assessment. Further investigation and/or**

NEED	
Question	**Response**
subject to significant human resource usage and development pressure, 1.1.3. Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs"), 1.1.4. Conservation targets, 1.1.5. Ecological drivers of the ecosystem, 1.1.6. Environmental Management Framework, 1.1.7. Spatial Development Framework, and 1.1.8 Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.).	**assessment will be undertaken during the EIA phase, as required.** **The mitigation hierarchy of avoidance, reduction and improved management have been applied to inform the findings of the Terrestrial Ecology Impact Assessment. The Ecologist is of the view that the proposed development should be authorised.** **An environmental sensitivity map based on the input obtained from the various specialist studies has been included in this DSR (refer to Appendix 5). This will be refined in the EIA phase, if required.**
1.2. How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	**The environmental sensitivities present on site were assessed within the scoping phase Terrestrial Ecological Assessment undertaken as part of this EIA Process, including CBAs and ESAs. It should be noted that a detailed site walkthrough of the entire project footprint was undertaken during the scoping phase in order to inform the impact assessment. Further investigation and/or assessment will be undertaken during the EIA phase, as required.** **The mitigation hierarchy of avoidance, reduction and improved management have been applied to inform the findings of the Terrestrial Ecology Impact Assessment. The Ecologist is of the view that the proposed development should be authorised.** **An environmental sensitivity map based on the input obtained from the various specialist studies has been included in this DSR (refer to Appendix 5). This will be refined in the EIA phase, if required.**
1.3. How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided	**This development has the potential to impact on the terrestrial and aquatic ecology of the area, this includes impacts on the natural vegetation, biodiversity (including avifauna),**

NEED	
Question	**Response**
altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	**sensitive habitats (such as watercourses) and ecosystem function. Environmental sensitivities present on site (including CBAs and ESAs) were assessed by various specialists during the scoping phase. This included terrestrial ecology, surface water and avifauna. It should be noted that further investigation and/or assessment will be undertaken by the specialists during the EIA phase, if required.** **The amount of habitat that will be lost to the proposed development is insignificant compared to the area (in ha) of the regional vegetation type that occurs on site but may be significant in terms of local patterns and diversity that could be affected**. **Preliminary assessment of the ecological impacts is incorporated in Appendix 6H of this report. In addition, the surface water and avifauna assessments are provided in Appendix 6G and Appendix 6B respectively. Measures to avoid, remedy, mitigate and manage impacts have been included within the scoping phase ecology, avifauna and surface water impact assessments and the Draft EMPr, which will form part of the EIA report.**
1.4. What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether; what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	**It is not anticipated that a significant amount of waste will be generated.** **The EMPr will include measures to avoid, remedy, mitigate and manage impacts with regards to waste and waste management. The Draft EMPr will be included in the EIA report.**
1.5. How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy	**A Desktop Heritage Impact Assessment (HIA), including a full Palaeontology Impact Assessment (PIA), was undertaken as part of the EIA process for this proposed development. <u>The overall findings of the HIA indicate that unmitigated impacts during</u>**

NEED	
Question	**Response**
(including offsetting) the impacts? What measures were explored to enhance positive impacts?	**construction can be MEDIUM to HIGH but reduced to LOW with the implementation of management measures. Impacts during the operational and decommissioning phase is projected to be LOW with the implementation of management measures.** **It should be noted that further field truthing will be undertaken for the heritage assessment through an archaeological walk down. This heritage field truthing exercise can however only be undertaken once the layout of the solar PV energy facility and associated infrastructure has been determined, based on the findings of the other specialist studies.** **It is anticipated that the proposed development will have an acceptable low impact on heritage resources. However, it must be noted that there are two (2) operational projects which are located within a 35km radius of the proposed site, namely the Linde SEF and Noupoort Wind Farm, in addition to several other renewable energy developments which are being proposed or have already received approval. Thus, changes to the current cultural landscape are already in process. The scoping phase Desktop Heritage Impact Assessment Report is included in Appendix 6D of this DSR.**
1.6. How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	**This proposed development requires water during the construction phase. Minimal water is required during the operational phase. At this stage, it is anticipated that water will be sourced from the local municipality. Should the local municipality not be able to ensure water supply, other local water sources (e.g. Boreholes) will be investigated. The necessary approvals from the Department of Water and Sanitation (DWS) will be applied for separately.**

NEED	
Question	**Response**
1.7. How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts? 1.7.1. Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note: sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life) 1.7.2. Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources of the proposed development alternative?) 1.7.3. Do the proposed location, type and scale of development promote a reduced dependency on resources?	**The proposed development aims to harness solar energy for the generation of electricity. This proposed development is seen as a source of clean energy and reduces the dependence on non-renewable sources, such as coal-fired power plants. The proposed development is however <u>not</u> located in any of the REDZs, where wind and solar PV development is being incentivised from resource, socio-economic and environmental perspectives. For more information, <u>please refer to the Alternatives section included in Section 2.3 of this DSR for an outline of the suitability of this activity.</u>**

NEED	
Question	**Response**
1.8. How were a risk-averse and cautious approach applied in terms of ecological impacts?: 1.8.1. What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? 1.8.2. What is the level of risk associated with the limits of current knowledge? 1.8.3. Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	**The precautionary approach has been adopted for this EIA process (i.e. assuming the worst-case scenario will occur and then identifying ways to mitigate or manage these impacts).** **The assessment of cumulative impacts assumed that all proposed renewable energy developments within a 35km radius will be constructed. In reality, only a handful of proposed renewable energy developments would be constructed and therefore this approach is considered to be precautionary in nature.** **Additionally, based on the specialist findings, the layout will be amended to avoid sensitive areas where possible. This will be assessed and discussed in more detail during the EIA phase.** **Please refer to Appendix 6 of this DSR for the full specialist studies which were undertaken as part of this EIA process. These studies outline the assumptions and limitations that were applicable to the respective studies. The risk associated with the limits in knowledge is considered to be low.**
1.9. How will the ecological impacts resulting from this development impact on people's environmental right in terms following?: 1.9.1. Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? 1.9.2. Positive impacts: e.g. improved access to resources, improved	**Please refer to Section 5 and Section 6 of this DSR for the results of the specialist assessments which were undertaken as part of this EIA process. In addition, all specialist assessments are provided in Appendix 6 of this DSR.** **The overall negative impact to people's environmental right in terms of social and visual impacts are considered to be low to moderate and moderate respectively. In addition, the scoping phase Social Impact Assessment found that the proposed development has a positive element which outweighs the negative in that it will**

NEED	
Question	**Response**
amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?	**contribute towards the supply of renewable energy into a grid system heavily reliant on coal-powered energy generation.**
1.10. Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	**This is considered and addressed as part of the scoping phase Social Impact Assessment which was undertaken as part of the EIA process for this proposed development (included in Appendix 6F and summarised in Section 5.14 and Section 6 of this DSR).** **The study concluded that '*regarding the social impacts associated with the project it was found that most apply over the short term to the construction phase of the project. Of these impacts all can be mitigated to within acceptable ranges and there are no fatal flaws associated with the construction or operation of the project.* *On a cumulative basis it is evident that the cumulative impacts associated with changes to the social environment of the region are more significant than those attached to the project in isolation. On a negative front there are two (2) issues associated with developments in the region that are of most concern. The first of these issues is the change to the sense of place of an area that was once considered a pristine region of South Africa. The second is the potential, through an influx of labour and an increase in transportation to constructions sites, of the risk for the prevalence of HIV to rise in an area that has a relatively low HIV prevalence rate. In this regard it is important that the relevant authorities recognise these issues and find ways of mitigating them to ensure that they do not undermine the benefit that renewable energy projects bring, both to the region as well as to the country as a whole.***

NEED	
Question	**Response**
	These issues are beyond a project-specific basis and as such will need to be addressed at a higher level.' **Additionally, *'the project site and surrounding areas are sparsely populated with the agricultural potential of the area being low. Accordingly, the negative social impacts associated with the proposed Paarde Valley solar PV facility and associated grid connection infrastructure are of low to moderate significance with most occurring over the short term construction phase. The project has a positive element which outweighs the negative in that it will contribute towards the supply of renewable energy into a grid system heavily reliant on coal-powered energy generation. In this sense the project forms part of a national effort to reduce South Africa's carbon emissions and thus carries with it a significant social benefit and is thus supported and should proceed.'*** **With regards to the EIA phase, the following was noted: *'As the area is sparsely populated and the negative social impacts associated the solar PV facility and associated grid infrastructure of moderate significance it is most unlikely that any further social study will be necessary. This will, however, be dependent on the outcome of the public participation process which may result in a need to update the current report by incorporating the comments recorded and updating the social impacts accordingly.'***
1.11. Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives / targets / considerations of the area?	**The proposed Paarde Valley solar PV energy facility will have a positive impact on the ecological integrity objectives or targets of the area. This has been discussed in detail in the scoping phase Social Impact Assessment, which is summarised in Section 5.14 and Section 6 of this DSR. The**

NEED	
Question	**Response**
	full impact assessment is included in Appendix 6F of this DSR. **The proposed Paarde Valley solar PV energy facility will therefore be aligned with the vision and goals of the DM and the LM.**
1.12. Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	**Please refer to the Alternatives section (Section 2.3 of this DSR) for an outline of the suitability of this activity.**
1.13. Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	**Please refer to the summary of the findings from the scoping phase Terrestrial Ecology Impact Assessment in Section 5.7 and Section 6 of this DSR. The full scoping phase Terrestrial Ecology Impact Assessment is provided in Appendix 6H of this DSR.**
2.1. What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?	
2.1.1. The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area.	**According to the Chris Hani District Municipality's IDP, the greatest challenge facing government and local government in particular is how to minimise harmful environmental practices that contribute to global warming and ultimately climate change. In addition, the IDP states the following: *' …we can see that CHDM is now ready to address the scourge of climate change and make it beneficial to the citizens of this region through greening, recycling, and renewable energy initiatives… [and the Renewable Energy Sector is listed] As a Special Development Area [as follows] Manufacturing, Industry Mining and Renewable Energy Sectors.'* Additionally, the Manufacturing, Industry Mining and more importantly Renewable Energy Sectors have been identified as Areas of Local Economic Development Potential. In terms of Environmental Management, it has been**

NEED	
Question	**Response**
	stated that the municipality is ready to address climate change and make it beneficial to the citizens of this region through greening, recycling, and renewable energy initiatives. **The proposed Paarde Valley solar PV energy facility will therefore be aligned with the vision and goals of the DM.** **The proposed development will also be supportive of the IDPs' objective of creating more job opportunities. The proposed development will lead to the creation of both direct and indirect job which will have a positive economic benefit within the region (if the DEA grants an EA). There are approximately 297 jobs associated with the construction phase. It is likely that approximately 75% of this workforce will be recruited from within local communities, creating employment opportunities for residents of Middelburg, Noupoort and Hanover. Many of the beneficiaries are likely to be historically disadvantaged members of the community and the project will provide opportunities to develop skills amongst these people. The operational phase will employ approximately 16 people full time for a period of up to 20 years.** **It should however be noted that employment during the construction phase will be temporary, whilst being long-term during the operational phase. Therefore, the proposed development would help to address the need for increased electricity supply (on a national level) while also be providing advanced skills transfer and training to the local communities and creating contractual and permanent employment in the area.**

NEED	
Question	**Response**
	Apart from construction and operational phase jobs, the proposed development is also likely to stimulate the local economy as there will be a significant economic contribution attached to the proposed development. This contribution will be in the form of disposable salaries and the purchases of services and supplies from the local communities in and around the towns of Noupoort, Hannover and Middleburg. Apart from job creation and procurement spend, the proposed development will also have broader positive socio-economic impacts as far as socio-economic development contributions are concerned. This will create an opportunity to support the local community over the life span of the operational phase of the proposed development which will stretch over a 20-year period.
2.1.2. Spatial priorities and desired spatial patterns (e.g. need for integration of segregated communities, need to upgrade informal settlements, need for densification, etc.),	**Not applicable. The proposed development is located within a rural area and the site is zoned for agricultural use.**
2.1.3. Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.)	**Please refer to Section 5 and Section 6 of this DSR for a description of the receiving environment and results of the impact assessment, respectively.** **The impact of the proposed development on cultural/heritage areas (archaeology and palaeontology) have been assessed in the form of a Desktop HIA and full PIA. The Desktop HIA Report is provided in Appendix 6D of this DSR, and the results are summarised in Section 5.13 and Section 6 respectively. The PIA Report is provided in Appendix 6E of this DSR, and the results are also summarised in Section 5.13 and Section 6 respectively. As mentioned, further field truthing will be undertaken for the HIA through an archaeological walk down. This**

NEED	
Question	**Response**
	heritage field truthing exercise can however only be undertaken once the layout of the solar PV energy facility and associated infrastructure has been determined, based on the findings of the other specialist studies. **The proposed site is currently being used for agricultural purposes, predominantly sheep farming. The climate does not support any cultivation, except for small patches of irrigation associated with farm dams. Low-intensity natural grazing is the dominant agricultural activity. The low climatic moisture availability means that natural grazing is the only viable agricultural land use for most of the area, except for the small patches of irrigation. The majority of the study area has low agricultural potential and therefore low agricultural sensitivity to development and consequent loss of agricultural land use. The only exception are the small patches of irrigation. These should be considered no-go areas for any footprint of development that will exclude cultivation.** **An Agricultural and Soils Impact Assessment (Appendix 6A of this DSR and results summarised in Section 5.10 and Section 6 respectively) was undertaken as part of the EIA process and is included within this DSR to reflect the impact of the proposed development in terms of the land use and agricultural potential. Agricultural impacts of the proposed development are assessed as being of low to medium significance.**
2.1.4. Municipal Economic Development Strategy ("LED Strategy").	**Please refer to the scoping phase Social Impact Assessment summarised in Section 5.14 and Section 6 of this DSR respectively, and included in Appendix 6F of this DSR, for an outline of how the LED Strategy has been considered.**

NEED	
Question	**Response**
2.2. Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area? 2.2.1. Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	**Please refer to the scoping phase Social Impact Assessment summarised in Section 5.14 and Section 6 of this DSR respectively, and included in Appendix 6F of this DSR, for an outline of the social impacts that could occur due to the proposed development of the solar PV energy facility.**
2.3. How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	
2.4. Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long term? Will the impact be socially and economically sustainable in the short- and long-term?	
2.5. In terms of location, describe how the placement of the proposed development will:	
2.5.1. result in the creation of residential and employment opportunities in close proximity to or integrated with each other,	**Please refer to the scoping phase Social Impact Assessment summarised in Section 5.14 and Section 6 of this DSR respectively, and included in Appendix 6F of this DSR, for an outline of the positive impacts associated with the creation of employment opportunities that could be created by the proposed solar PV energy facility.**
2.5.2. reduce the need for transport of people and goods,	**Not applicable. This is a proposal for a renewable energy development.**
2.5.3. result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport),	**Not applicable. This is a proposal for a renewable energy development.**
2.5.4. compliment other uses in the area,	**A scoping phase Agricultural and Soils Impact Assessment was undertaken as part of the EIA process in order to determine the impact on the current land-use. Refer to Section 5.10, Section 6 and Appendix 6F for a summary of the study and the full study, respectively.**
2.5.5. be in line with the planning for the area,	

NEED	
Question	**Response**
	The proposed site is currently being used for agricultural purposes, predominantly sheep farming. The climate does not support any cultivation, except for small patches of irrigation associated with farm dams. Low-intensity natural grazing is the dominant agricultural activity. The low climatic moisture availability means that natural grazing is the only viable agricultural land use for most of the area, except for the small patches of irrigation. The majority of the study area has low agricultural potential and therefore low agricultural sensitivity to development and consequent loss of agricultural land use. The only exception are the small patches of irrigation. These should be considered no-go areas for any footprint of development that will exclude cultivation.
2.5.6. for urban-related development, make use of underutilised land available with the urban edge,	**Not applicable. The proposed development is located within a rural area and the proposed site is zoned for agricultural use.**
2.5.7. optimise the use of existing resources and infrastructure,	**The proposed development will connect to the Hydra D MTS or the proposed Coleskop WEF substation (depending on which grid connection infrastructure option is chosen as 'preferred'), both of which will still be constructed. In addition, the proposed development will make use of existing site roads as far as possible. It will also make use of the excellent on-site solar resource.**
2.5.8. opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement),	**Not applicable. The proposed development is a renewable energy project and is not related to bulk infrastructure expansion.**
2.5.9. discourage "urban sprawl" and contribute to compaction/densification,	**Please refer to the scoping phase Social Impact Assessment summarised in Section 5.14 and Section 6 of this DSR respectively, and included in Appendix 6F of this DSR, for management measures on how to manage**

NEED	
Question	**Response**
	the impact associated with the '*disruption of local social structures as a result of the construction workforce and in-migration of job seekers*'.
2.5.10. contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,	**Not applicable. The proposed development is located within a rural area and the site is zoned for agricultural use.**
2.5.11. encourage environmentally sustainable land development practices and processes,	**Based on the findings of the scoping phase assessments, the proposed development would <u>not</u> have a significant ("high") negative impact on the receiving environment, with the implementation of suitable mitigation measures (refer to Section 6) and will therefore not go against sustainable land development practices and processes. In addition, the proposed development will be designed according to relevant national specifications and standards which are regarded as best practice in the renewable energy sector. In addition, the proposed development will be aligned with national planning priorities, despite not being located within any of the eight (8) identified REDZs.**
2.5.12. take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.),	**Please refer to the Alternatives section included in Section 2.3 of this DSR for an outline of the selection and suitability of this activity.**
2.5.13. the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential),	**Please refer to the scoping phase Social Impact Assessment summarised in Section 5.14 and Section 6 of this DSR respectively, and included in Appendix 6F of this DSR. It should be noted that the Applicant will ultimately own the proposed development and, if successful, will compile an Economic Development Plan which will be compliant with REIPPPP requirements and will inter alia set out to achieve the following:** • **Create a local community trust or similar (as required by REIPPPP)**

NEED	
Question	**Response**
	which has an equity share in the project life to benefit historically disadvantaged communities; • **Initiate a skills development and training strategy to facilitate future employment from the local community;** • **Give preference to local suppliers for the construction of the facility; and** • **Support local community upliftment projects and entrepreneurship through socio-economic and enterprise development initiatives.**
2.5.14. impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and	**A Desktop HIA, including a full PIA, was undertaken as part of the EIA process for this proposed development. <u>The overall findings of the HIA indicate that unmitigated impacts during construction can be MEDIUM to HIGH but reduced to LOW with the implementation of management measures. Impacts during the operational and decommissioning phase is projected to be LOW with the implementation of management measures</u>.** **It should be noted that further field truthing will be undertaken for the HIA through an archaeological walk down and palaeontological study covering the site. This heritage field truthing exercise can however only be undertaken once the layout of the solar PV energy facility and associated infrastructure has been determined, based on the findings of the other specialist studies.**
2.5.15. in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	**The proposed solar PV energy facility is not located within any of the eight (8) REDZs. There are however two (2) operational projects which are located within a 35km radius of the proposed site (namely the Linde SEF and Noupoort Wind Farm), in addition to several other renewable energy developments which are being proposed or have already received approval, which lends**

NEED	
Question	**Response**
	itself potentially to a renewable energy development area. Refer to Table 24 for an outline of the other renewable energy developments which are operational, are being proposed or have already received approval within a 35km radius.
2.6. How were a risk-averse and cautious approach applied in terms of socio-economic impacts?	
2.6.1. What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	**Please refer to the scoping phase Social Impact Assessment summarised in Section 5.14 and Section 6 of this DSR respectively, and included in Appendix 6F of this DSR.**
2.6.2. What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?	
2.6.3. Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	
2.7. How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following:	
2.7.1. Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	**Please refer to the scoping phase Social Impact Assessment summarised in Section 5.14 and Section 6 of this DSR respectively, and included in Appendix 6F of this DSR.**
2.7.2. Positive impacts. What measures were taken to enhance positive impacts?	
2.8. Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socioeconomic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	
2.9. What measures were taken to pursue the selection of the "best practicable environmental	

NEED	
Question	**Response**
option" in terms of socio-economic considerations?	
2.10. What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	
2.11. What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	
2.12. What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	
2.13. What measures were taken to:	
2.13.1. ensure the participation of all interested and affected parties,	**The activities which will be undertaken as part of the Public Participation Process (PPP) for the proposed development are outlined in this DSR (Appendix 7 and summarised in Section 8). This DSR will be released for a 30-day review and commenting period to all the relevant Interested and/or Affected Parties (I&APs), Organs of State (OoS) / authorities and key stakeholders. Various methods will be employed to notify potential I&APs of the proposed development, namely through an advert in a local newspaper, site notices on the affected property and notification letters. In addition, posters were erected in**
2.13.2. provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,	
2.13.3. ensure participation by vulnerable and disadvantaged persons,	
2.13.4. promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means,	

NEED	
Question	**Response**
2.13.5. ensure openness and transparency, and access to information in terms of the process,	**Middelburg and Background Information Documents (BIDs) were also distributed here (Appendix 7A).** **The Scoping and EIA process has taken cognisance of all interests, needs and values espoused by all I&APs, including occupiers. Opportunity for public participation will be provided to all I&APs throughout the Scoping and EIA process in terms of the 2014 EIA Regulations, as amended.**
2.13.6. ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge,	
2.13.7. ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein was promoted.	
2.14. Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	**Please refer to the scoping phase Social Impact Assessment summarised in Section 5.14 and Section 6 of this DSR respectively, and included in Appendix 6F of this DSR.**
2.15. What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	**A Draft EMPr will be developed to address health and safety concerns and will be included in the EIA report. An Environmental Control Officer (ECO) will also be appointed to monitor compliance from an environmental perspective.**
2.16. Describe how the development will impact on job creation in terms of, amongst other aspects:	
2.16.1. the number of temporary versus permanent jobs that will be created,	**Please refer to the scoping phase Social Impact Assessment summarised in Section 5.14 and Section 6 of this DSR respectively, and included in Appendix 6F of this DSR.**
2.16.2. whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area),	
2.16.3. the distance from where labourers will have to travel,	
2.16.4. the location of jobs opportunities versus the location of impacts (i.e.	

NEED	
Question	**Response**
equitable distribution of costs and benefits),	
2.16.5. the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).	
2.17. What measures were taken to ensure:	
2.17.1. that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment,	**Legislation, policies and guidelines, which could apply to impacts of the proposed development on the environment, have been considered. The scope and content of this DSR have been informed by applicable integrated environmental management legislation and policies. This has been outlined in Section 3 of this DSR.**
2.17.2. that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	**The activities which have been undertaken as part of the PPP for the scoping phase of the proposed development are summarised in Section 8 on page 260 of this DSR. The DSR was released for a 30-day review and commenting period to all the relevant I&APs, OoS / authorities and key stakeholders. Various methods were employed to notify potential I&APs of the proposed development, namely through an advert in a local newspaper, site notices on the affected property and notification letters. In addition, posters were erected in Middelburg and BIDs were also distributed here (Appendix 7A).** **The scoping and EIA process has taken cognisance of all interests, needs and values espoused by all I&APs. Opportunity for public participation were and will continue to be provided to all I&APs throughout the scoping and EIA process in terms of the 2014 EIA Regulations, as amended.**
2.18. What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?	**The outcomes of this scoping and EIA process and the associated conditions of the EA (should it be granted) will serve to address this question.**

NEED	
Question	**Response**
2.19. Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	**The proposed mitigation measures will be included in the Draft EMPr, which will be included in the EIA report.**
2.20. What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	**The Draft EMPr which will be included in the EIA report of this proposed development must form part of the contractual agreement and be adhered to by both the contractors/workers and the applicant.**
2.21. Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?	**Please refer to the Alternatives section included in Section 2.3 of this DSR for an outline of the selection and suitability of this activity.**
2.22. Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?	**Please refer to Section 6.3 of this DSR for a summary of the cumulative impacts.**

4.1 National Renewable Energy Requirement

In 2010, South Africa had 44 157MW of power generation capacity installed. Current forecasts indicate that by 2025, the expected growth in demand will require the current installed power generation capacity to be almost doubled to approximately 74 000MW (SAWEA, 2010).

This growing demand, fuelled by increasing economic growth and social development within Southern Africa, is placing increasing pressure on South Africa's existing power generation capacity. Coupled with this, is the growing awareness of environmental impact, climate change and the need for sustainable development. Despite the worldwide concern regarding Green House Gas (GHG) emissions and climate change, South Africa continues to rely heavily on coal as its primary source of energy, while most of the countries renewable energy resources remain largely untapped (DME, 2003). There is therefore an increasing need to establish a new source of generating power in South Africa within the next decade.

The use of renewable energy technologies, as one (1) of a mix of technologies needed to meet future energy consumption requirements is being investigated as part of Eskom's long-term strategic planning and research process. It must be remembered that solar energy is plentiful, renewable, widely distributed, clean and reduces GHG emissions when it displaces fossil-fuel derived from electricity. In this light, renewable solar energy can be seen as desirable.

The REIPPPP and the competitiveness nature of the bidding process has resulted in significant lowering of solar and wind tariff prices since 2011. Solar PV, for example, was bid with tariffs of R2.80/kWh at the inception of the REIPPPP in 2011, to 60c/kWh at present. Further projects will increase the competitive nature of the REIPPPP and further result in cost savings to South African consumers.

4.2 National Renewable Energy Commitment

In support of the need to find solutions for the current electricity shortages, the increasing demand for energy, as well as the need to find more sustainable and environmentally friendly energy resources, South Africa has embarked on an infrastructure growth programme supported by various government initiatives. These include the National Development Plan (NDP), the Presidential Infrastructure Coordinating Commission (PICC), the DoE's Integrated Resource Plan, the National Strategy for Sustainable Development, the National Climate Change Response White Paper, the Presidency of the Republic of South Africa's Medium-Term Framework, and the National Treasury's Carbon Tax Policy Paper.

The Government's commitment to growing the renewable energy industry in South Africa is also supported by the *White Paper on Renewable Energy* (2003) which sets out the Government's principals, goals and objectives for promoting and implementing renewable energy in South Africa. In order to achieve the long-term goal of achieving a sustainable renewable energy industry, the DoE has set a target of contributing 17,8*GW* of renewable energy to the final energy consumption by 2030. This target is to be produced mainly through, wind and solar; but also, through biomass and small-scale hydro (DME, 2003; IRP, 2010). According to the 2018 Draft IRP, 1474MW of solar energy output capacity had been installed by 2018 already, while 1980MW of wind energy output capacity had been installed (**Figure 8**). Additionally, the 2018 Draft IRP states that new installed energy capacity to 2030 will include 2500MW hydro, 5600MW wind and 8100MW solar PV. It is also recommended that 10.5% of the generation capacity should be from solar PV energy by 2030 (Draft IRP, 2018).

4.3 Site Specific Suitability

The selection of a potential site for the proposed solar PV energy facility included several key aspects, namely solar resource, climate, topography, environmental, grid connections and access to the site. As mentioned, the proposed project site has been identified through a pre-feasibility desktop analysis based on the estimation of the solar energy resource as well as weather, dust and dirt effects.

According to the Direct Normal Solar Irradiation (DNI) map below (**Figure 9**), the Eastern Cape Province of South Africa has a predicted DNI ranging from approximately 1461 to 2556kWh/m^2/year and higher. In addition, as mentioned, the project site receives an annual GHI ranging from approximately 1534 to 1972kWh/m²/year and higher (**Figure 6**). It should be noted that more accurate results from on-site measurements will be provided during the EIA phase (if available).

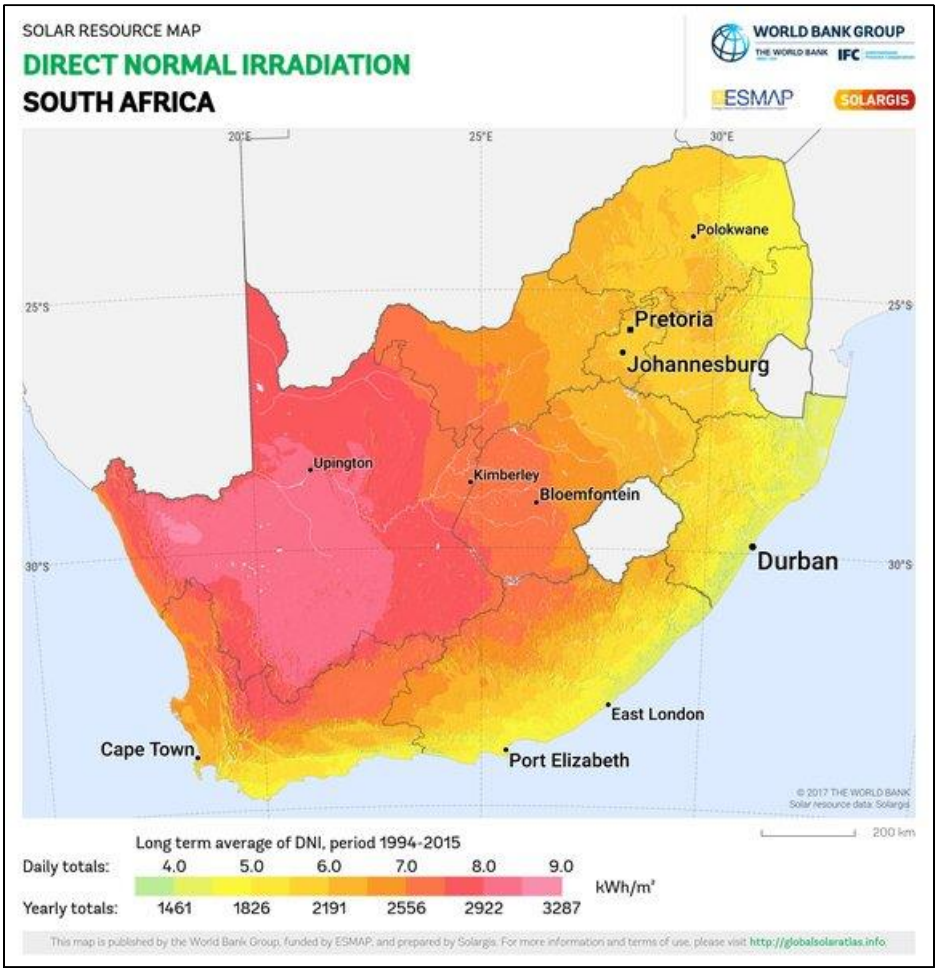

Figure 9: Direct Normal Solar Irradiation (DNI) map (Source - 2017 The World Bank, Solar resource data: SolarGis)

Based on the Photovoltaic (PV) Power Potential map below (**Figure 10**), the Eastern Cape Province of South Africa has a relatively high solar potential when compared to other provinces. The project site is thus suitable for the establishment of the proposed solar PV energy facility. Based on an estimation of the solar energy resource as well as weather, dust, dirt, surface albedo and the pre-feasibility studies conducted by Paarde Valley Solar Power, the site has been identified as optimal for the proposed Paarde Valley Solar PV Energy Facility.

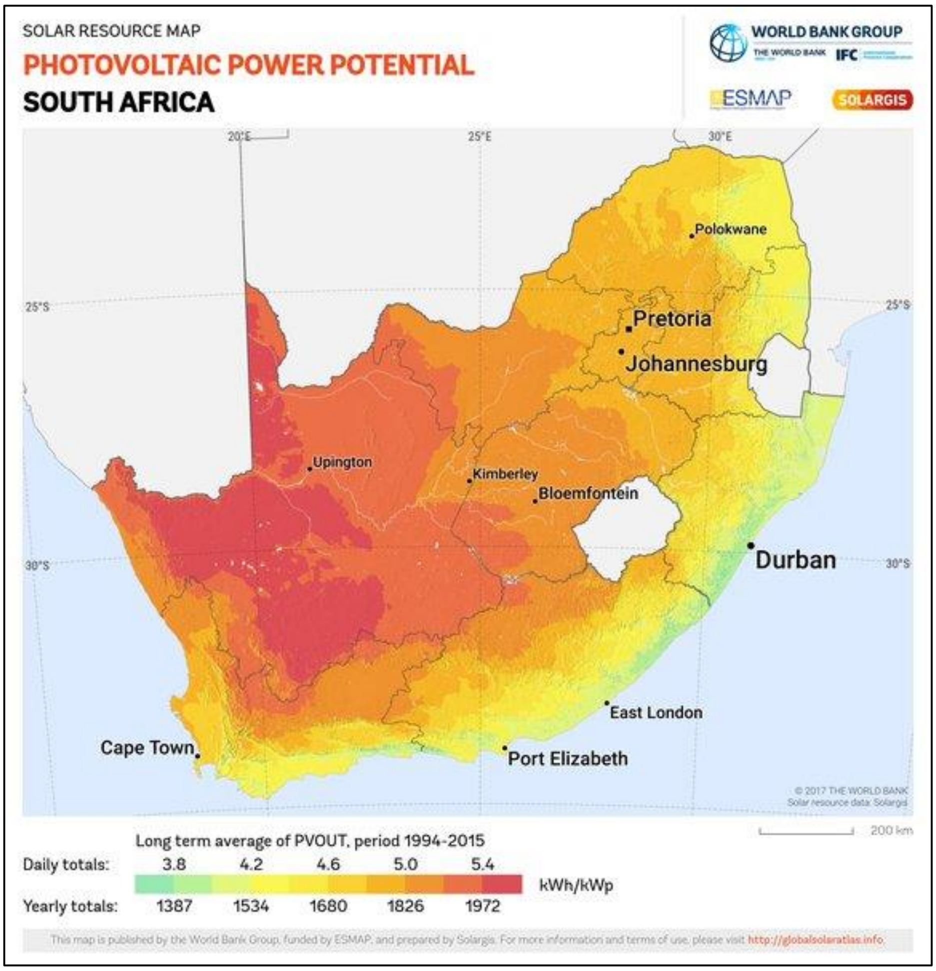

Figure 10: Photovoltaic (PV) Power Potential map (Source - © 2017 The World Bank, Solar resource data: SolarGis)

The proposed project site is not located in any of the eight (8) identified REDZs, which are geographical areas that have been identified on a strategic planning level to have reduced negative environmental impacts but high commercial attractiveness (due to its proximity to, *inter alia*, the national grid) and socio-economic benefit to the country. Despite this, the development of the proposed solar PV energy facility is still considered to be important for South Africa as it will reduce the country's overall environmental footprint from power generation (including externality costs), and thereby steer the country on a pathway towards sustainability. The proposed development will provide socio-economic benefits to the region it is situated in and will have a high commercial attractiveness. In addition, the negative environmental impacts associated with the proposed development can be mitigated to acceptable levels.

Solar resource is only one (1) driver of site selection. The other aspects should be considered when holistically evaluating a proposed development.

The proposed site is currently being used for agricultural purposes, predominantly sheep farming. The climate does not support any cultivation, except for small patches of irrigation associated with farm dams. Low-intensity natural grazing is the dominant agricultural activity. The low climatic moisture availability means that natural grazing is the only viable agricultural land use for most of the area, except for the small patches of irrigation. In addition, isolated farmsteads, including farm worker's dwellings, and ancillary farm buildings can also be found within the study area. It is expected that the small patches of irrigation will be unaffected by the proposed development as these should be considered no-go areas for any footprint of development that will exclude cultivation. As such, it is not envisioned that farming activities will be impacted after the construction phase has been completed. It is not anticipated that any of the farmsteads, farm worker's dwellings or ancillary farm buildings located within the application site will need to be moved or decommissioned. The Applicant is however willing to relocate any farm workers' dwellings or any other farm buildings, if needed. Should infrastructure changes be required, this will be discussed with the relevant landowner(s). It must be noted that the affected landowner is in support of the proposed development as the landowner understands the importance of building generation capacity. The proposed project site is therefore considered to be suitable from a land use perspective.

Grid connection suitability is the next element which drives the project location. Long connection lines have increased environmental impacts as well as add increased costs to the proposed development. The Paarde Valley project site has good grid connection potential as the proposed solar PV energy facility will connect to the Hydra D MTS or the proposed Coleskop WEF substation (depending on which grid connection infrastructure option is chosen as 'preferred'), which are still to be constructed. This thereby minimises the need for an extensive grid network upgrade or long power line.

Environmental is a key aspect that Paarde Valley Solar Power considers when evaluating a solar PV energy development. The proposed development should be developed in a sustainable and ecologically friendly manner ensuring its development has the least possible impact on the land on which it will be built.

Other key criteria which refine the site selection on a micro level include competition, topography and site access.

The proposed project site has a relatively flat topography, which is suitable for the development of a solar PV energy facility. The project site can be accessed easily via an existing dirt secondary road which connects to the tarred N10 national road.

The farms are currently used for agricultural purposes, specifically commercial sheep farming. The proposed development is not envisioned to impact farming activities after the construction phase had been completed. The site is therefore considered to be suitable from a land use perspective.

4.4 Local Need

The Eastern Cape Province faces numerous socio-economic and developmental challenges, which are not unique to the Province and are observed throughout the country. A sustainable future for the Eastern Cape rests on people-centred development to achieve five (5) related goals, namely an inclusive, equitable and growing economy for the province; an educated, innovative and empowered citizenry; a healthy population; vibrant, equitably enabled communities and capable agents across government and other institutional partners committed to the development of the Province. These goals will be pursued with a focus on rural development to address serious inherited structural deficiencies. (Eastern Cape PDP, 2014).

The PDP for the Eastern Cape Province states that one (1) of the challenges which the Province faces is that the economy is overly and unsustainably resource intensive. There is an over-reliance of the provincial economy on the motor manufacturing industry and small manufacturing sector. In this sense, the introduction of renewable energy developments will assist in diversifying the economy within the Province and can thus be seen as beneficial. It has also been noted that the Eastern Cape is endowed with a number of resources that give it a competitive edge, including energy resources. The PDP has subsequently identified the western region of the Province, namely Cacadu and Nelson Mandela Bay, as a region which holds potential for the generation of renewable wind and solar energy. Despite this, the proposed development is still considered to be favourable to the affected region.

It should also be noted that some of the development opportunities which have been identified largely focus on developing the rural regions of the province. The proposed development is situated near the town of Middelburg, within a mostly rural setting, and is expected to contribute to the development of the region to some degree. In terms of the Province's rural development agenda, it has been identified that this agenda should be cognizant of the climate and environmental challenge, enhance environmental resilience and sustainability, use scarce natural resources efficiently, promote renewable sources of energy and leverage a green agenda for new jobs and income for the poor (Eastern Cape PDP, 2014). The proposed development of solar PV energy facility within the Province will adhere to this agenda.

Additionally, a number of the strategic objectives (which were identified to assist in achieving the goals which inform the PDP) are focused on renewable energy developments. *Strategic action 1.1.6* is aimed at positioning the Province as a key investment hub in the energy sector and ensuring a reliable energy supply to high-potential sectors. In this sense, the province is positioning itself as an investment hub in the energy sector. This will provide opportunities to develop the capital goods sector and heavy industries. This new investment could become a major catalyst for provincial economic development, as regional and local benefits are expected to accrue from new investment in the energy sector. Approved wind energy projects already account for 63% of the average provincial energy demand. The PDP further states that pre-authorisation arrangements in 'renewable energy zones' (to be located in Cacadu and Chris Hani districts) will allow this industry to expand to its full potential. As part of *Strategic action 1.5.4* (which is aimed at growing and developing the manufacturing industry), the Green/renewables industry has been identified to have potential for expansion. Additionally, *Strategic action 4.3.2* is aimed at ensuring adequate energy infrastructure for household and public facility access. New investments in the electricity transmission and distribution networks are required to accommodate new generation capacity and strengthen grid capacity. This will improve network performance, network flexibility and the quality of supply for both economic and social activities. The PDP aims to ensure universal access to energy by 2030. Economics may dictate that off-grid solutions are necessary and renewable energy hubs for remote rural areas are a potential solution, using solar, wind and biomass/biogas as a resource (Eastern Cape PDP, 2014).

Considering the above, it can be concluded that the proposed development follows the provincial priorities and developmental objectives. From a spatial perspective, the proposed development also does not appear to raise any red flags.

The district and local municipality where the proposed solar PV energy facility is to be established also face similar challenges to the Province. Therefore, the municipalities' developmental priorities largely coincide. In like manner with the national and provincial policies, the district and local municipalities have placed considerable emphasis on the prioritisation and promotion of renewable energy resources within their boundaries. According to the Chris Hani District Municipality's IDP, the greatest challenge facing government and local government in particular is how to minimise harmful environmental practices that contribute to global warming and ultimately climate change. The EMP which was produced by the Chris Hani District Municipality highlights areas of the environment which should be conserved and protected. This includes present and future environmental problems which were identified per local municipality as well as all renewable resources. In addition, the IDP states the following: ' *…we can see that CHDM is now ready to address the scourge of climate change and make it beneficial to the citizens of this region through greening, recycling, and renewable energy initiatives'* (Chris Hani District Municipality, 2019). In order to direct development according to the Guidelines of the National Spatial Development Perspective, Special Development Areas (SDAs) have been identified. These SDAs focus more specifically on defining spatial areas where certain forms of development potential have been identified. It should be noted that the Manufacturing, Industry Mining and more importantly Renewable Energy Sectors have been identified as Areas of Local Economic Development Potential (Chris Hani District Municipality, 2019).

Based on the information above, it is evident that the proposed development fits well with the plans to diversify the provincial, district and local economies through investment in renewable energy developments.

5 DESCRIPTION OF THE RECEIVING ENVIRONMENT

A general description of the study area is outlined in the section below. The receiving environment in relation to each specialist study is also provided.

As mentioned, the specialists compiled one (1) combined report covering all three (3) of the proposed Umsobomvu PV projects and grid infrastructure. Some of the sections below therefore provide a general description of the greater area surrounding the proposed PV project. Findings and impact assessment sections are however project specific. The DEA confirmed that this approach is acceptable during a pre-application meeting (refer to **Appendix 9B** for pre-application meeting minutes).

5.1 Regional Locality

The proposed development will be located approximately 29km north-west of Middelburg in the Inxuba Yethemba Local Municipality, which falls within the Chris Hani District Municipality in the Eastern Cape Province of South Africa (**Figure 11**). As mentioned, the proposed solar PV energy facility will be accessed by the N10 national road which lies north-east of the application site.

The centre point and corner coordinates for the proposed application site are included in **Table 8** below.

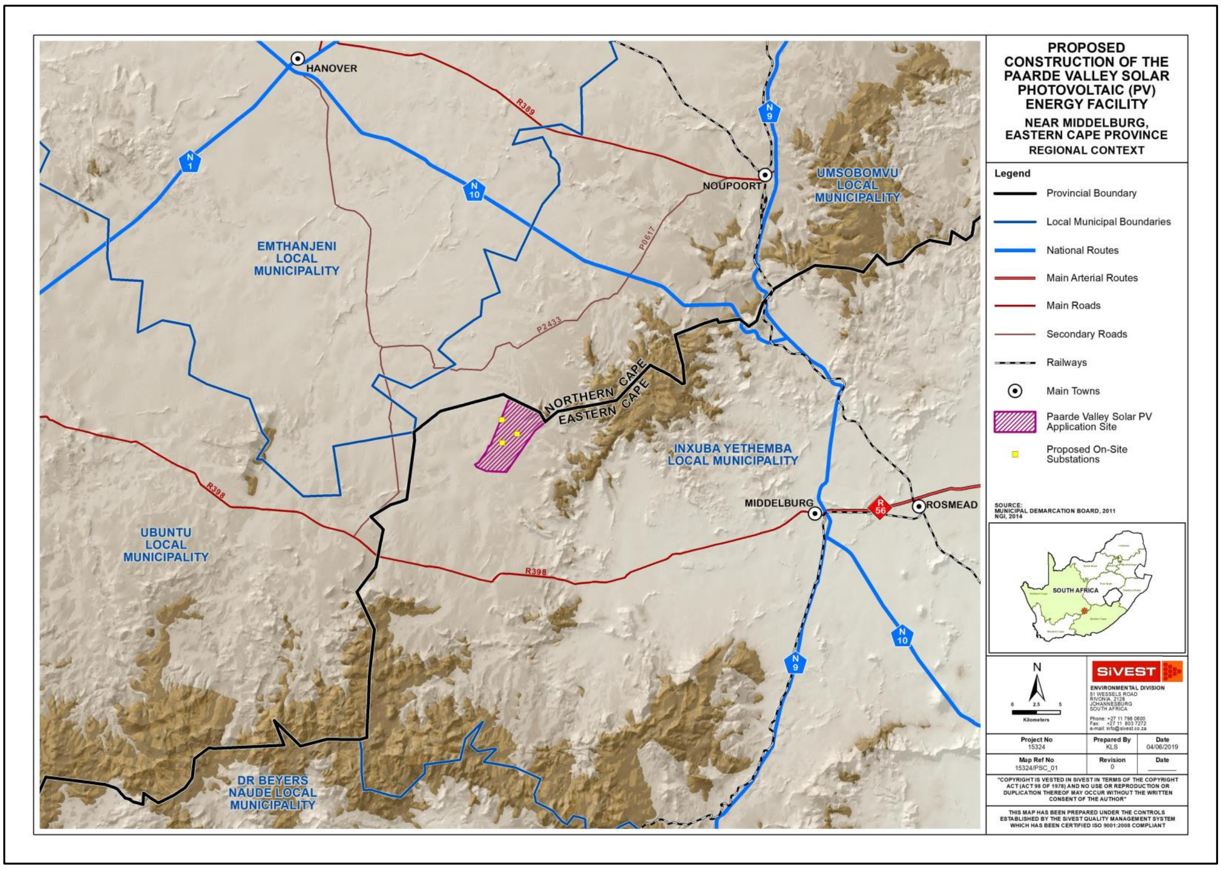

Figure 11: Regional context of the Paarde Valley Solar PV Energy Facility

5.2 Study Site Description

The entire study area is largely in a natural state, but used for animal production. There is well-established farm infrastructure, including homesteads, farm buildings, camps, dams, small areas of cultivated lands, and some stands of exotic trees used as shade and wind-screens. There are also access roads, narrow gravel roads, jeep tracks and fences. The vegetation in the study area is used primarily for livestock grazing and is affected to some degree by this usage, but not to the extent that any severe degradation was noted on-site. This natural pattern extends beyond the study area in all directions and gives the general area a sense of being relatively untransformed and largely natural.

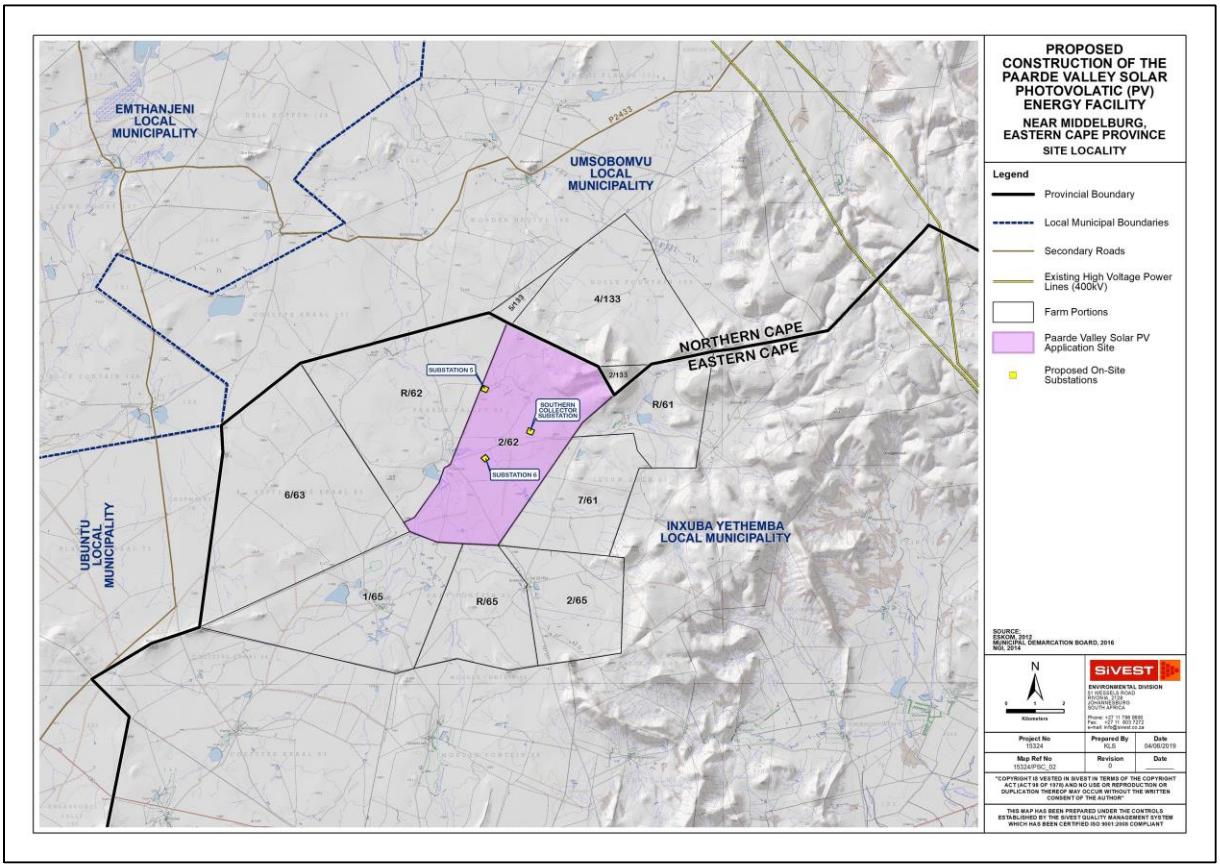

Figure 12: Site locality

Table 8: Centre point and corner coordinates for the application site

PAARDE VALLEY SOLAR PV ENERGY FACILITY: APPLICATION SITE		
CORNER POINT COORDINATES (DD MM SS.sss)		
POINT	**SOUTH**	**EAST**
A	S31° 23' 12.200"	E24° 40' 18.000"
B	S31° 24' 2.055"	E24° 42' 17.317"
C	S31° 24' 34.180"	E24° 42' 38.180"
D	S31° 25' 5.082"	E24° 41' 56.504"
E	S31° 27' 23.493"	E24° 40' 4.881"
F	S31° 27' 19.619"	E24° 38' 45.155"
G	S31° 27' 7.376"	E24° 38' 9.002"
H	S31° 26' 57.354"	E24° 38' 0.988"
I	S31° 26' 51.530"	E24° 38' 15.162"
J	S31° 26' 12.784"	E24° 38' 47.405"
K	S31° 25' 55.818"	E24° 38' 54.674"
L	S31° 25' 52.186"	E24° 39' 2.364"
CENTRE POINT COORDINATES (DD MM SS.sss)		

POINT	SOUTH	EAST
P	S31° 25' 23.905"	E24° 40' 22.307"

It should be noted that Portion 7 of the Farm Leeuw Hoek No. 61 was not included as part of the original application site which was assessed during the scoping phase (see **Figure 12** above). This property was identified for inclusion into the application site following the identification of sensitive areas. Due to the prohibitive size of the PV development area, after the areas identified as no-go from an environmental perspective were excluded, it was proposed that this property also should be incorporated into the application site to ensure sufficient land is available for the proposed development. This property will be included in the application site and assessed in the EIA phase. Centre and corner point coordinates will therefore be provided in the DEAIr.

5.3 Topography

The study area is situated in an area along the boundary between plains and mountain ranges, with moderately to steeply sloping topography in the south-eastern parts, and relatively flat to undulating terrain in the remainder of the area. The elevation on-site varies from 1430 to 1855m above sea level, an elevation difference of approximately 425m across a distance of around 15,0km. The mountains rise fairly steeply from the surrounding plains resulting in much steeper gradients along this interface. The mountain areas are incised by steep valleys and are dissected and variable in topography. The plains are relatively flat to undulating, but with regular low ridges and koppies to break the landscape, some isolated and others linked into long, low ridges.

The topography within the application site is generally mildly undulating with a few localised ridges and koppies scattered across the site. There are a number of scattered outcrops/boulders across the site. The north-eastern section of the site is situated on a hilly/mountainous zone with steep slopes.

The topography of the proposed site and surrounding area is shown in **Figure 13** below. The degree of slope of the site and surrounding area is shown in **Figure 14** below.

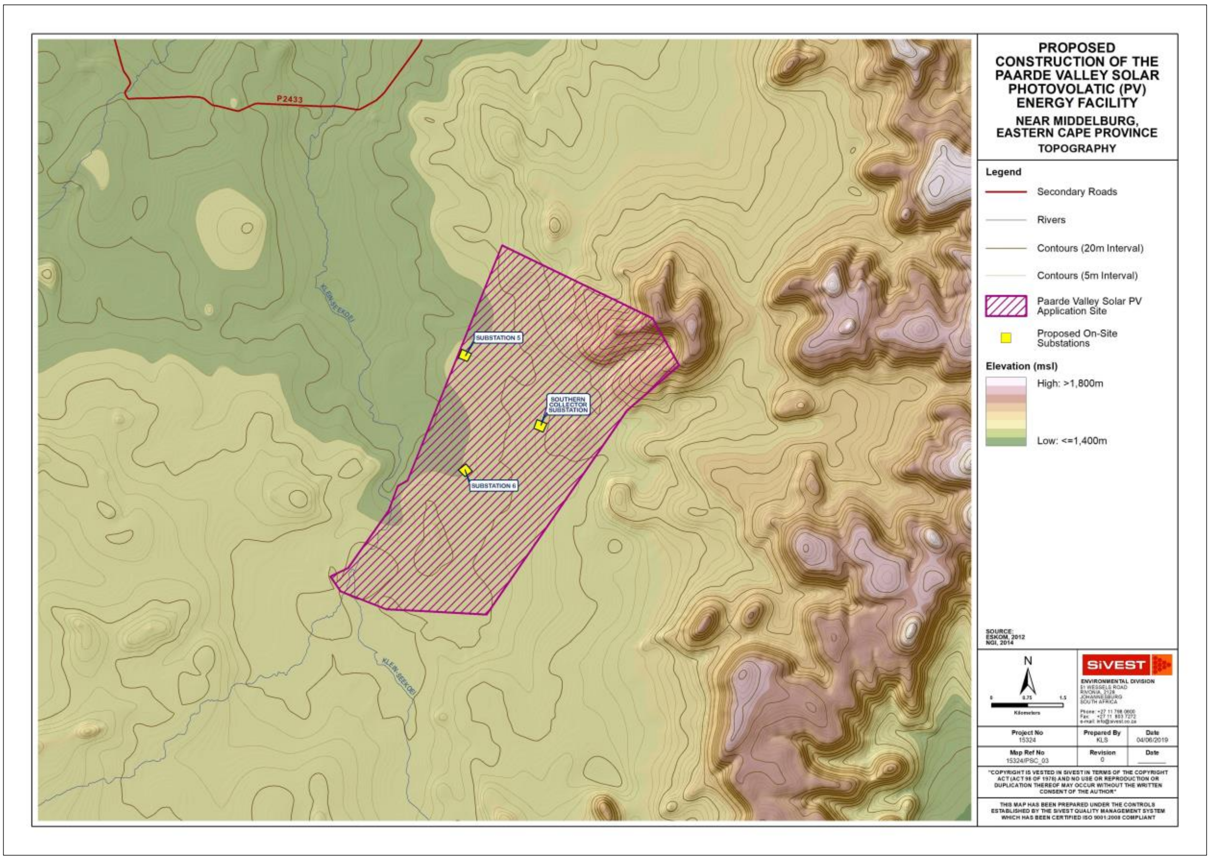

Figure 13: Topography of the study area

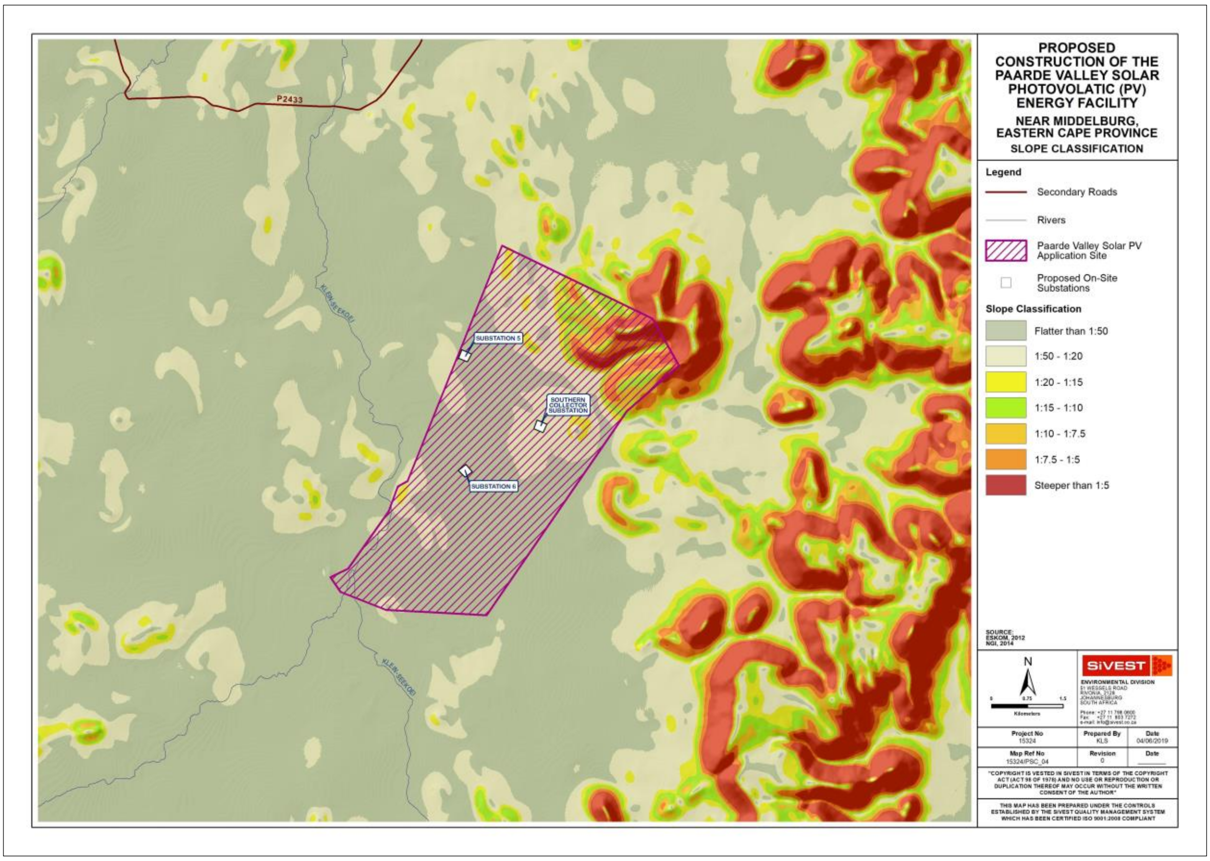

Figure 14: Degree of slope in region of the study area

5.4 Geology

The development area is underlain by a series of Karoo sandstones, mudstones and shales, deposited under fluvial environments of the Adelaide Subgroup that forms part of the Beaufort Group. The Beaufort group overlays the Ecca Group and consists essentially of sandstones and shales. The Beaufort Group covers a total land surface area of approximately 200 000km^2 in South Africa and is the first fully continental sequence in the Karoo Supergroup. The Beaufort Group is divided into the Adelaide subgroup and the overlying Tarkastad subgroup.

5.5 Land Use

Much of the land use in the study area is characterised by low shrubland with large areas of grassland and smaller patches of woodland / open bush and thicket / dense bush occurring in the hilly areas in the eastern sector of the study area. Significant tracts of land in the study area are classified as 'bare (none vegetated)', and while some of these 'bare' areas are representative of transformation due to human activity, in many cases these patches of land are merely undisturbed areas with very sparse vegetation cover (**Figure 15**).

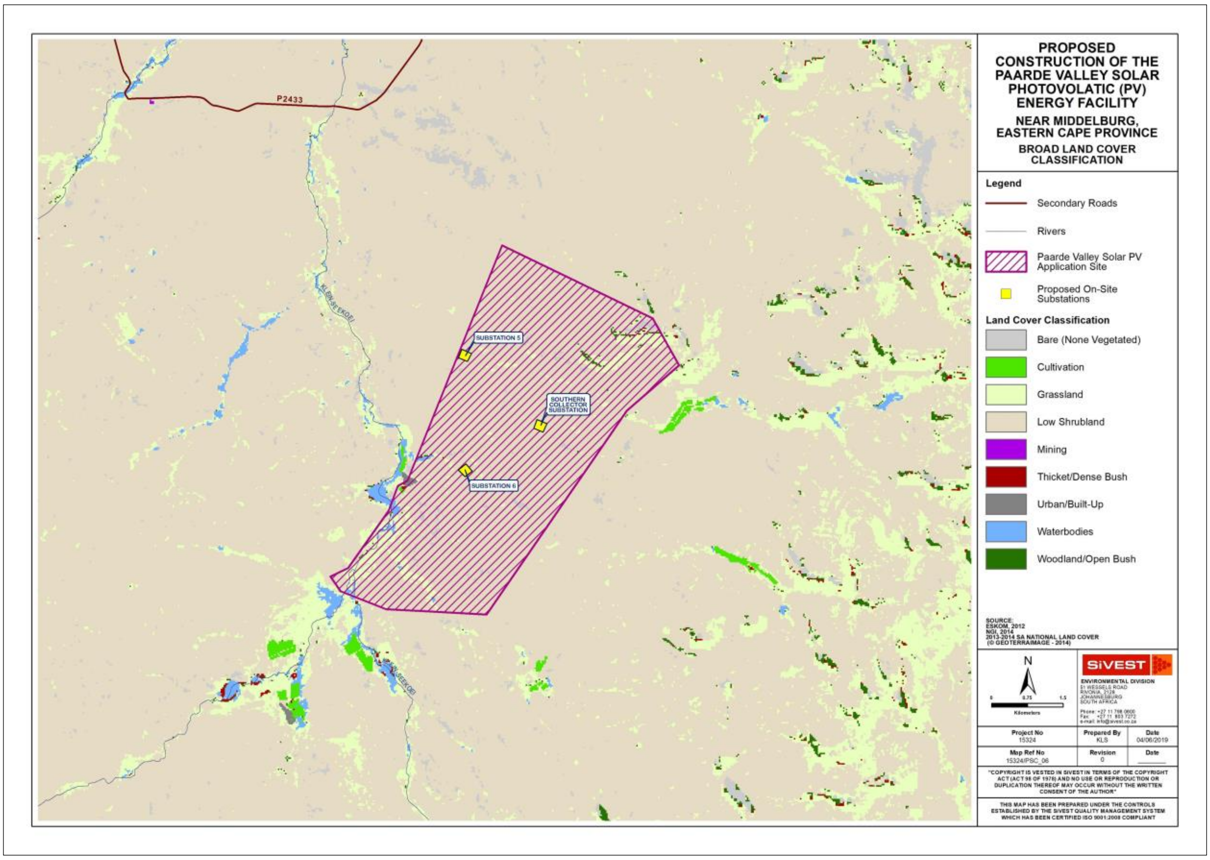

Figure 15: Land use in the region of the study area

Agricultural activity in the area is restricted by the arid nature of the local climate and areas of cultivation are largely confined to relatively limited areas distributed along drainage lines. As such, the natural vegetation has been retained across much of the study area.

Livestock farming (mostly sheep) is the dominant activity, although the climatic and soil conditions have resulted in low densities of livestock and relatively large farm properties across the area. Thus, the area has a very low density of rural settlement, with relatively few scattered farmsteads in evidence.

Built form in much of the study area is limited to isolated farmsteads, including farm worker's dwellings and ancillary farm buildings, gravel access roads, telephone lines, fences and windmills.

The closest built-up area is the town of Middelburg which is situated approximately 30km to the south-east of the Paarde Valley application site.

5.6 Climate

The study area is within an arid environment. Rainfall for the site is given as a low 378 mm per annum (The World Bank Climate Change Knowledge Portal, 2015). Rainfall can potentially occur at any time of the year, but is more likely in summer to late-summer, most often from October to April. Winters can be cold, with mean minimum temperatures approaching zero in July. Winter frost is common and occurs on average 30 days per year. In contrast, summers can be very hot with mean maximum temperatures in January exceeding 30°C.

The average monthly temperature and distribution of rainfall is shown in **Figure 16** below.

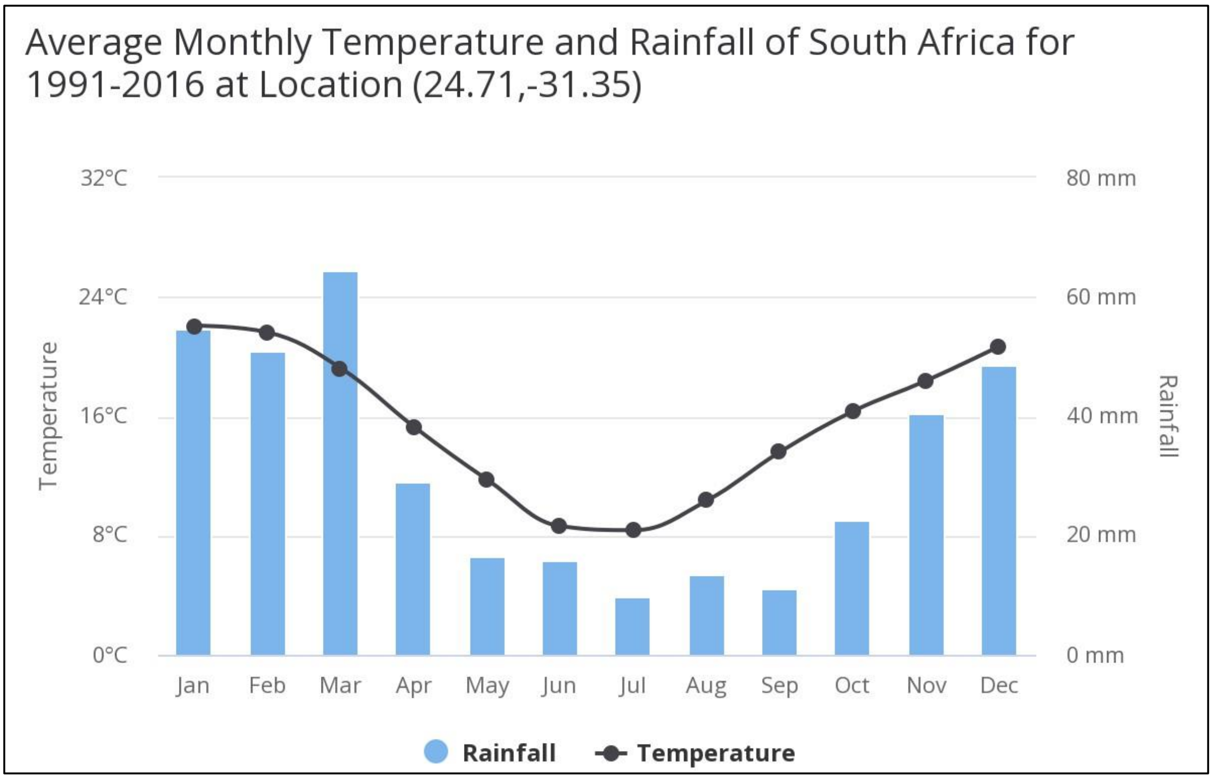

Figure 16: Average monthly temperature and rainfall for a position approximately in the centre of the development (The World Bank Climate Change Knowledge Portal, 2015)

5.7 Terrestrial Ecology

The scoping phase Terrestrial Ecological Impact Assessment was conducted by Dr David Hoare and is included as **Appendix 6H**. The study commenced as a desktop-study, followed by a site-specific field study which was undertaken from the 4th – 8th of February 2019.

The environmental baseline from a terrestrial ecological perspective is presented below.

5.7.1 Broad Vegetation Patterns

There are two (2) regional vegetation types occurring in the study area, namely Eastern Upper Karoo and Besemkaree Koppies Shrubland. The first of these two (2) units (Eastern Upper Karoo) occurs across most of the study area, whereas the second (Besemkaree Koppies Shrubland) is restricted to the mountainous areas and is only affected by small proportions of the proposed infrastructure. There are three (3) additional units that occur in nearby areas, namely Southern Karoo Riviere (to the south-east of the application site), Tarkastad Montane Shrubland (small patches to east and north-east of the application site) and Karoo Escarpment Grassland (to the north-east of the application site). It is possible that floristic components and/or plant community patterns related to any of these could extend locally into the study area.

The national vegetation map (Mucina & Rutherford 2006) for the study area is depicted below in **Figure 17** below.

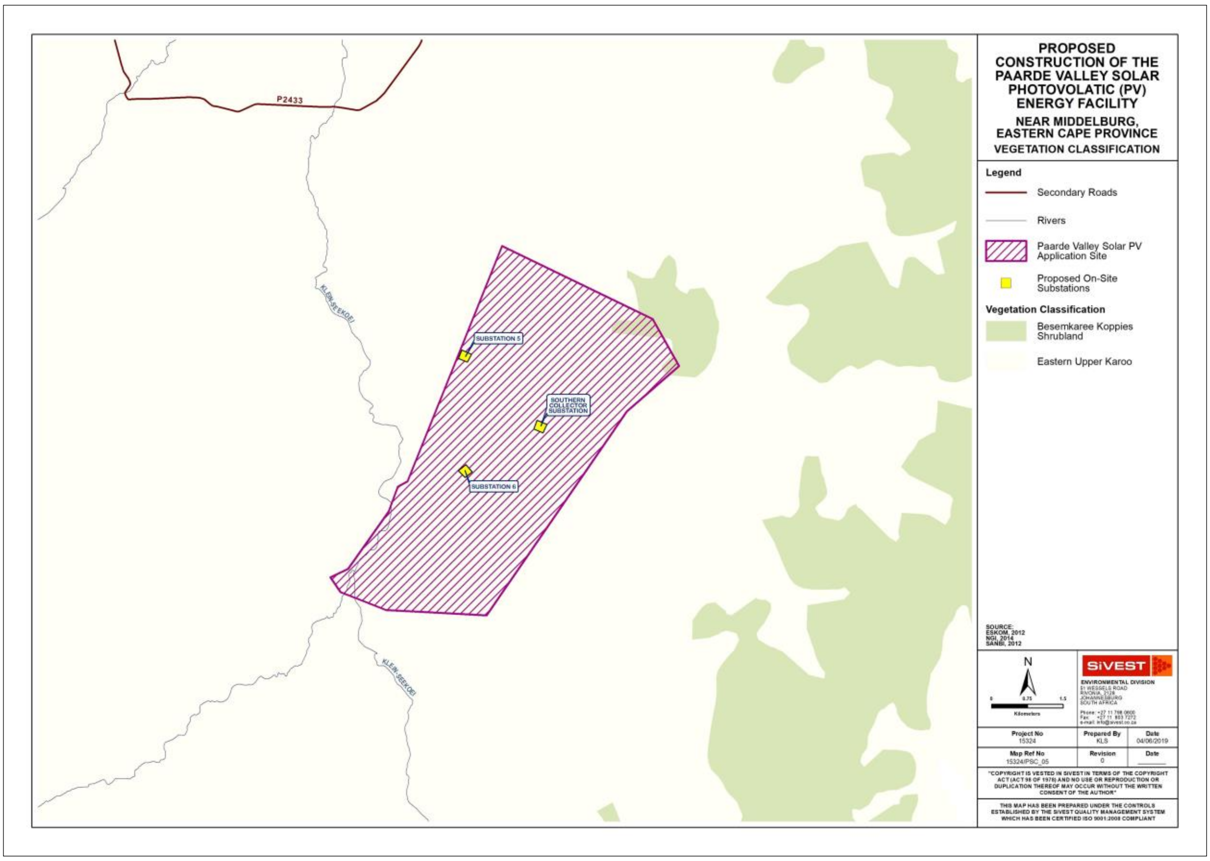

Figure 17: The national vegetation map (Mucina & Rutherford, 2006) for the study area. Rivers and wetlands (pans) delineated by the National Freshwater Ecosystem Priority Areas Assessment (Nel *et al.* 2011) are also depicted.

The vegetation types that occur in the study area and nearby areas are briefly described below.

<u>Eastern Upper Karoo</u>

The vegetation occurs on flats and gently sloping plains (interspersed with hills and rocky areas of Upper Karoo Hardeveld in the west, Besemkaree Koppies Shrubland in the northeast and Tarkastad Montane Shrubland in the southeast), dominated by dwarf microphyllous shrubs, with 'white' grasses of the genera Aristida and Eragrostis (these become prominent especially in the early autumn months after good summer rains). The grass cover increases along a gradient from southwest to northeast.

<u>Besemkaree Koppies Shrubland</u>

Slopes of koppies, butts and tafelbergs covered by two-layered karroid shrubland. The lower (closed-canopy) layer is dominated by dwarf small-leaved shrubs and, especially in precipitation-rich years, also by abundant grasses, while the upper (loose canopy) layer is dominated by tall shrubs, namely *Rhus erosa*, *R. burchellii*, *R. ciliata*, *Euclea crispa subsp. ovata*, *Diospyros austro-africana* and *Olea europaea subsp. africana*.

<u>Southern Karoo Riviere</u>

Narrow riverine flats supporting a complex of *Acacia karoo* or *Tamarix usneoides* thickets (up to 5 m tall) and fringed by tall *Salsola*-dominated shrubland (up to 1.5 m high), especially on heavier (and salt-laden) soils on very broad alluvia. In sandy drainage lines *Stipagrostis namaquensis* may occasionally also dominate. Mesic thicket forms in the far eastern part of this region (see Van der Walt 1980: Table 4) may also contain *Leucosidea sericea*, *Rhamnus prinoides* and *Ehrharta erecta*.

Tarkastad Montane Shrubland

Ridges, hills and isolated mountain slopes, characterised by high surface rock cover, this often consisting of large, round boulders. The vegetation is low, semi-open, mixed shrubland with 'white' grasses and dwarf shrubs forming a prominent component of the vegetation.

Karoo Escarpment Grassland

Mountain summits, low mountains and hills with wiry, tussock grasslands, usually dominated by *Merxmuellera disticha*. Other common species include the grasses typical of dry grasslands (genera *Eragrostis*, *Tetrachne*, *Karroochloa*, *Helictotrichon*, *Melica*, *Tragus*, *Elionurus* and *Aristida*). An important low shrub component occurs throughout this grassland unit.

5.7.2 Conservation Status of Broad Vegetation Types

On the basis of a scientific approach used at national level by the South African National Biodiversity Institute (SANBI) (Driver *et al*., 2005), vegetation types can be categorised according to their conservation status which is, in turn, assessed according to the degree of transformation relative to the expected extent of each vegetation type. The status of a habitat or vegetation type is based on how much of its original area remains intact relative to various thresholds. The original extent of a vegetation type is as presented in the most recent national vegetation map (Mucina, Rutherford & Powrie, 2005) and is the extent of the vegetation type in the absence of any historical human impact. On a national scale, the thresholds are as depicted in **Table 9** below, as determined by best available scientific approaches (Driver *et al*., 2005). The level at which an ecosystem becomes Critically Endangered differs from one ecosystem to another and varies from 16% to 36% (Driver *et al*., 2005).

Determining ecosystem status (Driver *et al*., 2005). *BT = biodiversity target (the minimum conservation requirement).

Habitat remaining (%)			
	80–100	least threatened	LT
	60–80	vulnerable	VU
	*BT–60	endangered	EN
	0–*BT	critically endangered	CR

Table 9: Conservation status of different vegetation types occurring in the study area

Vegetation Type	Target (%)	Conserved (%)	Transformed (%)	Conservation status	
				Driver *et al*. 2005; Mucina *et al*., 2006	National Ecosystem List (NEM:BA)
Eastern Upper Karoo	21	3	2	Least threatened	Not listed

Besemkaree Koppies Shrubland	28	5	3	Least threatened	Not listed
Southern Karoo Riviere	24	3	12	Least threatened	Not listed
Tarkastad Montane Shrubland	28	1	3	Least threatened	Not listed
Karoo Escarpment Grassland	24	3	3	Least threatened	Not listed

According to scientific literature (Driver *et al*., 2005; Mucina *et al*., 2006), as shown in **Table 9**, all regional vegetation types described here are listed as Least Threatened. The National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004), lists national vegetation types that are afforded protection on the basis of rates of transformation. The thresholds for listing in this legislation are higher than in the scientific literature, which means there are fewer ecosystems listed in the National Ecosystem List versus in the scientific literature. None of the vegetation types described here are listed in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011).

5.7.3 Biodiversity Conservation Plans

The study area straddles the provincial boundary between the Northern Cape and the Eastern Cape. There are biodiversity conservation plans for the Eastern Cape Province, however, the closest designated feature in the Eastern Cape Biodiversity Conservation Plan for the site is over 20km away. There are therefore no features of concern from the Eastern Cape conservation plan.

A map showing the CBAs and ESAs which can be found within the application site and broader study area is provided in **Figure 18** below.

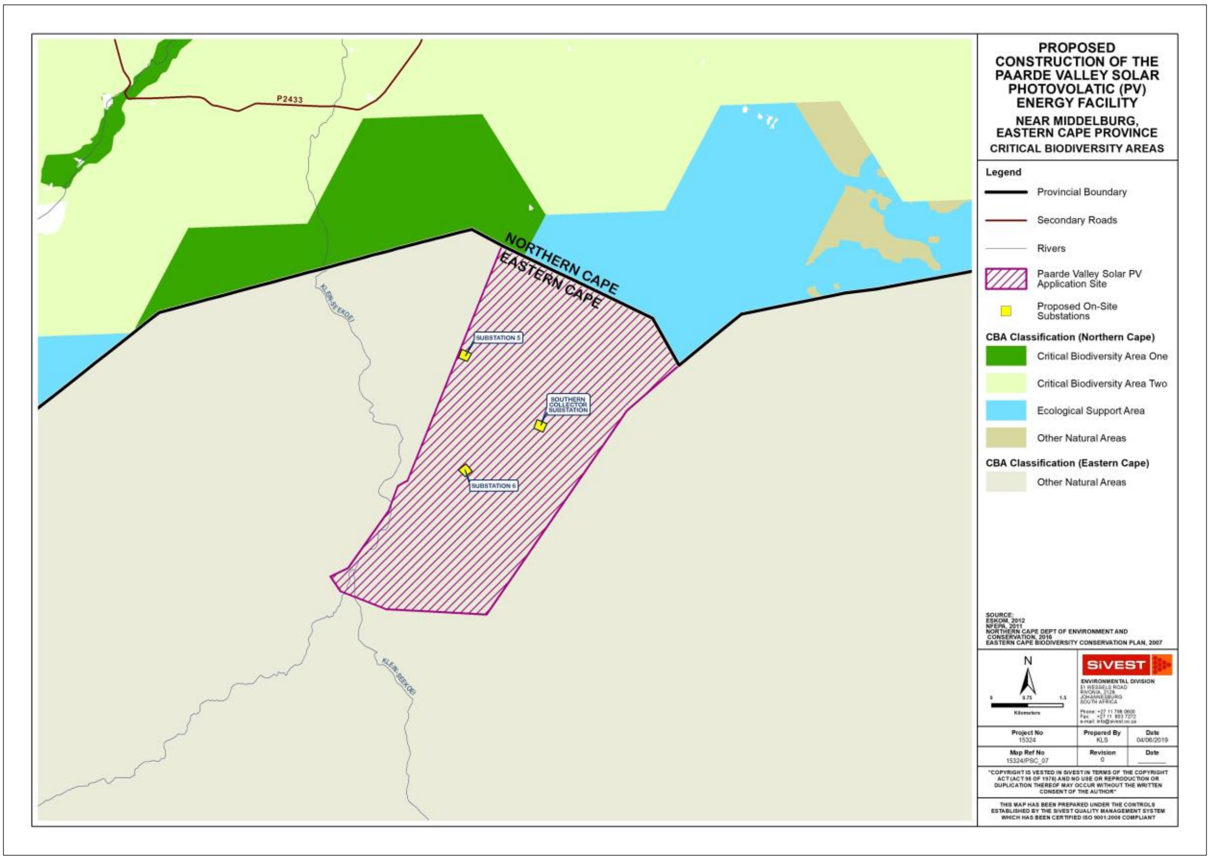

Figure 18: Map showing Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)

It should be noted that the ecologist undertook a detailed site walkthrough of the project footprint to verify the relevance of the CBAs and ESAs. This was done to address any uncertainty in the coarse scale delineation of CBAs and ESAs.

5.7.4 Red List Plant Species of the Study Area

Lists of plant species previously recorded in the study area were obtained from the SANBI website (http://newposa.sanbi.org/). These are listed in Appendix 3 of the scoping phase Terrestrial Ecology Impact Assessment Report. There are very few collection records for this part of the country so a much larger area was searched for potential species of concern. Despite this broader search, there are very few species that were identified of conservation concern that could potentially occur in the broad area that includes the project area.

The list contains two (2) species listed in an IUCN threat category (Critically Endangered, Endangered or Vulnerable - see Table 3 in scoping phase Terrestrial Ecology Impact Assessment Report) of which two (2) have a moderate possibility of occurring in the general area and in the type of habitats available in the study area. This does not mean that they will occur there, only that the review has identified that these are species that should be assessed as possibly occurring in the area. None of these species were encountered on site. The first of the two (2) species, *Gnaphalium simii*, listed as Data Deficient: taxonomic problems (DDT), would only occur in calcareous vleis, which could occur in any of the drainage lines in the project area. The second species, *Trichodiadema rogersiae*, also listed as DDT, is found in mountain areas.

None of the species recorded on site (see Appendix 3 of scoping phase Terrestrial Ecology Impact Assessment Report) are listed in any threat category.

5.7.5 Protected Plants (National Environmental Management: Biodiversity Act)

Plant species protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) are listed in Appendix 6 of the scoping phase Terrestrial Ecology Impact Assessment Report. None of the species on this list were encountered on site and none are considered likely to occur there, because they do not have a geographical distribution that includes the study area.

5.7.6 Protected Trees

Tree species protected under the National Forest Act are listed in Appendix 2 of the scoping phase Terrestrial Ecology Impact Assessment Report. There are none with a geographical distribution that includes the region in which the proposed development is located. There are two (2) species that have a geographical distribution that ends south of the study area, namely *Boscia albitrunca* and *Pittosporum viridiflorum*.

Boscia albitrunca

This is a small to medium-sized of up to 7m tall with a dense, roundish crown and smooth, white to greyish-white trunk. It is found in the drier parts of South Africa, as well as in the northern savanna parts of the country, but also extending some of the way down the eastern seaboard. There are scattered records of this species in the general area that includes the project site, although it's main area of occurrence is further north. It is therefore possible that it could occur in the study area. However, no trees of this species were seen on site and it is considered unlikely that it occurs there. In the unlikely event that it is found to occur there, it is unlikely that any more than a few individuals would be found.

Pittosporum viridiflorum

This species occurs primarily in a band along the southern part of the country, extending up the east coast, where, from Lesotho northwards, it extends further inland. In the part of the country around the study area, the occurrence is generally south of the Great Escarpment, although there is one (1) record from Philipstown and two (2) from near Graaff-Reinet. It is considered unlikely that it occurs in the study area. In the unlikely event that it is found to occur there, it is unlikely that any more than a few individuals would be found.

In summary, no species of protected trees were found or are likely to occur in the geographical area that includes the site.

5.7.7 *Vertebrate Animal Species of the Study Area*

Vertebrate species (mammals, reptiles and amphibians) with a geographical distribution that includes the study area are listed in Appendix 4 of the scoping phase Terrestrial Ecology Impact Assessment Report. All threatened (Critically Endangered, Endangered or Vulnerable) or near threatened vertebrate animals that could occur in the study area and have habitat preference that includes habitats available in the study area, are discussed further below.

Mammals

There are 79 mammal species that have a geographical distribution that includes the study area, of which eleven (11) are listed in a conservation category of some level (see Appendix 3 of scoping phase Terrestrial Ecology Impact Assessment Report). This is a relatively moderate diversity of mammals compared to other parts of South Africa. Based on the natural state of the study area and surrounding areas, it is considered likely that some of these species could occur on site. Listed species with a geographical range that includes the site are discussed in more detail below to evaluate the potential for them to occur on site.

- Black Rhinoceros

The Black Rhinoceros (*Diceros bicornis bicornis*), listed as Endangered, has a geographical distribution that includes the study area. The species is confined to formal conservation areas as well as a few individuals held on private land. **Although the habitat on site is suitable for this species, it does not occur there and would not be found there unless deliberately introduced.**

- Grey Rhebok

The Grey Rhebok (*Pelea capreolus*), listed as Near Threatened, is endemic to South Africa, Lesotho and parts of Swaziland. In the south and southwest, their distribution is associated with the rocky hills of mountain Fynbos and the Little Karoo (Taylor *et a*l., 2016). They are predominantly browsers, feeding on ground-hugging forbs, and largely water independent, obtaining most of their water requirements from their food (Taylor *et al*., 2016). Local declines in their population have been attributed to increased densities of natural predators, such as Black-backed Jackal, Caracals and Leopards. It has not been recorded in the grid in which the site is located, but has been recorded in the grid to the north-east and many grids further to the south, so the site is within the overall distribution range of the species. There is therefore a moderate likelihood that it could occur on-site within any suitable habitat. However, it is a relatively mobile species and not necessarily dependent on any particular habitat. It is likely to move away from the path of any construction and development of parts of the study area. **The proposed development is therefore highly unlikely to have any negative effect on the species, even though it could possibly occur there.**

- Black-footed Cat

The Black-footed Cat (*Felis nigripes*), listed as Vulnerable, has been previously recorded in the grid in which the project is located, as well as in most surrounding grids. It’s known distribution is on the inland part of most of South Africa, but seemingly not within the winter-rainfall part of the country. It also occurs in Botswana and Namibia. The current project area is within the core of the distribution range of the species and the species is therefore highly likely to occur in the area. The species is nocturnal and carnivorous, favouring any vegetation cover that is low and not too dense. They make use of dens in the daytime, which can be abandoned termite mounds, or dens dug by other animals, such as aardvark, springhares or cape ground squirrels. Local declines in their population have been attributed to increased densities of natural predators, such as Black-backed Jackal, Caracals and Leopards. They are highly vulnerable to domestic carnivores. The study area is definitely suited to this species and it probably occurs there. It is possible that it has interbred with cats on the farm – two (2) kittens seen on site had colour characteristics of this species, such as black paws and markings similar to black-footed cats. **The proposed development may possibly have a negative effect on the species.**

- Leopard

The Leopard (*Panthera pardus*), listed as Vulnerable, has a wide habitat tolerance, but with a preference for densely wooded areas and rocky areas. In montane and rocky areas of the Eastern, Western and Northern Cape, they prey on dassies and klipspringers. They have large home ranges, but do not migrate easily, males having ranges of about 100km^2 and females 20km^2. It has not been recorded in any of the adjacent or nearby grids and the overall distribution shows a gap in its distribution that includes the current study area. There is therefore a low probability of this species occurring on site, and if it did occur there it would probably be at very low densities. **The proposed development could possibly displace individuals, in the unlikely event that they occur there, but is unlikely to have a significant effect on overall population densities.**

- Cape Clawless Otter

The Cape Clawless Otter (*Aonyx capensis*), listed as Near Threatened, is widely but patchily distributed throughout South Africa, and is also the most widely found otter in Africa. It is aquatic and seldom found far from permanent water, which needs to be fresh. They may be found in seasonal rivers in the Karoo, provided suitable-sized pools persist. The site is within the known distribution of this species and there are historical records for one (1) adjacent grid to the south, although not from the current grid. There is suitable habitat for this species on-site. Paw-prints in the mud adjacent to water on site were identified as belonging to an otter and it is considered most likely that it would be this species. The area where it occurs is in the power line corridor associated with the Hydra D MTS, which is an option for the project. **It is therefore considered definite that it occurs on site and that individuals could be affected by construction activities, if suitable habitat is damaged.**

- African Striped Weasel

The African Striped Weasel (*Poecilogale albinucha*), listed as Near Threatened, is found throughout most of South Africa, except for the arid interior, and into central Africa (excluding Namibia). It has not been recorded in the grid in which the site is located or any surrounding grid, but the site is within the overall distribution range for the species. It is found primarily in moist grasslands and fynbos, where adequate numbers of prey may be found. **It is considered unlikely to occur in the study area and the proposed development will therefore not affect this species**.

- Brown Hyaena

The Brown Hyaena (*Hyaena brunnea*), listed as Near Threatened, is found in a band running down the centre of the country, expanding into the entire northern parts of the country. There is a gap in the distribution around the current study area, but there is a possibility that vagrant individuals could extend into this area. The species is found in desert areas, particularly along the west coast, semi-desert, open scrub and open woodland savannah (Mills & Hes, 1997). It is a solitary scavenger that travels vast distances every day in search of food. It has a medium chance of occurring in the study area since the distribution range includes the study area, however there are no historical records from nearby. It is a mobile animal that is likely to move away from the path of any construction and development of parts of the site is therefore highly unlikely to have any negative effect on the species. **It is considered that there is a low likelihood of it occurring on site or that individuals could be affected by construction activities.**

- South African Hedgehog

The South African Hedgehog (*Atelerix frontalis*), listed as Near Threatened, is found in a large part of the central part of South Africa, extending down to the south-eastern coast, and is also found in Namibia, Botswana, Zimbabwe, Lesotho and Swaziland. It requires ample ground cover for cover, nesting and foraging and prefers dense vegetation and rocky outcrops. The site is well within the known distribution of this species and there are historical records for nearby grids in all directions, and it has been recorded from the current grid. There is therefore a high probability of the study area being suitable for this species. **It is considered likely that it could occur on site and individuals could be affected by construction activities, if suitable habitat is damaged.**

- White-tailed Rat

The White-tailed Rat (*Mystromys albicaudatus*), listed as Vulnerable, is endemic to South Africa and Lesotho, where it is found primarily in Highveld grasslands, but extending into adjacent Fynbos and Karoo areas. It is terrestrial, but never found in soft, sandy substrates, rocks, wetlands or river banks, and do not occur in transformed habitat. The study area is on the edge of the known distribution of this species, but there are historical records for the grid in which the projects are located, as well as two (2) adjacent grids. There is therefore a high probability of the study area being suitable for this species. **It is considered likely that it could occur on-site and individuals could be affected by construction activities, if suitable habitat is damaged.**

- Vlei Rat

The Vlei Rat (Grassland-type) (*Otomys auratus*), listed as Near Threatened, is near-endemic to South Africa, occurring in the north-eastern half of the country, associated with mesic grasslands and wetlands within alpine, montane and sub-montane regions. It is likely to be associated with sedges and grasses in densely-vegetated wetlands with wet soils. The study area is on the very edge of the known distribution of this species and there are no historical records for grid in which the study area is located, not any adjacent grids. There is therefore a low probability of the study area being suitable for this species. **It is considered unlikely that it occurs on site and the proposed development will therefore probably not affect this species.**

- Spectacled Dormouse

The Spectacled Dormouse (*Graphiurus ocularis*), listed as Near Threatened, is endemic to South Africa, where it is found in the Northern, Eastern and Western Cape Provinces. It is associated with rock piles, crevices, outcrops and stone kraals. They may be territorial. The study area is within the known distribution of this species and there are historical records for three (3) adjacent grids to the north, north-east and east, although not from the current grid. There is therefore a moderate probability of the study area being suitable for this species, including suitable habitat within the project area. **It is considered likely that it could occur on site and individuals could be affected by construction activities, if suitable habitat is damaged.**

Of the species currently listed as threatened or protected (see Appendix 5 of scoping phase Terrestrial Ecology Impact Assessment Report for list of protected species), those listed in **Table 10** below are considered to have a probability of occurring on site and being potentially negatively affected by proposed activities associated with the proposed development.

Table 10: Mammal species of conservation concern with a likelihood of occurring on site

Scientific name	**Common name**	**Status**	**Likelihood of occurrence**
Felis nigripes	Black-footed Cat	Vulnerable, protected	Very High
Aonyx capensis	Cape Clawless Otter	Near Threatened, protected	Very high
Atelerix frontalis	South African Hedgehog	Near Threatened, protected	High
Pelea capreolus	Grey Rhebok	Near Threatened, protected	Medium
Mystromys albicaudatus	White-tailed Rat	Vulnerable	Medium
Graphiurus ocularis	Spectacled dormouse	Near Threatened	Medium
Panthera pardus	Leopard	Vulnerable, protected	Low
Poecilogale albinucha	African Striped Weasel	Near Threatened	Low
Hyaena brunnea	Brown hyaena	Near Threatened	Low
Otomys auratus	Vlei Rat	Near Threatened	Low

Reptiles

A total of 55 reptile species have a geographical distribution that includes the study area in which the project site is found (Alexander & Marais 2007, Bates *et al*. 2014, Branch 1988, Marais 2004, Tolley & Burger, 2007). This is a moderate diversity compared to average diversity in other parts of the country. Of the reptile species that could potentially occur in the study area, none have been listed in a threat category.

There are therefore no reptile species of conservation concern that could potentially occur in the study area and that may therefore be affected by the proposed development.

Amphibians

A total of only ten (10) frog species have a geographical distribution that includes the general study area in which the project site is found (Du Preez & Carruthers, 2009). Some of these species are only marginally present in the study area due to the fact that their distribution range ends close to the study area. Of the frog species that could potentially occur in the study area, none are listed in a threat category, but one (1) species is listed as protected, according to National legislation, the Giant Bullfrog.

- The Giant Bull Frog

The Giant Bull Frog (*Pyxicephalus adspersus*) previously listed as Near Threatened, is found in seasonal shallow grassy pans, vleis and other rain-filled depressions in open flat areas of grassland or savanna and, at the limits of its distribution, in Nama Karoo and thicket. For most of the year the species remains buried up to 1m underground. They emerge only during the peak of the rainy season to forage and breed. If conditions are extremely dry, they may remain cocooned underground for several years. Long distances often separate suitable breeding sites. In order to breed, they require shallow, rain-filled depressions that retain water long enough for the tadpoles to metamorphose. Before and after breeding, bullfrogs forage in open grassland, feeding mostly on insects, but also on other frogs, lizards, snakes, small birds and rodents. After breeding males generally bury themselves within 100m of the breeding site, but females may disperse up to 1km away. Based on habitat requirements, there is a medium probability that this species occurs in the study area.

It is concluded that the site contains habitat that is suitable for various frog species, although only one (1) species of conservation concern is likely to occur in the study area. One (1) frog species of concern is therefore potentially likely to be affected by development in the study area, including the proposed project, as shown in **Table 11** below.

Table 11: Amphibian species of conservation concern with a likelihood of occurring on site

Scientific name	Common name	Status	Likelihood of occurrence
Pyxicephalus adspersus	Giant Bullfrog	Protected	Medium

5.7.8 Protected Animals

There are a number of animal species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004). According to this Act, "*a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7*". Such activities include any that are "*of a nature that may negatively impact on the survival of a listed threatened or protected species*". This implies that any negative impacts on habitats in which populations of protected species occur or are dependent upon would be restricted according to this Act.

Those species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that have a geographical distribution that includes the site are listed in Appendix 6 of the scoping phase Terrestrial Ecology Impact Assessment Report, marked with the letter "N". This includes the following species: Black Rhinoceros (does not occur on-site), Black-footed Cat, Leopard (probably does not occur on-site), Cape Clawless Otter, Cape Fox, South African Hedgehog, Brown Hyena and Giant Bullfrog.

Due to habitat and forage requirements, and the fact that some species are restricted to game farms and/or conservation areas, only the Black-footed Cat, Cape Clawless Otter, Cape Fox, South African Hedgehog, and Giant Bullfrog have any likelihood of occurring on-site. Most of these species are territorial with small home ranges or may be dependent on specific habitat to exist on-site. They could therefore be affected by the development of the proposed project.

5.7.9 Habitats on Site

It should be noted that transformed areas where no vegetation occurs were insignificant in area. This included roads, farm buildings and similar existing disturbances. The broad natural habitat units on site are as follows:

1. Lowland plains vegetation (karroid dwarf shrubland);
2. Mountain vegetation (shrubland);
3. Low ridges (shrubland);
4. Broad drainage areas; and
5. Mountain stream.

Lowland plains vegetation

The general study area is characterised by a low succulent, dwarf shrubland, typical of the regional vegetation type, Eastern Upper Karoo, which is described as 'dwarf microphyllous shrubs, with 'white' grasses of the genera *Aristida* and *Eragrostis*" (Mucina & Rutherford 2006). A typical view of this vegetation, as found on site, is shown in **Figure 19** below. This was the most widespread vegetation community on-site, occurring on all the relatively flat plains areas.

Figure 19: Photo showing Nama-karoo vegetation on plains with steeper topography in background

The general floristic character of this vegetation on site is fairly uniform across wide areas, often dominated by the same suite of species, including *Ruschia intricata*, *Aristida diffusa*, *Tragus koelerioides*, *Eragrostis lehmanniana*, *Amphiglossa triflora*, *Wahlenbergia nodosa*, *Lycium cinereum*, *Pteronia glomerata, Pteronia mucronata, Chrysocoma ciliata* and *Eriocephalus spinescens*. However, any local variation in topography can lead to localised increase in richness associated with a more diverse species composition.

Mountain vegetation

This vegetation is somewhat typical of Besemkaree Koppies Shrubland, described above, in terms of structure, species composition and location in the landscape, with the exception of having the common presence of the grass, *Tenaxia stricta*, which is more expected in Karoo Escarpment Grassland. The vegetation community is found in all the more significant mountains in the study area, with steep topography and higher elevation than the surrounding plains. At the time of the field survey, most of these mountain areas had been recently burnt, but unburnt patches showed a consistency in species composition and structure across the study area that suggested that observed patterns could be generally extrapolated to burnt areas. An example is shown in **Figure 20** below.

Figure 20: Shrubby vegetation in unburnt mountainous areas in the study area

This species composition and structure included a shrub layer dominated by woody species, such as *Searsia erosa*, *Euclea crispa*, *Felicia filifolia*, *Elytropappus rhinocerotis*, *Diospyros lycioides*, *Tarchonanthus minor*, and *Diospyros austro-africanus*, and a grass layer dominated by *Tenaxia stricta*, along with *Themeda triandra*, *Eriocephalus ericoides*, *Chrysocoma ciliata*, *Ehrharta calycina*, *Cheilanthes eckloniana* and *Cymbopogon pospischilii*. There is likely to be some ecological variation in structure and species composition in different parts of the landscape, although this could not be verified within burnt vegetation. The topography introduces variation in slope and aspect, with some slopes facing hotter northern or western directions and others facing cooler southern and eastern directions, all of which introduces ecological variation into the landscape, providing new habitats for different species. Due to the sedimentary origin of the substrates, there are often bands of more resistant rock layers at specific heights on the mountain slopes. These substrates manifest themselves as small cliffs and rocky outcrops. There is a known diversity relationship between increased surface rockiness and increased local floristic species richness, which is likely to be true for the current study area. This generalisation is supported by the fact that many of the rarer floristic sitings on site were within rocky areas.

Low ridges and koppies

There are low ridges and koppies scattered throughout the plains area of the study area. They appear to mostly be associated with dolerite outcrops. The soils in these areas are mostly shallow and rocky, there are often more boulders and the vegetation consists of a distinct open shrub canopy with a sparse grassy understorey. The floristic diversity is slightly higher in these areas than in surrounding plains and the structure of the vegetation almost certainly provides shelter and refuge for animals. Common shrubs on these ridges include *Rhus erosa*, *Euclea crispa*, *Lycium cinereum*, *Diospyros austro-africana* and *Diospyros lycioides*. The species composition is not similar to any of the main vegetation units described for the study area and surrounding areas, but is probably most similar to *Tarkastad Montane Shrubland*.

An example of typical vegetation found on low ridges is shown in **Figure 21** below.

Figure 21: Typical habitat on low ridges and koppies in the study area

Broad drainage areas

There is a network of shallow drainage areas throughout the lower-lying parts of the study area. These are sometimes indistinct from surrounding areas, but often resolve into channels, or include areas with woody shrubs. It also includes bare areas, erosion gullies, and empty farm dams (at the time of the survey). Most of the homesteads in the study area are built on or adjacent to drainage areas, including buildings, roads, camps and often stands of exotic trees, some of which are dense and fairly substantial in extent. The small amount of formal cultivation also occurs almost entirely within this unit.

The unit is equivalent to the vegetation unit, Southern Karoo Riviere, although there is considerable variation from one (1) part of the study area to another: in the wide open plains, the vegetation on-site is more in line with the description for Southern Karoo Riviere, but closer to hills, it becomes more grassy, but with the inclusion of typical wetland species, such as Afroscirpoides dioeca, *Pseudoschoenus inanis* and *Juncus rigidus*. Some areas where permanent channel formation had taken place were almost completely dominated by the robust grass, *Miscanthus ecklonii*, along with *Pennisetum sphacelatum* and *Searsia pyroides*. Where these channelled systems were larger and approaching being more perennial in terms of water presence, there was increasing dominance by woody species, such as *Diospyros lycioides, Helichrysum trilineatum*, *Melianthus comosus, Lycium cinereum*, *Deverra burchellii*, *Asparagus laricinus* and *Diospyros austro-africana.*

A typical view of this more structurally developed habitat is shown in **Figure 22** below.

Figure 22: Typical drainage line habitat in the study area

The drainage areas are important habitat for animals, providing refuge and shelter, water, when it is available, palatable vegetation, when surrounding areas are in drought, and softer and deeper soils for burrowing animals. The habitat is also an important flood-attenuation component of the landscape, and a reservoir for soil water. If it occurs on-site, this is the habitat in which the protected Giant Bullfrog would be found.

<u>Mountain stream</u>

Strictly, this is part of the broad drainage area in the study area, which varies from broad, wide areas with no aquatic characteristics, to semi-permanent pools, but is discussed separately due to the fact that they are within the mountains and have different characteristics to other parts of the landscape. The mountain stream map unit occurs only in the eastern part of the study area in the mountains, and is part of a valley that eventually exits into a wider drainage valley, as described in the previous section. Within the mountains, the stream is contained by the surrounding rocky mountain slopes, has a rocky bed with sandy banks in places, and consists of permanent wetlands, aquatic habitats, rocky slabs and other micro-habitats.

A typical view is shown in **Figure 23** below.

Figure 23: Mountain stream habitat

The riparian areas have a species composition and structure that is almost completely different to the surrounding landscape. The habitat contains a combination of bare rock and deeper sands, so it is able to support a flora that is adapted to these substrate conditions, in addition to the sporadic flooding and scouring that takes place in these habitats as a result of rare large rainfall events. Although not necessarily floristically sensitive, the habitat that is derived under these ecological conditions is critically important for fauna, providing food and shelter as well as corridors for undetected movement. In times of drought, riparian areas may offer the only slightly green vegetation as a source of food. The deeper sands are important for burrowing animals and the shrubs and low trees offer shelter and browse.

Riparian habitats are disproportionately important in terms of the proportion of the area that they occupy in the landscape – they provide a unique and important habitat for both flora and fauna in this arid part of the country. The plant species occurring within these habitats are not necessarily rare in a global sense, but the degradation of this interconnected system can cause floristic loss and change in areas far removed from any impact. For this reason, and for the utilitarian importance to fauna, the riparian vegetation is considered to be ecologically sensitive. In addition, this is the habitat in which the Near Threatened and nationally protected Cape Clawless Otter is found on-site.

5.7.10 Habitat Sensitivity

To determine ecological sensitivity in the study area, local and regional factors were taken into account. There are some habitats in the study area that have been described as sensitive in their own right, irrespective of regional assessments. This includes the stream beds and associated riparian zones and adjacent floodplains primarily. A detailed assessment of these areas has been undertaken by an aquatic specialist and they are only considered here in terms of being an important habitat for flora and fauna. Mountain areas and steep slopes, especially at higher elevations are more sensitive than surrounding areas, mainly due to higher floristic diversity and the likelihood of plant species with low local abundance occurring there.

In terms of other species of concern, including both plants and animals (with the exception of the Cape Clawless Otter that has already been discussed in the scoping phase Terrestrial Ecology Impact Assessment Report), there are no specific locations where conservation of habitat would benefit a specific species based on the existing data available. All mammal species of concern and all protected plant species described in the scoping phase Terrestrial Ecology Impact Assessment Report could occur on any part of the site, whether in the mountains or on the lowlands, although it is probable that low ridges and drainage areas are of more importance than plains areas.

A summary of sensitivities that occur on site and that may be vulnerable to damage from the proposed development are as follows:

1. Drainage areas;
2. Mountain stream;
3. High-lying areas (i.e. mountain vegetation); and
4. CBA areas, especially CBA1.

The main habitat sensitivity classes on site are as follows:

1. MEDIUM-LOW for lowland plains vegetation outside of CBAs. In the absence of CBAs, all lowland plains on site would be within this sensitivity class.
2. MEDIUM for all rocky ridges and drainage areas outside of CBAs. In the absence of CBAs, all rocky ridges and drainage areas would be within this sensitivity class.
3. MEDIUM-HIGH for mountain areas outside of CBAs.
4. HIGH for CBA1 areas, and mountain areas surrounding aquatic habitat where the Cape Clawless Otter occurs. The aquatic habitat and surrounding mountain slopes would be within this sensitivity class in the absence of the CBA1 classification.
5. VERY HIGH for aquatic habitat where the Cape Clawless Otter occurs and a buffer, also inside a CBA1 area.

5.8 Avifaunal

The Avifaunal Scoping Assessment is currently underway and is being conducted by Chris van Rooyen. The Avifaunal Scoping Assessment Report included as **Appendix 6B**. A desktop investigation was conducted to source information on the impacts of the proposed solar PV energy facility on avifauna. A visit to the site and general area was conducted on 15 and 16 January 2019, followed up by on-site surveys from 17-19 January 2019. Another round of surveys was undertaken from 9-12 May 2019 and the results will be presented in the EIA phase.

5.8.1 Baseline Assessment

5.8.1.1 Important Bird Areas

The Platberg-Karoo Conservancy Important Bird Area (IBA) SA037 is located approximately 3-4km north-west of the study area. The Platberg–Karoo Conservancy IBA covers the entire districts of De Aar, Philipstown and Hanover, including suburban towns. The landscape consists of extensive flat to gently undulating plains that are broken by dolerite hills and flat-topped inselbergs. The ephemeral Brak River flows in an arc from south-east to north-west, eventually feeding into the Orange River basin. Other ephemeral rivers include the Hondeblaf, Seekoei, Elandsfontein and Ongers rivers with a network of tributaries. Vanderkloof Dam is on the north-eastern boundary (Marnewick *et al.,* 2015).

This IBA is in the Nama Karoo and Grassland Biomes. The eastern Nama Karoo has the highest rainfall of all the Nama Karoo vegetation types and is thus ecotonal to grassland, with a complex mix of grass- and shrub-dominated vegetation types. Eight (8) broad vegetation types are present; seven (7) are Least Threatened and the Upper Gariep Alluvial Vegetation type is classified as Vulnerable (Marnewick *et al*., 2015).

The land is used primarily for grazing and agriculture. Commercial livestock farming is mostly extensive wool and mutton production, with some cattle and game farming. Less than 5% of this IBA is cultivated under dry-land or irrigated conditions and includes Lucerne and prickly pear (*Opuntia ficus-indica*) orchards (Marnewick *et al.*, 2015).

This IBA contributes significantly to the conservation of large terrestrial birds and raptors. These include Blue Crane (*Anthropoides paradiseus*), Ludwig's Bustard (*Neotis ludwigii*), Kori Bustard (*Ardeotis kori*), Blue Korhaan (*Eupodotis caerulescens*), Black Stork (*Ciconia nigra*), Secretarybird (*Sagittarius serpentarius*), Martial Eagle (*Polemaetus bellicosus*), Verreauxs' Eagle (*Aquila verreauxii*) and Tawny Eagle (*A. rapax*) (Marnewick *et al.*, 2015).

In summer, close to 10% of the global population of Lesser Kestrels (*Falco naumanni*) roost in this IBA. Amur Falcons (*F. amurensis*) are also abundant and forage and roost with Lesser Kestrels. This IBA is seasonally important for White Stork (*Ciconia ciconia*), with high numbers of this species recorded during outbreaks of brown locusts (*Locustana pardalina*) and armoured ground crickets (*Acanthoplus discoidalis*) (Marnewick *et al.*, 2015).

IBA trigger species are the globally threatened Blue Crane, Ludwig's Bustard, Kori Bustard, Secretarybird, Martial Eagle, Blue Korhaan, Black Harrier (*Circus maurus*) and Denham's Bustard (*Neotis denhami*). Regionally threatened species are Black Stork, Lanner Falcon (*Falco biarmicus*), Tawny Eagle, Karoo Korhaan and Verreaux's' Eagle (Marnewick *et al*., 2015).

Biome-restricted species include Karoo Lark (*Calendulauda albescens*), Karoo Long-billed Lark (*Certhilauda subcoronata*), Karoo Chat (*Cercomela* schlegelii), Tractrac Chat (*C. tractrac*), Sickle-winged Chat (*C. sinuate*), Namaqua Warbler (*Phragmacia substriata*), Layard's Tit-Babbler (*Sylvia layardi*), Pale-winged Starling (*Onychognathus nabouroup*) and Black-headed Canary (*Serinus alario*). Congregatory species include Lesser Kestrel and Amur Falcon.

Due to the proximity of the IBA to the study area, it is possible that the proposed development could impact on some of the trigger species in the IBA. Far-ranging birds that move in and out of the IBA could be impacted, namely power line sensitive species such as Blue Crane, Ludwig's Bustard, Kori Bustard, Black Stork, Secretarybird, Martial Eagle, Verreaux's Eagle and Tawny Eagle.

5.8.1.2 Habitat Classes

Vegetation structure, rather than the actual plant species, is more significant for bird species distribution and abundance (Harrison *et al.*, 1997). The description of the vegetation types occurring in the study area largely follows the classification system presented in the Atlas of southern African birds (SABAP1) (Harrison *et al*., 1997). The criteria used to amalgamate botanically defined vegetation units, or to keep them separate were (1) the existence of clear differences in vegetation structure, likely to be relevant to birds, and (2) the results of published community studies on bird/vegetation associations. It is important to note that no new vegetation unit boundaries were created, with use being made only of previously published data. The description of vegetation presented in this study therefore concentrates on factors relevant to the bird species present and is not an exhaustive list of plant species present.

Whilst the distribution and abundance of the priority bird species in the study area are closely tied to natural features (e.g. vegetation structure and topography/relief), it is also necessary to examine external modifications to the environment that might have relevance for priority species. Anthropogenic avifaunal-relevant habitat modifications which could potentially influence the avifaunal community that were recorded in or close to the study area are dams and water reservoirs, high voltage transmission lines, agriculture, fences and alien trees. The habitat classes are discussed in more detail below.

The solar priority species associated with each habitat class are listed in **Table 12** below.

Table 12: Solar priority species potentially occurring at the site, conservation status, priority criteria, SABAP reporting rates, probability of occurrence, habitat use and potential impacts

Species	Taxonomic name	Solar priority species	SABAP2 Average reporting rate: full protocol	Red Data status: International	Red Data status: Regional	Endemic - South Africa	Endemic - Southern Africa	Possibility of occurrence	Recorded during surveys	Grassy Karoo	Surface water	Alien trees	Cliffs	Power lines	Agriculture	Fences	PV panel collisions	Displacement - disturbance	Displacement - habitat loss	Entrapment in fences
Avocet, Pied	*Recurvirostra avosetta*	*x*	15.48					Low			x						x			
Bustard, Ludwig's	*Neotis ludwigii*	*x*	25.67	EN	EN		Near-endemic	High	x	x					x			x	x	x
Buzzard, Jackal	*Buteo rufofuscus*	*x*	22.22			Near endemic	Endemic	High	x	x	x	x	x	x	x	x	x	x		
Canary, Black-headed	*Serinus alario*	*x*	14.56			Near endemic	Endemic	Low		x	x					x	x	x		
Chat, Sickle-winged	*Cercomela sinuata*	*x*	48.81			Near endemic	Endemic	High	x	x						x	x	x		
Cisticola, Cloud	*Cisticola textrix*	*x*	0.00			Near endemic	Near-endemic	High	x	x							x	x		
Coot, Red-knobbed	*Fulica cristata*	*x*	14.41					Low			x						x			
Cormorant, Reed	*Phalacrocorax africanus*	*x*	13.49					Low			x						x			
Crane, Blue	*Anthropoides paradiseus*	*x*	73.41	VU	NT		Endemic	High	x	x	x				x			x	x	x
Duck, African Black	*Anas sparsa*	*x*	8.33					Low			x						x			

Duck, Maccoa	*Oxyura maccoa*	*x*	1.59	NT	NT			Low			x						x			
Duck, White-faced	*Dendrocygna viduata*	*x*	2.78					Low			x						x			
Duck, Yellow-billed	*Anas undulata*	*x*	50.92					Low			x						x			
Eagle, Martial	*Polemaetus bellicosus*	*x*	7.14	VU	EN			Medium		x	x	x		x	x			x	x	
Eagle, Verreaux's	*Aquila verreauxii*	*x*	18.26	LC	VU			High	x	x		x	x	x						
Eagle-owl, Spotted	*Bubo africanus*	*x*	12.43					High		x		x	x		x	x	x	x		
Egret, Cattle	*Bubulcus ibis*	*x*	4.63					Low		x		x			x			x		
Egret, Great	*Egretta alba*	*x*	0.00					Low			x						x			
Falcon, Lanner	*Falco biarmicus*	*x*	2.78	LC	VU			Medium		x	x	x	x	x	x	x	x	x		
Falcon, Peregrine	*Falco peregrinus*	*x*	1.59					Low			x	x	x	x			x			
Fish-eagle, African	*Haliaeetus vocifer*	*x*	3.18					Low			x	x					x			
Species	**Taxonomic name**	**Solar priority species**	**SABAP2 Average reporting rate: full protocol**	**Red Data status: International**	**Red Data status: Regional**	**Endemic - South Africa**	**Endemic - Southern Africa**	**Possibility of occurrence**	**Recorded during surveys**	**Grassy Karoo**	**Surface water**	**Alien trees**	**Cliffs**	**Power lines**	**Agriculture**	**Fences**	**PV panel collisions**	**Displacement - disturbance**	**Displacement - habitat loss**	**Entrapment in fences**
Flamingo, Greater	*Phoenicopterus ruber*	x	3.18	LC	NT			Low			x						x			
Flycatcher, Fiscal	*Sigelus silens*	*x*	34.40			Near endemic	Endemic	High	x	x		x				x	x	x		

Goose, Spur-winged	*Plectropterus gambensis*	*x*	34.79					High	x		x			x	x		x			
Goshawk, Southern Pale Chanting	*Melierax canorus*	*x*	34.66				Near-endemic	High	x	x	x	x		x		x	x	x		
Grebe, Black-necked	*Podiceps nigricollis*	*x*	0.00					Low			x						x			
Grebe, Great Crested	*Podiceps cristatus*	*x*	1.59					Low			x						x			
Grebe, Little	*Tachybaptus ruficollis*	*x*	9.12					Low			x						x			
Greenshank, Common	*Tringa nebularia*	*x*	12.70					Low			x						x			
Hamerkop	*Scopus umbretta*	*x*	1.86					Low			x						x			
Harrier, Black	*Circus maurus*	*x*	2.78	VU	EN	Near endemic	Endemic	Low		x	x					x	x			
Harrier-Hawk, African	*Polyboroides typus*	*x*	1.59					Low		x	x	x	x							
Heron, Black-headed	*Ardea melanocephala*	*x*	17.33					Medium		x	x	x		x	x			x		
Heron, Grey	*Ardea cinerea*	*x*	23.93					Low			x	x					x			
Ibis, African Sacred	*Threskiornis aethiopicus*	*x*	20.23					Low			x	x			x		x			
Kestrel, Greater	*Falco rupicoloides*	*x*	21.30					High	x	x		x		x		x		x		
Kestrel, Lesser	*Falco naumanni*	*x*	20.37					Medium		x				x	x			x		
Kestrel, Rock	*Falco rupicolus*	*x*	27.41					High	x	x		x	x	x	x	x		x		
Kingfisher, Malachite	*Alcedo cristata*	*x*	2.78					Low			x						x			
Kingfisher, Pied	*Ceryle rudis*	*x*	2.78					Low			x						x			

Kite, Black-shouldered	*Elanus caeruleus*	*x*	15.44					High	x	x		x		x	x					
Korhaan, Blue	*Eupodotis caerulescens*	*x*	56.34	NT	LC	Endemic (SA, Lesotho, Swaziland)	Endemic	High	x	x					x			x		x
Korhaan, Karoo	*Eupodotis vigorsii*	*x*	13.10	LC	NT		Endemic	High	x	x								x		x
Species	**Taxonomic name**	**Solar priority species**	**SABAP2 Average reporting rate: full protocol**	**Red Data status: International**	**Red Data status: Regional**	**Endemic - South Africa**	**Endemic - Southern Africa**	**Possibility of occurrence**	**Recorded during surveys**	**Grassy Karoo**	**Surface water**	**Alien trees**	**Cliffs**	**Power lines**	**Agriculture**	**Fences**	**PV panel collisions**	**Displacement - disturbance**	**Displacement - habitat loss**	**Entrapment in fences**
Lapwing, Blacksmith	*Vanellus armatus*	*x*	49.33					Low			x				x		x	x		
Lark, Large-billed	*Galerida magnirostris*	*x*	75.27			Near endemic	Endemic	High	x	x						x		x		
Moorhen, Common	*Gallinula chloropus*	*x*	17.07					Low			x						x			
Night-Heron, Black-crowned	*Nycticorax*	*x*	0.00					Low			x						x			
Owl, Barn	*Tyto alba*	*x*	7.41					Medium		x		x			x	x	x	x		
Pipit, African Rock	*Anthus crenatus*	*x*	11.11	LC	NT	Endemic (SA, Lesotho, Swaziland)	Endemic	Low					x							

Plover, Kittlitz's	*Charadrius pecuarius*	*x*	28.70					Low			x						x			
Plover, Three-banded	*Charadrius tricollaris*	*x*	57.68					Low			x						x			
Pochard, Southern	*Netta erythrophthalma*	*x*	1.59					Low			x						x			
Prinia, Karoo	*Prinia maculosa*	*x*	76.19			Near endemic	Endemic	Medium		x							x	x		
Ruff	*Philomachus pugnax*	*x*	3.18					Low			x						x			
Sandpiper, Wood	*Tringa glareola*	*x*	3.18					Low			x						x			
Secretarybird	*Sagittarius serpentarius*	*x*	19.44	VU	VU			High	x	x								x	x	x
Shelduck, South African	*Tadorna cana*	*x*	51.86				Endemic	Medium			x						x			
Shoveler, Cape	*Anas smithii*	*x*	7.14				Near-endemic	Low			x						x			
Snake-eagle, Black-chested	*Circaetus pectoralis*	*x*	1.86					High	x	x	x	x		x	x			x	x	
Snipe, African	*Gallinago nigripennis*	*x*	1.59					Low			x						x			
Sparrowhawk, Black	*Accipiter melanoleucus*	*x*	0.00					Low			x	x								
Sparrowhawk, Rufous-chested	*Accipiter rufiventris*	*x*	2.78					Low			x	x								
Sparrowlark, Black-eared	*Eremopterix australis*	*x*	2.78			Near endemic	Endemic	Low		x	x						x	x	x	
Spoonbill, African	*Platalea alba*	*x*	5.96					Low			x						x			

Species	Taxonomic name	Solar priority species	SABAP2 Average reporting rate: full protocol	Red Data status: International	Red Data status: Regional	Endemic - South Africa	Endemic - Southern Africa	Possibility of occurrence	Recorded during surveys	Grassy Karoo	Surface water	Alien trees	Cliffs	Power lines	Agriculture	Fences	PV panel collisions	Displacement - disturbance	Displacement - habitat loss	Entrapment in fences
Starling, Pied	*Spreo bicolor*	*x*	*94.44*	94.44		Endemic (SA, Lesotho, Swaziland)	Endemic	High	x	x	x	x			x	x	x	x		
Stilt, Black-winged	*Himantopus himantopus*	*x*	23.01					Low			x						x			
Stint, Little	*Calidris minuta*	*x*	9.12					Low			x						x			
Stork, Black	*Ciconia nigra*	*x*	0.00	LC	VU			Low			x		x							
Stork, White	*Ciconia ciconia*	*x*	0.00					Medium		x	x				x			x	x	
Sunbird, Southern Double-collared	*Cinnyris chalybeus*	*x*	5.56			Near endemic	Endemic	Low		x							x	x		
Teal, Cape	*Anas capensis*	*x*	8.73					Low			x						x			
Teal, Red-billed	*Anas erythrorhyncha*	*x*	13.37					Low			x						x			
Thrush, Karoo	*Turdus smithi*	*x*	34.12			Near endemic	Endemic	Low				x								
Tit, Grey	*Parus afer*	*x*	10.19			Near endemic	Endemic	Low		x							x	x	x	

Vulture, Cape	*Gyps coprotheres*	*x*	2.78	EN	EN		Near-endemic	Low		x				x						
Weaver, Cape	*Ploceus capensis*	*x*	7.14			Near endemic	Endemic	Low				x								
White-eye, Cape	*Zosterops virens*	*x*	25.40			Near endemic	Endemic	Low				x								
Woodpecker, Ground	*Geocolaptes olivaceus*	*x*	1.86			Endemic (SA, Lesotho, Swaziland)	Endemic	Low					x							

- **Grassy Karoo**

The study area lies at the intersection between Nama Karoo and Grassland biomes (Mucina & Rutherford, 2006), described by Harrison *et al*. (1997) as Grassy Karoo. The dominant vegetation type in the study area is Eastern Upper Karoo, which occurs on the plains where the PV assessment area is located, and is dominated by dwarf microphyllous shrubs, with 'white' grasses of the genera *Aristida* and *Eragrostis* (these become prominent especially in the early autumn months after good summer rains). Rainfall occurs mainly in autumn and summer, peaking in March. The mean annual precipitation ranges from about 180mm to 430mm. Incidence of frost is relatively high. Mean maximum and minimum monthly temperatures in Middelburg (Grootfontein) are 36.1°C and –7.2°C for January and July, respectively (Mucina & Rutherford, 2006).

Figure 24: Example of Eastern Upper Karoo (Grassy Karoo) occurring on plains where the proposed PV area is located

Figure 25: Example of Besemkaree Koppies Shrubland which occurs on slopes

- **Surface Water**

Surface water is of specific importance to avifauna in this semi-arid environment. The study area contains many boreholes with open water troughs that provide drinking water to livestock. Open water troughs are important sources of surface water and could potentially be used extensively by various bird species, including large raptors, to drink and bath. There are also a number of dams and natural water bodies in the study area, which are located in drainage lines (see **Figure 26** below). The dams and water bodies were mostly dry when the surveys were conducted, but it could hold water after good rains, when it could be attractive to various bird species, including large raptors, to drink and bath. It could also serve as an attraction to water birds when it contains water.

Figure 26: A dam in study area

- **Cliffs**

The south-eastern part of the broader area contains several cliffs which is utilised by a number of cliff-nesting raptors for breeding, including Booted Eagle, Verreaux's Eagle (see **Figure 27** below) and possibly Jackal Buzzard. **Figure 28** below shows the location of known nests in the study area.

Figure 27: Verreaux's Eagle nest on a cliff in study area

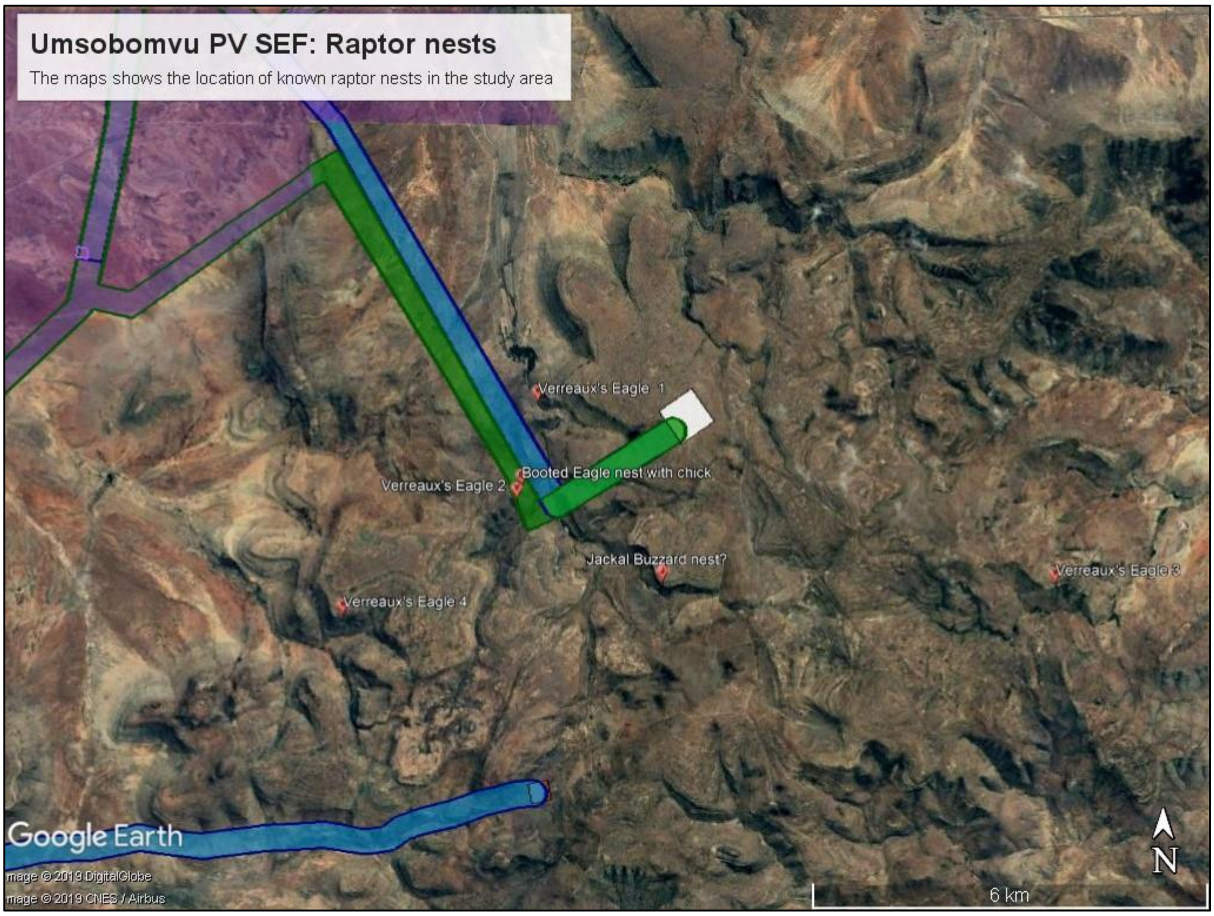

Figure 28: Location of raptor nests in study area

- **<u>High Voltage Lines</u>**

High voltage lines are an important roosting and breeding substrate for large raptors in the tree-less Karoo habitat (Jenkins *et al.*, 2006). There are two (2) 400kV transmission lines running through the study area, namely the Hydra-Poseidon 400kV 1 and 2 (see **Figure 29** below). So far, no large raptor nests were recorded during the first surveys. However, the inspection was repeated in another round of surveying from 9-12 May 2019. The results will be presented in the EIA phase.

Figure 29: Hydra-Poseidon 400kV 1 high voltage line running through the study area

- **Fences**

The study area is fenced off into grazing camps (see **Figure 30** below). Farm fences provide important perching substrate for a wide range of birds in this treeless environment where natural perches are scarce, as a staging post for territorial displays by small birds and also for perch hunting for raptors such as Greater Kestrel, Rock Kestrel, Black-winged Kite and Southern Pale Chanting Goshawk.

Figure 30: The study area contains many fences

- **Agriculture**

The study area contains a number of agricultural clearings and irrigated pivots (see **Figure 31** below). These areas may attract several solar and power line priority species, including Ludwig's Bustard, Blue Crane, Spurwing Goose, Egyptian Goose, Helmeted Guineafowl, White Stork and Blue Korhaan.

Figure 31: Irrigated fields in study area

- **Alien Trees**

Large indigenous trees are rare in the Karoo, therefore alien trees of the genus *Pinus*, *Populus* and *Eucalyptus* have been introduced in many areas, often around homesteads, but also at boreholes (see **Figure 32** below). In some places, these alien species have become an invasive threat in drainage lines. Many solar priority species use alien trees for nesting and roosting.

Figure 32: Alien trees in study area

5.8.1.3 Avifauna

- **Southern African Bird Atlas 2**

The SABAP2 data indicate that a total of 185 bird species could potentially occur in the broader area – Appendix 2 of the Avifaunal Scoping Assessment Report provides a comprehensive list of all the species, including those recorded during the pre-construction monitoring. Of these, 78 species are classified as priority solar species (see section 4 of Avifaunal Scoping Assessment Report for the definition of a priority species). The probability of a priority species occurring in the study area is indicated in **Table 12**.

Table 12 lists all the solar priority species and the possible impact on the respective species by the proposed solar energy infrastructure. The following abbreviations and acronyms are used:

EN = Endangered
VU = Vulnerable
NT = Near-threatened

- **Pre-Construction Surveys**

A visit to the study area was conducted on 15 and 16 January 2019, followed up by on-site surveys from 17 - 19 January 2019. Another round of surveys was undertaken from 9-12 May 2019 and the results will be presented in the EIA phase. Surveys were conducted according to the best practice guidelines for avifaunal impact studies at solar developments, compiled by BirdLife South Africa (BLSA) in 2017 (Jenkins et al., 2017). Please see Appendix 1 of the Avifaunal Scoping Assessment Report (**Appendix 6B**) for the methodology used in the surveys.

- **Priority Species Abundance**

The abundance of solar priority species (birds/km) recorded during the first of two (2) seasonal surveys are displayed in **Figure 33** below.

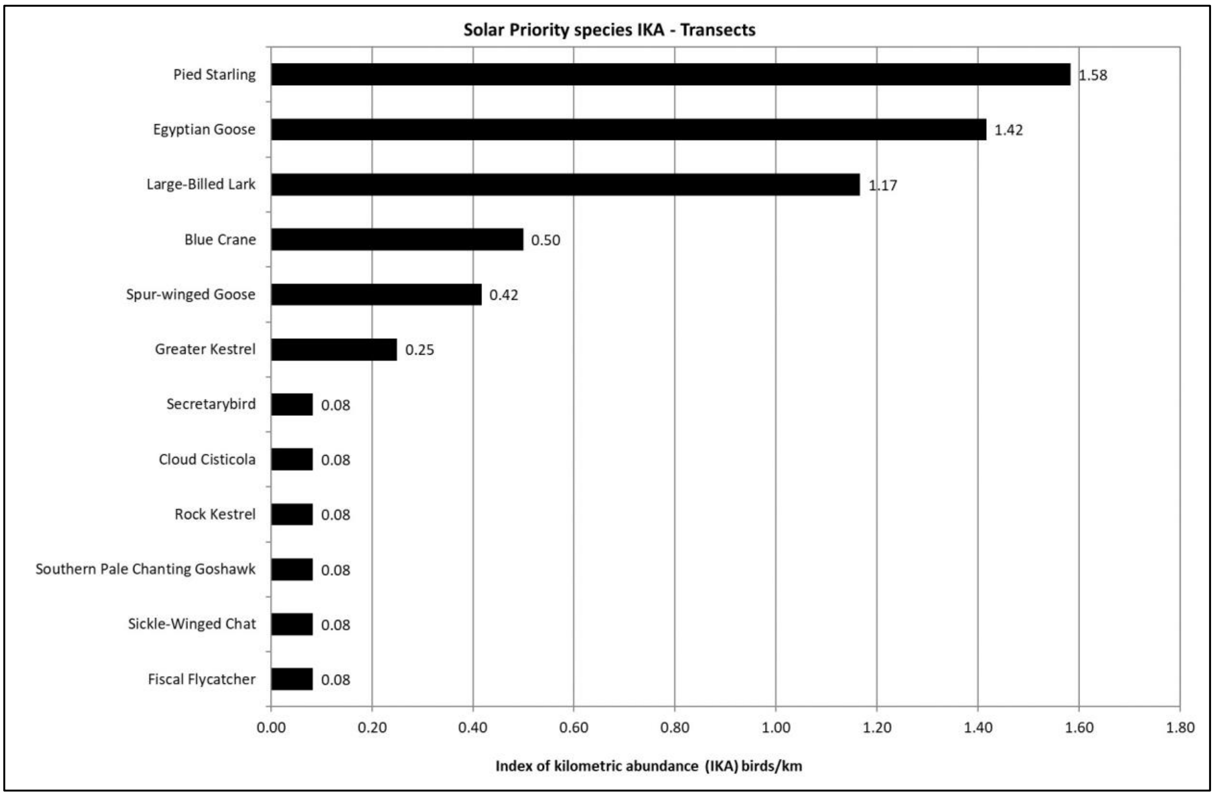

Figure 33: Abundance of solar priority species recorded during first round of surveys

- **Discussion**

The overall abundance of solar priority species at the site was fairly high, with an average of 5.83 birds/km being recorded in summer. For all birds combined, the index of kilometric abundance (IKA) for summer was 10.97 birds/km. This indicates that the impact of human activities on the natural habitat has been limited.

5.9 Surface Water

The scoping phase Surface Water Impact Assessment was conducted by Stephen Burton of SiVEST. The full scoping phase Surface Water Impact Assessment Report is included in **Appendix 6G**. The Surface Water Impact Assessment will be externally reviewed by suitably qualified external specialist during the EIA phase, prior to the DEIAr being released for review. The study commenced as a desktop assessment, followed by a site visit which was undertaken from the 05th to the 07th of February 2019.

The environmental baseline from a surface water perspective is presented below.

5.9.1 Desktop Findings

In terms of the Environmental Potential Atlas (ENPAT) (2002) national database, from a catchment perspective, the study site is located within the Orange Primary Catchment. More specifically, the study area is situated within the quaternary catchments D32C and D32B. The study site falls within the newly defined Water Management Areas (WMAs) of South Africa, as stated in Government Notice No. 1056 (16^{th} of September 2016), within the Upper Orange WMA.

Three (3) rivers are shown within the study area according to the National Freshwater Ecosystem Priority Areas (NFEPA) (2011) database, while a number of small wetlands are shown to occur at points associated with farm dams. The closest main river, the Klein-Seekoei River, as contained in the NFEPA (2011) database, crosses the western boundary of the Paarde Valley PV site. The site drains towards the Klein-Seekoei River to the West of the site. The topography of the site indicates the potential presence of watercourses running east to west, and north to south, across the site. Two (2) perennial rivers are present on the site. Both perennial rivers are tributaries of the Klein-Seekoei River, and both have a class C rating, meaning they are moderately modified. No other conservation sensitive areas were identified on the study site.

5.9.2 In-Field Findings and Delineations

The in-field wetland delineation assessment took place between the 05^{th} and 07^{th} of February 2019. Conditions were hot and sunny with partial cloud cover. The study site has historically been used for grazing by sheep, and most of the palatable plants have been selectively grazed out, with many of the remaining plants being poisonous for livestock. It was noted that the first decent rain (50mm) in a number of years had fallen just prior to the site visit, and as such, a number of water bodies were present that would normally be dry.

The fieldwork ground-truthing, verification and delineation assessment was undertaken to scrutinise the results of the desktop assessment, as well as to identify any potentially overlooked wetlands and/or riparian habitat in the field within the study site.

The fieldwork investigation confirmed that there are a number of non-perennial drainage channels which can be found flowing through the study site in an east to west direction, and south to north direction. In addition, a number of tributaries of the Klein-Seekoei River flows from within the site to the actual Klein-Seekoei River, which runs adjacent to the western boundary of the study area. A channelled valley bottom wetland system was noted within the Paarde Valley PV site.

Aside from the non-perennial watercourses, a number of man-made farm dams are present on the property, but many of these appear to have been dry for an extended period.

As mentioned, one (1) wetland was identified on the Paarde Valley PV study site.

Overall from the above, the following water resources were identified in the field on the study site:

- A number of non-perennial watercourses without associated Riparian Habitat.
- A number of perennial watercourses with associated Riparian Habitat.
- One (1) Channelled Valley Bottom Wetland System.

The biophysical characteristics and indicators of the above-mentioned water resources are provided in the Sub-sections below.

5.9.2.1 Non-Perennial Watercourses without Riparian Habitat

- **Topography Associated with a Watercourse**

The watercourses are shaped by a poorly to moderately developed channel which varies along the length of the watercourses within the study site. Some parts of the channel are better defined than other areas where the channel becomes more diffuse. For example, some of the mid-sections of watercourse are well defined, whereas the lower reaches of the watercourses are much more diffuse. Overall, a macro-channel is present with a smaller defined active (when in flow) channel within (**Figure 34**). The width of the macro-channel therefore varies. The macro-channel can be as little as 15m at the narrowest areas and up to 250m at the widest point on the study site.

Figure 34: Photo of typical channel structure. The Broad macro-channel section of watercourses is evident, but may have a number of smaller channels and flow paths within macro-channel

In terms of flow, as previously mentioned, the watercourses are non-perennial and flow from an east to west direction, or a south to north direction. The watercourse can be classified as an A-Section watercourse. The watercourse is above the zone of saturation, although relatively minimal soil depth (ranging from approximately 50mm to 600mm) along some sections of the active channel means that during the wet season, stormwater run-off / overland flow can be expected for a relatively brief period (hours to days). This is especially so where bedrock can be found extruding from the watercourses in the channel, as well as in eroded areas.

- **<u>Alluvial Soils and Deposited Materials</u>**

Deposited alluvial soils were clearly evident within the active channel as well as within the greater macro-channel bank (**Figure 35**). Sediments were sandy in texture ranging from fine to sandy sized grains. Detrital deposits were also observed in the form of leaves and small twigs.

Soil samples were taken where possible to determine whether soil wetness or wetland soil forms could be identified. Most areas were subject to soil augur restrictions due to the presence of exposed and/or deposited bedrock. Soils that have been deposited via wind or run-off from the surrounding area have however provided some substrate for which vegetation has established.

Soil samples that were taken showed no signs of mottling (which are typically associated with wetlands). The soils did not indicate hydromorphism which typically takes place in wetlands indicating that soil conditions are not favourable to wetland conditions.

Figure 35: Alluvial sand deposits within active channel of watercourses

- **<u>Vegetation</u>**

There are no riparian vegetation zones along any of the watercourses across the site (**Figure 36**). Of the vegetation species identified, none can be described as specifically hydrophytic. Presumably, this is a consequence of the semi-arid climate and other environmental constraints (including soil type and depth) limiting the study site.

Figure 36: There is no riparian vegetation associated with the Watercourses

5.9.2.2 Perennial Watercourses with Riparian Habitat

- **Topography Associated with a Watercourse**

The perennial watercourses are shaped by a well-developed channel which varies along the length of the watercourses within the study site. Most parts of the channel are well defined, with only a few areas where the channel becomes more diffuse (**Figure 37**).


Figure 37: Perennial Watercourses have well-defined channels

- **Vegetation**

There is a distinct riparian vegetation zone along the perennial watercourses on-site (**Figure 38**). Of the vegetation species identified, many can be described as specifically hydrophytic.

Figure 38: Perennial Watercourses have distinct riparian vegetation

5.9.2.3 Channelled Valley Bottom Wetland System

- **<u>Topography Associated with the Wetland</u>**

The channelled valley bottom wetland system on the Paarde Valley study site is characterised by a well-developed channel which varies from shallow to deep along the length of the wetland (**Figure 39**). Most parts of the channel are well defined, with only a few areas where the channel becomes more diffuse.


Figure 39: Wetland system has well-developed channel along much of its length

- **Soils and Deposited Materials**

In general, the soils within the wetland were only slightly mottled (**Figure 40**), which indicates that the wetland is only wet for perhaps a single season of the year. In general, there is evidence of alluvial material overlaying the wetland clay deposits, and this indicates that over surface flow is probably occurring during rainfall events.

Figure 40: Soils within wetland show slight mottling, which indicates a seasonal wetland that is not inundated for extended periods

- **<u>Vegetation</u>**

There is a distinct wetland vegetation zone along the wetland channel on-site (**Figure 41**). Of the vegetation species identified, many can be described as specifically hydrophytic.

Figure 41: Wetland obligate sedge and grass species present along channelled wetland system

5.9.3 Ecological Condition

5.9.3.1 Non-Perennial Watercourses without Riparian Habitat

Since no riparian or wetland habitat is present along the watercourses over most of the site, it is difficult to apply a quantitative assessment of the present ecological state of the systems. As such, the assessment is qualitative in nature, and appropriate reference conditions have been estimated from the level of disturbance that was obvious on the site.

- **Present Ecological Condition**

The results of the Present Ecological State assessment for the watercourses are as follows:

- Watercourse Ecological Condition – C Moderately Modified.

From the above, existing impacts are moderately affecting the current state of the watercourses. The factors affecting the various systems are explained below.

The area is semi-arid to arid, and the vegetation on-site should be dominated by a range of drought tolerant succulent species, with a limited graminoid component. Minimal encroachment of alien species was noted. Overgrazing impacts were extremely apparent along with associated onset of erosion due to animal movement and vegetation removal. Overall, cover was not high, and the habitat could be described as open scrubland.

Overall the impacts identified to be affecting vegetation cover, abundance and composition include overgrazing due to sheep, erosion due to sheep trampling and the excavation of the dams. Water quantity impacts are mainly indirect because of run-off impacts due to infrastructure (dirt roads, tar roads, rail etc.) and decreased vegetation cover due to overgrazing. Water quality impacts affecting the watercourse mainly relate to sedimentation originating from run-off from the surrounding areas and roads. In general, however, the sedimentation impacts are a relatively moderate factor affecting water quality (and geomorphology) which in turn contributes to the current perceived change in state.

5.9.3.2 Perennial Watercourse with Riparian Habitat

In order to apply the Vegetation Response Assessment Index (VEGRAI), it is essential to qualify the reference conditions (Kleynhans *et al*., 2007). The reference conditions are essentially a determination of the state of the riparian habitat that is completely natural and unmodified / affected by existing impacts. When assessing the state of the riparian habitat, the habitat can be broken down into two (2) components including, the marginal zone and non-marginal zone. The marginal zone includes the area from the water level at low flow, if present, to those features that are hydrologically activated for the greater part of the year (Kleynhans *et al*., 2007). The non-marginal zone collectively includes the lower and upper zone. The lower zone extends from the marginal zone and usually ends where a marked increase occurs in lateral elevation, whilst the upper zone extends from the end of the lower zone to the end of the riparian corridor which is usually characterised by steeper slopes and the presence of both riparian and terrestrial vegetation species (Kleynhans *et al*., 2007).

- **<u>Present Ecological Condition</u>**

The results of the VEGRAI assessment for the Klein-Seekoei River, and its tributaries, riparian habitat are as follows:

- Klein-Seekoei River, and tributaries, Riparian Habitat Ecological Condition – C Moderately Modified (67.5% of the reference condition).

From the above, existing impacts are moderately affecting the current state of the riparian habitats on site. The factors affecting the various systems are explained below.

Currently the marginal zone appears to be in a graminoid dominated state. Few tree species were present in this zone. This contrasts with what the reference state would be. The reference state should ideally be tree dominated. Nonetheless, the graminoid cover was estimated at approximately 50%, whilst few sub-adult tree species were also observed making up approximately 30% of the vegetation cover. The remaining area directly in the channel was bare owing to scouring effect from flows. Extensive overgrazing, and recent frosts affected the percentage of cover observed during the assessment. Otherwise, minimal encroachment of alien species was noted. Overgrazing impacts were also apparent along with associated onset of erosion due to animal movement and vegetation removal. Overall, cover was not high, and the habitat could be described as open grassland to open woodland.

The non-marginal zone generally contains a mixture of tree, shrub and graminoid species. The overall state of the non-marginal zone appears to be in transition to a graminoid dominated state. Like the marginal zone, the reference state should be tree dominated. As such, the degree of vegetation cover is somewhat reduced with less vegetation cover from tree species. Removal for firewood is also likely to contribute to decreased tree occurrence. Finally, overgrazing by cattle is similarly affecting general vegetation cover. In general, it is estimated that tree cover percentage is approximately 30%, whilst herbaceous cover is approximately 20% and graminoid cover is approximately 45%. The remaining is bare soils. Abundance of vegetation in the general non-marginal zone was higher in number of species, compared to adjacent areas. The moderately higher abundance owes mostly to the increased occurrence of tree and shrub species. Despite the increased tree and shrub occurrence, the current state differs from what should be a tree dominated state.

Overall the impacts identified to be affecting vegetation cover, abundance and composition include overgrazing due to sheep and cattle, removal of vegetation of firewood, and erosion due to animal trampling. Water quantity impacts are mainly indirect because of run-off impacts due to infrastructure (dirt roads) and decreased vegetation cover due to overgrazing. Water quality impacts affecting the watercourse mainly relate to sedimentation originating from run-off from the surrounding areas and roads. In general, however, the sedimentation impacts are a relatively moderate factor affecting water quality (and geomorphology) which in turn contributes to the current perceived change in state from a tree dominated reference state to a graminoid dominated current state.

5.9.3.3 Channelled Valley Bottom Wetland

A single Channelled Valley Bottom wetland system is present on the Paarde Valley PV site, and it shows slight mottling that indicates that it is a seasonal wetland. The relatively short inundation period that the wetland soils are prone to has led to a vegetation community that is hydrophilic, but also capable of surviving dry conditions. The wetland has been impacted upon by overgrazing, which has allowed some alien invasive plant species to enter the system. In addition, the high foot traffic of animals within the channel, has caused some changes to the geomorphology of the system through trampling of vegetation, and subsequent erosion.

- **Present Ecological Condition**

The formal health assessment of the wetland unit indicates that the wetland unit is Largely Modified resulting from past and current land uses and activities. A summary of the Present Ecological Status (PES) based on results from the WET-Health Tool is provided in **Table 13** below.

Table 13: WET-Health Score

	MODULE				
Unit	**Hydrology Impact Score and Class**	**Geomorphology Impact Score and Class**	**Vegetation Impact Score and Class**	**Combined Impact Score**	**PES Category**
1	3.7 (C)	3.5 (C)	3.1 (C)	3.47	C (Moderately Modified)

5.9.4 Ecological Importance and Sensitivity Categorisation

The environmental importance and sensitivity of the watercourses was assessed. A detailed description and reasons for the scoring of the Ecological Importance and Sensitivity Categorisation (EISC) results are displayed in **Table 14** below.

Considering conditions on-site, a fair amount of disturbance has affected the study site. Despite this disturbance, avifaunal species of conservation concern (Blue Cranes) were observed within the watercourses and riparian zones and wetland system. The disturbance caused by sheep grazing may influence the potential occurrence of sensitive species. Nonetheless, this does not preclude the occurrence of protected species that were noted on site, and other species of conservation significance may occur during other times of the year as seasonal fluctuations may also have a bearing on the potential occurrence.

Table 14: Environmental Importance and Sensitivity Category for biotic and habitat determinants associated with identified watercourses, riparian zones and wetland

Determinant	**Score**	**Confidence**	**Reason**
Primary Determinants			
1. Rare & Endangered Species	3	2	No specific red data flora species of conservation importance associated with the watercourses were noted during the field assessment. There is a possibility that red data species may grow in the study area at different times of the year and were simply not noticed however during the field assessment. The area surrounding the study site is known to provide habitat for the endangered riverine rabbit (*Bunolagus monticularis*).
2. Populations of Unique Species	3	2	No populations of unique species were observed during the site visit. However, again, the endangered riverine rabbit (*Bunolagus monticularis*) is likely to occur within the study site. This elevates the importance and sensitivity of the watercourses.
3. Species/taxon Richness	2	2	Species and taxon richness were moderate in terms of vegetation species. Disturbance due to sheep grazing is an important factor deterring the possible occurrence of indigenous faunal species.
4. Diversity of Habitat Types or Features	2	3	The diversity of habitat types is relatively homogenous.

5. Migration route/breeding and feeding site for water-dependent species	3	3	The watercourses have small crossing points for access, which should therefore not act as barriers for species using the watercourses as migration route/breeding and feeding sites. In addition, the watercourses potentially act as a link between the Adamskraal River system and the Karee River system.
6. Sensitivity to Changes in the Natural Hydrological Regime	2	3	The watercourses are highly sensitive to changes in the natural hydrological regime as little or no vegetation is present within the watercourses and they are sand based, thus leading to increased risk of erosion.
7. Sensitivity to Water Quality Changes	2	3	The watercourses are moderately sensitive to water quality changes, this is evident due to current sedimentation impacts within the affected watercourse.
8. Flood Storage, Energy Dissipation & Particulate/Element Removal	2	3	One (1) of the main potential watercourse ecosystem services / functions provided is the ability to provide flood attenuation. The watercourses are therefore regarded as relatively significant in terms of the role it performs in the greater landscape.
Modifying Determinants			
9. Protected Status	3	4	According to the Cape Winelands District Management Area database, the entire study site is located within an Ecological Support Zone.
10. Ecological Integrity	2	4	The overall EC of the watercourses are classified as C - Moderately Modified.
TOTAL	24	29	
MEDIAN	2,4	2,9	
OVERALL ECOLOGICAL SENSITIVITY AND IMPORTANCE	**B**		

Given the presence of Blue Cranes within numerous watercourses, the wetland, and the riparian zones, the importance and sensitivity of the watercourse habitat is elevated.

Whilst the condition of the vegetation surrounding the watercourses identified on the study site is somewhat disturbed, the habitat is moderately intact and does not contain any highly sensitive species. The sensitivity is therefore reduced to a limited extent in this regard. However, the potential presence of conservation-worthy species within the watercourses across the site leads to an increase in sensitivity.

Taking the above into account, as well as the EC and ecosystem services results, the EISC for the Watercourses, riparian zones and wetland was categorised as a Class B (High).

5.9.5 Ecological Buffer Zones

An adequate buffer zone is required that is suitable for the type of construction to be undertaken for the proposed development in provision of anticipated impacts. In consideration of this, limited clearance of vegetation will take place in the footprint of the internal roads, operation and maintenance building, lay-down area and under the actual PV panels. Shallow excavations can also be expected for underground cabling and other services that will be required.

Potential impacts to be expected include construction disturbance, habitat edge effects, indirect increased run-off and consequent sedimentation and erosion impacts. These are identified as the main threats to the watercourse, and wetland drivers (flow, water quality, geomorphology).

From an operation phase perspective, increased surface area characterised by hard impermeable structures (i.e. foundations, road infrastructure etc.) are expected to contribute to increased run-off rates. For the operation phase, a critical factor is the duration of potential impacts that may take place for the lifecycle of the proposed development. A consideration that was accordingly factored into the assessment. Accelerated flow resulting in increased run-off may pose an erosion and sedimentation risk to the watercourses and wetland given the shallow soil profile and characteristics of the study site. The increased flow rates are also likely to have flow alteration effects on the watercourses and wetland if not managed properly. Therefore, adequate protection of the watercourses and wetland will assist in minimising potential impacts downstream. With the implementation of mitigation measures, the identified potential impacts can be minimised.

It must be noted that the buffer zone has been determined bearing in mind that a number of mitigation measures have been proposed in **Table 23** in **Chapter 6** to reduce the potential impact to the delineated watercourses and wetland. The buffer zones that were determined include the following:

- All watercourses, rivers and the wetland Aquatic Buffer
    - Construction Phase Buffer: 15m; and
    - Operation Phase Buffer: 15m.

5.9.6 Risk Assessment

A risk assessment was undertaken as per Government Notice 509 of 2016 (No. 40229) needs to consider the '*regulated area of a watercourse*'. The outer edge of the delineated riparian habitat in addition to the 1:100-year flood line delineation (whichever is greatest) have therefore been taken as the full '*extent of the watercourses*'.

Importantly, the regulated area of the watercourse has been regarded as an exclusion zone for the PV foundations, building components of the plant (operation and maintenance buildings etc.) and underground cabling infrastructure given the sensitivity of the features. The only component that will be within the extent of the watercourse will be the proposed access roads that will make use of existing crossing points to minimise potential increased disturbance.

Given the above, as it is assumed that the proposed development will not directly encroach on the extent of the watercourse, the completion of the risk assessment protocol matrix in terms of Government Notice 509 of 2016 (No. 40229) has been undertaken to show the extremely low risk values and to ascertain the applicability of a general authorisation process, if required.

The detailed results of the risk protocol assessment are provided in Appendix D of the scoping phase Surface Water Impact Assessment Report.

Overall, the above findings show that the risk of potential impacts on the watercourse was assessed to be in the LOW-risk class. Where risks were identified, a number of control measures have been stipulated which will assist in decreasing the level of risk to an even lower level. In accordance with the implementation of control measures, all potential risks are classed as LOW. Importantly, no direct impact will take place on the identified watercourses, but rather within the surrounding catchment. Therefore, registration for General Authorisation (GA) can be undertaken, where required and agreed with the Department of Water and Sanitation (DWS).

5.10 Agricultural and Soil

The scoping phase Agricultural and Soils Impact Assessment was conducted by Johann Lanz. The full scoping phase Agricultural and Soils Impact Assessment Report is included in **Appendix 6A**. It should be noted that a field investigation was not considered necessary. The assessment was based on a desktop analysis of existing soil and potential agricultural data and other data for the site, which is considered entirely adequate for a thorough assessment of all the agricultural impacts of the proposed development (refer to Section 4.1 of scoping phase Agricultural and Soils Impact Assessment Report for further explanation).

The environmental baseline from an agricultural and soils perspective is presented below.

5.10.1 Soils

The land type classification is a nationwide survey that groups areas of similar soil, terrain and climatic conditions into different land types. The proposed development is located on predominantly two (2) similar land types, namely Da6 and Da77. Soils on these land types are fairly similar and are predominantly shallow, loamy sands on underlying rock or less commonly clay. Dominant soil forms are Swartland, Hutton, Mispah, and Valsrivier. The soils would fall into the Duplex and Lithic soil groups according to the classification of Fey (2010). A summary detailing soil data for the land types is provided in Table A1 in Appendix 1 of the scoping phase Agricultural and Soils Impact Assessment Report.

5.10.2 Agricultural capability

Land capability is defined as the combination of soil, climate and terrain suitability factors for supporting rainfed agricultural production. It is an indication of what level and type of agricultural production can sustainably be achieved on any land. The higher land capability classes are suitable as arable land for the production of cultivated crops, while the lower suitability classes are only suitable as non-arable grazing land, or at the lowest extreme, not even suitable for grazing. In 2017 the Department of Agriculture, Forestry and Fisheries (DAFF) released updated and refined land capability mapping across the whole of South Africa. This has greatly improved the accuracy of the land capability rating for any particular piece of land anywhere in the country. The new land capability mapping divides land capability into 15 different categories with 1 being the lowest and 15 being the highest. Values of below 8 are generally not suitable for the production of cultivated crops. Detail of this land capability scale is shown in **Table 15** below.

The project area is classified with land capability evaluation values that range from 1 to 7, with 6 being the predominant land capability. The land capability is limited by the very low climatic moisture availability, the rugged terrain, and the shallow, rocky soils.

Table 15: Details of the 2017 Land Capability classification for South Africa

<table>
<tr><th>Land capability evaluation value</th><th>Description</th></tr>
<tr><td>1</td><td rowspan="2">Very Low</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td><td rowspan="2">Very Low to Low</td></tr>
<tr><td>4</td></tr>
<tr><td>5</td><td>Low</td></tr>
<tr><td>6</td><td rowspan="2">Low to Moderate</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td><td>Moderate</td></tr>
<tr><td>9</td><td rowspan="2">Moderate to High</td></tr>
<tr><td>10</td></tr>
<tr><td>11</td><td>High</td></tr>
<tr><td>12</td><td rowspan="2">High to Very High</td></tr>
<tr><td>13</td></tr>
<tr><td>14</td><td rowspan="2">Very High</td></tr>
<tr><td>15</td></tr>
</table>

Due to the land capability constraints, agricultural land use is restricted to grazing only. The natural grazing capacity is given on Cape Farm Mapper as reasonable, at 16 to 17 hectares per large stock unit.

5.10.3 Land use and development on and surrounding the site

The area is a sheep farming area. The climate does not support any cultivation, except for small patches of irrigation associated with farm dams. Low-intensity natural grazing is the dominant agricultural activity. There are several farmsteads (that is a residential and administrative node of buildings and infrastructure from which a farm is managed) within the study area. There is often agricultural infrastructure, including some irrigation in the proximity of the farmsteads. The only agricultural infrastructure away from the small patches of cultivation, are wind pumps, stock watering points and fencing surrounding grazing camps.

5.10.4 Possible land use options for the site

The low climatic moisture availability means that natural grazing is the only viable agricultural land use for most of the area, except for the small patches of irrigation.

5.10.5 Agricultural sensitivity

Agricultural sensitivity is directly related to the capability of the land for agricultural production. This is because a negative impact on land of higher agricultural capability is more detrimental to agriculture than the same impact on land of low agricultural capability. A general assessment of agricultural sensitivity, in terms of loss of agricultural land in South Africa, considers arable land that can support viable production of cultivated crops, to have high sensitivity. This is because there is a scarcity of such land in South Africa, in terms of how much is required for food security. However, there is not a scarcity of land that is only suitable as grazing land in the country and such land is therefore not considered to have high agricultural sensitivity.

Agricultural sensitivity of a particular development is also a function of the severity of the impact which that type of development poses to agriculture. In the case of PV, fairly large areas of land are excluded from agricultural use, so in terms of that aspect, there is sensitivity.

The majority of the study area has low agricultural potential and therefore low agricultural sensitivity to development and consequent loss of agricultural land use. The only exception are the small patches of irrigation. These have a higher sensitivity, because of their agricultural value, and should be considered ‘no-go’ areas for any footprint of development that will exclude cultivation. ‘No-go’ areas require no buffers.

Apart from the cultivated no-go areas, agricultural potential and conditions are very uniform across the rest of the study area and the choice of placement of facility infrastructure therefore has minimal influence on the significance of agricultural impacts.

5.11 Geotechnical

The scoping phase Geotechnical Impact Assessment was conducted by Salversan Kullen of JG Afrika (Pty) Ltd. The full scoping phase Geotechnical Impact Assessment Report is included in **Appendix 6C**. The Geotechnical Impact Assessment was undertaken via a high-level, scoping phase, desktop study.

The geotechnical characteristics present over the area in which the site is situated are presented below.

5.11.1 Geotechnical Characteristics and Potential Constraints

From the 1:250 000 Geology map, the following near surface conditions may be encountered on site:

5.11.1.1 Beaufort Group

The Beaufort Group, which forms part of the Karoo Supergroup, is represented by the Adelaide Subgroup across the site. The Adelaide Formation is comprised of mudstone with subordinate sandstone. The geotechnical characteristics of these rock types are discussed below.

- **Sandstone**

The sandstones of the Karoo Supergroup are closely intercalated with mudrock. The sandstones usually poorly sorted (often containing rock fragments) and have a matrix comprised of clay or iron oxide, and occasionally calcite.

Due to the local climatic conditions, mechanical disintegration is the predominant form of weathering. This typically results in the formation of a relatively thin residual soil mantle overlying the bedrock.

Brink (1983) highlights this variability in the Beaufort Group, where similarly aged thick quartz-rich (more resistant to weathering) sandstones are found adjacent to thin, poorly sorted sandstone.

Karoo Sandstone is also noted to have a non-uniform weathering pattern. Dense competent layers are sometimes underlain by less competent layers of lower consistency, therefore, founding conditions in feldspathic sandstones may not always improve with depth (Brink, 1983).

Slope instability may also be encountered in the Karoo sandstones. Brink (1983) notes four (4) main instability types, namely Disintegration of intercalated mudrock, Pore water pressures on intercalated siltstone, Erosion of underlying strata and Block and wedge failures. Slope instability will be assessed during the detailed site investigation; however, weathering and erosion of the intercalated mudstone and block/wedge failures are anticipated to be the primary instability types.

- **Mudrock**

The mudrocks of the Karoo Supergroup are known to break down upon exposure. The mechanisms of breakdown are still unclear, however, changes in temperature, humidity, moisture content and stress relief are believed to be possible causes. Three (3) main responses to the breakdown are highlighted by Brink (1983), namely very little break down of the rock, disintegration of the rock into pieces of various sizes and shapes and lastly, slaking into silt and clay-sized particles.

Brink (1983) also noted moisture content related volumetric changes in the Karoo mudrock. Fresh mudrock samples from the Beaufort group were observed to swell upon exposure to water. This property should be considered when founding any structures in or in close proximity to flood plains.

Slope instability may also be encountered in the Karoo mudrock. Brink (1983) highlight two (2) main types of instability, namely the movement of completely weathered / colluvial material and the sliding of rock on bedding planes. Although these instability events were predominantly noted in KwaZulu-Natal, care should be taken when working with cuttings and long / deep excavations. Mudrock is closely intercalated with sandstone. Undercutting of more weathering resistant sandstone may also occur, which could cause slope instability.

Due to the dry climate, a deep weathering profile/thick residual soils are not expected on site. Residual mudrock soils are also known to be potentially expansive and laboratory tests will need to be undertaken to confirm this.

- **Dolerite**

The Karoo Supergroup contains many Jurassic aged dolerite intrusions. The magma predominantly intruded into the weaker argillaceous horizons in the form of sills and occasionally dykes (Brink, 1983).

Fresh/solid dolerite typically forms boulder/fractured dolerite during the initial stages of weathering. Due to mechanical breakdown being the predominant form of weathering in this region, further weathering results in the formation of gravel and/or granular dolerite with sandy soils (Brink, 1983).

Founding conditions on residual dolerite are generally non-problematic in areas with a dry climate. Care should be taken in areas with calcrete, as calcrete powder has been noted to increase the Plasticity Index of the residual dolerite (Brink, 1983).

Dolerite boulders will cause difficult excavation conditions due to their size and scattered occurrences. Hard excavation conditions are also expected in areas with shallow bedrock. Additional site clearing may be required to remove boulders from potential development sites. Potentially unstable talus deposits formed from dolerite corestones may be encountered on slopes.

Weathered dolerite may be targeted for use during construction of internal roads etc. The identification of potential borrow pits and the usage of the dolerite for construction material will need to be confirmed during a more comprehensive site investigation with laboratory testing.

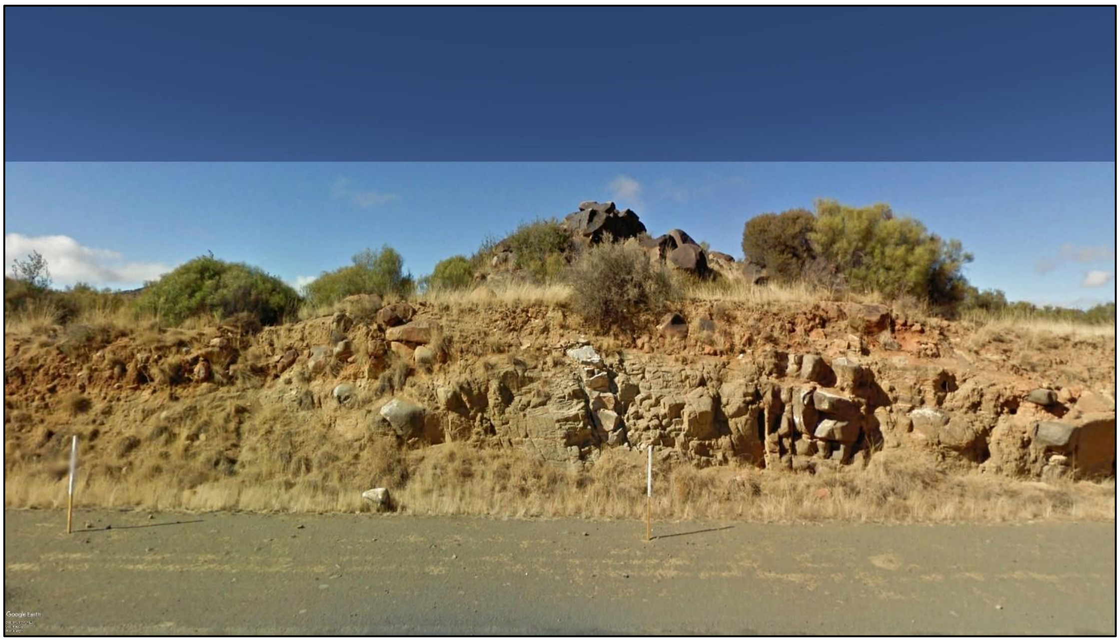

Figure 42: Dolerite weathering profile with corestones and surface boulders (N10 – Google Earth)

Figure 43: Dolerite profile with boulders on surface (N10 – Google Earth)


Figure 44: Dolerite Ridge with Boulders on surface (N10 – Google Earth)

- **Quarternary Deposits**

Alluvium / Colluvium / Talus

Alluvial deposits are created when sediments are transported and deposited by water. Alluvial deposits may be quite thick, variable in composition and be prone to settlement.

Colluvial deposits are created when sediments are transported and deposited by gravity. As mentioned above, talus deposits are a type of colluvial deposits that accumulate on talus element of slopes Talus deposits generally occur where there are steep slopes below a stronger caprock. The caprock on this site is expected to be dolerite and/or sandstone. Talus deposits accumulate at their natural angle of repose and the upper part of talus slopes have a factor of safety that is close to 1.0. Due to weathering and colluvial action, talus deposits are generally poorly sorted, with large/coarse particles occurring with a finer matrix. The finer matrix has less strength than the surrounding unweathered rock fragments/debris, therefore the properties of this matrix influence the stability of the slope. With time, deterioration and weathering of the talus deposits result in instability. In addition to potential slope instability, difficult excavation conditions may be expected due to the large unweathered boulders.

Calcrete

According to the geology map, calcrete underlies a small portion of the application site proposed for the Paarde Valley Solar PV Energy Facility.

Calcrete is a deposit formed when soils have been cemented and/or replaced by carbonates. Calcretes are either formed by percolating groundwater or by pedogenic methods. Calcrete deposits may have thicknesses of over 30m, however, they are usually not continuous over depths exceeding 1 – 2m (Brink, 1979).

Caution should be exercised when founding heavy structures on pedocretes (calcrete) as hard calcrete layers may be underlain by less competent material. Calcretes may also be laterally discontinuous over short distances (in occurrence, composition and degree of development/ cementation).

Brink (1979) notes that a collapsible fabric has been suspected in some powder and nodular calcrete and cemented soils. Small scale karst structures and evidence of small sinkholes have also been observed in weathered calcretes.

Hard excavation conditions are expected in well developed, cemented, calcretes.

Calcrete may be used for wearing course and all layers within the road prism for unpaved roads.

5.12 Visual

The scoping phase Visual Assessment (VIA) was conducted by Kerry Schwartz of SiVEST. The full scoping phase VIA Report is included in **Appendix 6J**. The VIA will be externally reviewed by suitably qualified external specialist during the EIA phase, prior to the DEIAr being released for review. The VIA has been based on a desktop-level assessment supported by field-based observation. A four (4) day site visit was undertaken between the 4th and the 7th of February 2019 (mid to late summer).

The environmental baseline from a visual perspective and the physical and land use related characteristics are outlined below as they are important factors contributing to the visual character of the study area. Defining the visual character of an area is an important part of assessing visual impacts as it establishes the visual baseline or existing visual environment in which the development would be constructed. The visual impact of a development is measured by establishing the degree to which the development would contrast with, or conform to, the visual character of the surrounding area. The inherent sensitivity of the area to visual impacts or visual sensitivity is thereafter determined, based on the visual character, the economic importance of the scenic quality of the area, inherent cultural value of the area and the presence of visual receptors.

5.12.1 Topography

Areas of flat relief, including the flat plains and the higher-lying plateaus, are characterised by wide-ranging vistas (**Figure 45**), although views eastwards will be somewhat constrained by the hilly terrain in the western sector of the study area (**Figure 46**). In the hillier and higher-lying terrain, the vistas will depend on the position of the viewer. Viewers located within some of the more incised valleys for example, would have limited vistas, whereas a much wider vista would be experienced by viewers on higher-lying ridge tops or slopes. Importantly in the context of this study, the same is true of objects placed at different elevations and within different landscape settings. Objects placed on high-elevation slopes or ridge tops would be highly visible, while those placed in valleys or enclosed plateaus would be far less visible.

The PV arrays will not however be located on high elevation slopes or on ridgelines and as such there will be minimal impact on the skyline. However, with little to no topographic shielding, the steel structures of the proposed substations at a maximum height of 25m are likely to be visible from many of the locally occurring receptor locations.

Maps showing the topography and slopes within and in the immediate vicinity of the proposed application site are provided in **Figure 13** and **Figure 14** respectively (**Section 5.3** on **page 76**).

Figure 45: View northwards across the study showing area wide-ranging vistas

Figure 46: Hilly terrain constraining views east and south-east

5.12.2 Vegetation

As discussed in **Section 5.7**, vegetation cover across the study area is predominantly short and sparse and thus will not provide any visual screening. In some instances, however, tall exotic trees planted around farmhouses will restrict views from receptor locations (**Figure 47**).

Figure 47: Screening vegetation around farmhouses

5.12.3 Land Use

Sparse human habitation and the predominance of natural vegetation cover across much of the study area would give the viewer the general impression of a largely natural setting with some pastoral elements. In addition, there are no towns or settlements in the study area and thus, there are very low levels of human transformation and visual degradation across much of the study area.

The short, scrubby or grassy vegetation that occurs over the entire study area offers no visual screening in itself, and thus terrain / topography is the most important factor in limiting vistas. Exceptions to this situation occur at some local farmsteads where trees and shrubs have been established around the farmstead, providing effective screening from the surrounding areas.

The influence of the level of human transformation on the visual character of the area is described in more detail below.

5.12.4 Visual Character and Cultural Value

The above physical and land use-related characteristics of the study area contribute to its overall visual character. Visual character largely depends on the level of change or transformation from a natural baseline in which there is little evidence of human transformation of the landscape. Varying degrees of human transformation of a landscape would engender differing visual characteristics to that landscape, with a highly modified urban or industrial landscape being at the opposite end of the scale to a largely natural undisturbed landscape. Visual character is also influenced by the presence of built infrastructure such as buildings, roads and other objects such as telephone or electrical infrastructure.

As mentioned, much of the study area is characterised by natural landscapes with some pastoral elements and low densities of human settlement. Livestock grazing is the dominant land use. These activities have not transformed the natural landscape to any significant degree and as such a large portion of the study area has retained its natural character and is dominated by largely natural views.

There are no towns or built-up areas in the study area influencing the overall visual character and thus there are very low levels of human transformation and visual degradation across much of the study area. Built form is largely dominated by isolated farmsteads, gravel access roads, telephone lines, low voltage power lines, fences and windmills. The presence of this infrastructure is an important factor in this context, as the introduction of a development such as a solar energy facility (SEF) would result in less visual contrast where other anthropogenic elements are already present, especially where the scale of those elements is similar to that of the proposed development.

The greater area surrounding the development site is an important component when assessing visual character. The area can be considered to be typical of a Karoo or 'platteland' landscape that would characteristically be encountered across the high-lying dry western and central interior of South Africa. Much of South Africa's dry Karoo interior consists of wide open, uninhabited spaces sparsely punctuated by scattered farmsteads and small towns. Over the last couple of decades an increasing number of tourism routes have been established in the Karoo and in a context of increasing urbanisation in South Africa's major centres, the Karoo is being marketed as an undisturbed getaway. Examples of this may be found in the '*Getaway Guide to Karoo, Namaqualand and Kalahari*' (Moseley and Naude-Moseley, 2008).

The typical Karoo landscape can be considered a valuable 'cultural landscape' in the South African context. Although the cultural landscape concept is relatively new, it is becoming an increasingly important concept in terms of the preservation and management of rural and urban settings across the world (Breedlove, 2002).

Cultural Landscapes can fall into three (3) categories (according to the Committee's Operational Guidelines):

- '*a landscape designed and created intentionally by man*';
- an '*organically evolved landscape'* which may be a '*relict (or fossil) landscape*' or a '*continuing landscape*'; and
- an '*associative cultural landscape*' which may be valued because of the '*religious, artistic or cultural associations of the natural element*'.

The typical Karoo landscape consisting of wide-open plains, and isolated relief, interspersed with isolated farmsteads, windmills and stock holding pens, is an important part of the cultural matrix of the South African environment. The Karoo farmstead is also a representation of how the harsh arid nature of the environment in this part of the country has shaped the predominant land use and economic activity practised in the area, as well as the patterns of human habitation and interaction. The presence of small towns, such as Middelburg, engulfed by an otherwise rural, almost barren environment, form an integral part of the wider Karoo landscape. As such, the Karoo landscape as it exists today has value as a cultural landscape in the South African context. In terms of the types of cultural landscape listed above, the Karoo cultural landscape would fall into the second category, that of an organically evolved, 'continuing' landscape.

In light of this, it is important to assess whether the introduction of a solar PV energy facility with associated infrastructure into the study area would be a degrading factor in the context of the natural Karoo character of the landscape. However, considering the fact that a number of SEFs and wind energy facilities (WEFs) have been developed or are likely to be developed across the Karoo, it is possible that renewable energy facilities and wind turbines may in the future become an integral part of the typical Karoo cultural landscape.

In this instance, visual impacts on the cultural landscape would be reduced by the fact that the area is relatively remote and there are relatively few tourism or nature-based leisure facilities in the study area.

5.12.5 Visual Sensitivity

Visual sensitivity can be defined as the inherent sensitivity of an area to potential visual impacts associated with a proposed development. It is based on the physical characteristics of the area (i.e. topography, landform and land cover), the spatial distribution of potential receptors, and the likely value judgements of these receptors towards a new development (Oberholzer, 2005). A viewer's perception is usually based on the perceived aesthetic appeal of an area and on the presence of economic activities (such as recreational tourism) which may be based on this aesthetic appeal.

In order to assess the visual sensitivity of the area, SiVEST has developed a matrix based on the characteristics of the receiving environment which, according to the Guidelines for Involving Visual and Aesthetic Specialists in the EIA Processes, indicate that visibility and aesthetics are likely to be 'key issues' (Oberholzer, 2005).

Based on the criteria in the matrix (**Table 16**), the visual sensitivity of the area is broken up into a number of categories, as described below:

i) **High -** The introduction of a new development such as a solar PV facility would be likely to be perceived negatively by receptors in this area; it would be considered to be a visual intrusion and may elicit opposition from these receptors.
ii) **Moderate –** Receptors are present, but due to the nature of the existing visual character of the area and likely value judgements of receptors, there would be limited negative perception towards the new development as a source of visual impact.
iii) **Low -** The introduction of a new development would not be perceived to be negative, there would be little opposition or negative perception towards it.

The table below outlines the factors used to rate the visual sensitivity of the study area. The ratings are specific to the visual context of the receiving environment within the study area.

Table 16: Environmental factors used to define visual sensitivity of study area

FACTORS	DESCRIPTION	RATING									
		1	2	3	4	5	6	7	8	9	10
Pristine / natural / scenic character of the environment	Study area is largely natural with areas of scenic value and some pastoral elements.										
Presence of sensitive visual receptors	Relatively few sensitive receptors have been identified in the study area.										
Aesthetic sense of place / visual character	Visual character is typical of Karoo Cultural landscape.										
Irreplaceability / uniqueness / scarcity value	Although there are areas of scenic value within the study area, these are not rated as highly unique.										
Cultural or symbolic meaning	Much of the area is typical of a Karoo Cultural landscape.										
Protected / conservation areas in the study area	No protected or conservation areas were identified in the study area.										
Sites of special interest present in the study area	No sites of special interest were identified in the study area.										
Economic dependency on scenic quality	Few tourism/leisure based facilities in the area										
International / regional / local status of the environment	Study area is typical of Karoo landscapes										
**Scenic quality under threat / at risk of change	Introduction of an SPF will alter the visual character and sense of place. In addition, the development of other renewable energy facilities in the broader area as planned will introduce an increasingly industrial character, giving rise to significant cumulative impacts										

Based on the above factors, the study area is rated as having a low to moderate visual sensitivity. It should be stressed however that the concept of visual sensitivity has been utilised indicatively to provide a broad-scale indication of whether the landscape is likely to be sensitive to visual impacts, and is based on the physical characteristics of the study area, economic activities and land use that predominates. An important factor contributing to the visual sensitivity of an area is the presence, or absence of visual receptors that may value the aesthetic quality of the landscape and depend on it to produce revenue and create jobs.

No formal protected areas were identified in the study area, and only one (1) tourism facility was identified. In addition, relatively few sensitive or potentially sensitive receptors were found to be present.

5.12.6 Visual Absorption Capacity

Visual absorption capacity is the ability of the landscape to absorb a new development without any significant change in the visual character and quality of the landscape. The level of absorption capacity is largely based on the physical characteristics of the landscape (topography and vegetation cover) and the level of transformation present in the landscape.

The relatively flat topography in the study area and the relative lack of vegetation to provide screening would reduce the visual absorption capacity across much of the area. This would be offset to some degree where the landscape has already undergone transformation, thus increasing the overall visual absorption capacity of the landscape.

Visual absorption capacity in the study area is therefore rated as low to moderate.

5.12.7 Visually Sensitive Areas on the Site

During the scoping phase, all project specialists were requested to indicate environmentally sensitive areas within the application site. This exercise aimed to demarcate those areas of the application site which should be precluded from the solar PV development footprint. From a visual perspective, these would be areas where the establishment of PV panels or other associated infrastructure would result in the greatest probability of visual impacts on potentially sensitive visual receptors.

Using GIS-based visibility analysis, it was possible to determine which sectors of the application site would be visible to the highest numbers of receptors in the study area. This analysis took into account all the sensitive and potentially sensitive receptor locations identified. The areas visible to the highest number of receptors were rated as areas of 'high sensitivity' and PV panels should preferably be precluded from these areas in order to reduce the potential visual impact on the identified sensitive and potentially sensitive receptor locations. However, as the study area as a whole is rated as having a low to moderate visual sensitivity (refer to section 3.**3** of the VIA Report), these zones are <u>not considered to be areas of high visual sensitivity or 'no-go' areas</u>, but rather should be viewed as zones where development should be limited, as the PV panels will still be highly visible.

It should be noted that this sensitivity rating applies to PV fields only. The visual impacts resulting from the associated infrastructure are considered to have far less significance when viewed in the context of multiple PV panels and as such the infrastructure has been excluded from the sensitivity analysis.

It should be noted that the visibility analysis is based purely on topographic data available for the broader study area and does not take into account any localised topographic variations or any existing infrastructure and / or vegetation which may constrain views. In addition, the analysis does not take into account differing perceptions of the viewer which largely determine the degree of visual impact being experienced.

The visual sensitivity analysis should therefore be seen as a conceptual representation or a worst-case scenario which rates the visibility of the site in relation to potentially sensitive receptors.

In addition to the sensitivity ratings, a 500m exclusion zone has been delineated around the existing residences on the application sites. It is recommended that PV fields should not be developed within these buffer zones so as to prevent significant adverse impacts of glint and glare on the local residents.

5.12.8 Sensitive Visual Receptors

A sensitive visual receptor location is defined as a location from where receptors would potentially be impacted by a proposed development. Adverse impacts often arise where a new development is seen as an intrusion which alters the visual character of the area and affects the 'sense of place'. The degree of visual impact experienced will however vary from one receptor to another, as it is largely based on the viewer's perception.

A distinction must be made between a receptor location and a sensitive receptor location. A receptor location is a site from where the proposed development may be visible, but the receptor may not necessarily be adversely affected by any visual intrusion associated with the development. Less sensitive receptor locations include locations of commercial activities and certain movement corridors, such as roads that are not tourism routes. More sensitive receptor locations typically include sites that are likely to be adversely affected by the visual intrusion of the proposed development. They include tourism facilities, scenic sites and residential dwellings in natural settings.

The identification of sensitive receptors is typically based on a number of factors which include:

- the visual character of the area, especially taking into account visually scenic areas and areas of visual sensitivity;
- the presence of leisure-based (especially nature-based) tourism in an area;
- the presence of sites or routes that are valued for their scenic quality and sense of place;
- the presence of homesteads / farmsteads in a largely natural setting where the development may influence the typical character of their views; and
- feedback from interested and affected parties, as raised during the public participation process conducted as part of the EIA study.

As the visibility of the development would diminish exponentially over distance (refer to section 2.4 of VIA Report), receptor locations which are closer to the Solar PV facility would experience greater adverse visual impacts than those located further away. Zones of visual impact for the solar PV facility and the grid connection infrastructure were therefore delineated based on distance bands measured from the outer boundary of the application site.

The degree of visual impact experienced will however vary from one (1) inhabitant to another, as it is largely based on the viewer's perception. Factors influencing the degree of visual impact experienced by the viewer include the following:

- Value placed by the viewer on the natural scenic characteristics of the area;

- The viewer's sentiments toward the proposed structures. These may be positive (a symbol of progression toward a less polluted future) or negative (foreign objects degrading the natural landscape); and
- Degree to which the viewer will accept a change in the typical Karoo character of the surrounding area.

5.12.8.1 Receptor Identification

Preliminary desktop assessment of the study area identified 34 potentially sensitive visual receptor locations, most of which appear to be existing farmsteads or farmhouses. These dwellings are regarded as potentially sensitive visual receptors as they are located within a mostly rural setting and the proposed development will likely alter natural vistas experienced from these locations, although sentiments toward the proposed development are unknown.

This assessment was refined according to the findings of the field visit conducted in February 2019 and eight (8) of the identified locations were removed from the list of potentially sensitive receptors. Some of these eight (8) locations were found to be abandoned dwellings while others were identified as structures not considered to be visual receptors. Due to access limitations during the time of the field investigation, it was not possible to fully investigate all of the identified potentially sensitive visual receptor locations from a visual perspective. Notwithstanding this limitation, these receptor locations were still regarded as being potentially sensitive to the visual impacts associated with the proposed development and were assessed as part of the VIA, via desktop means where required.

Three (3) of the identified receptor locations were confirmed to be sensitive receptors, as they are linked to leisure or nature-based activities within the study area. These three (3) receptors are all component facilities of Transkaroo Adventures, a nature-based tourism undertaking providing secluded accommodation facilities, hiking trails and 4 x 4 routes in the scenic eastern sector of the assessment area.

In many cases, roads along which people travel, are regarded as sensitive receptors. The primary thoroughfares in the study area include local access roads and do not form part of any scenic tourist routes. These roads are not specifically valued or utilised for their scenic or tourism potential and are therefore not regarded as visually sensitive.

A total of six (6) of the potentially sensitive receptors identified in the study area were found to be within 5km of the Paarde Valley PV application site. None of these receptor locations are considered to be sensitive receptors, although all six (6) receptors are existing farmsteads or farmhouses which are regarded as potentially sensitive visual receptors. These receptor locations are indicated in **Figure 48** below.

No part of the N10 receptor road is within 5km of the solar PV application site and as such motorists travelling along this route will not be affected by the proposed Paarde Valley solar PV facility.

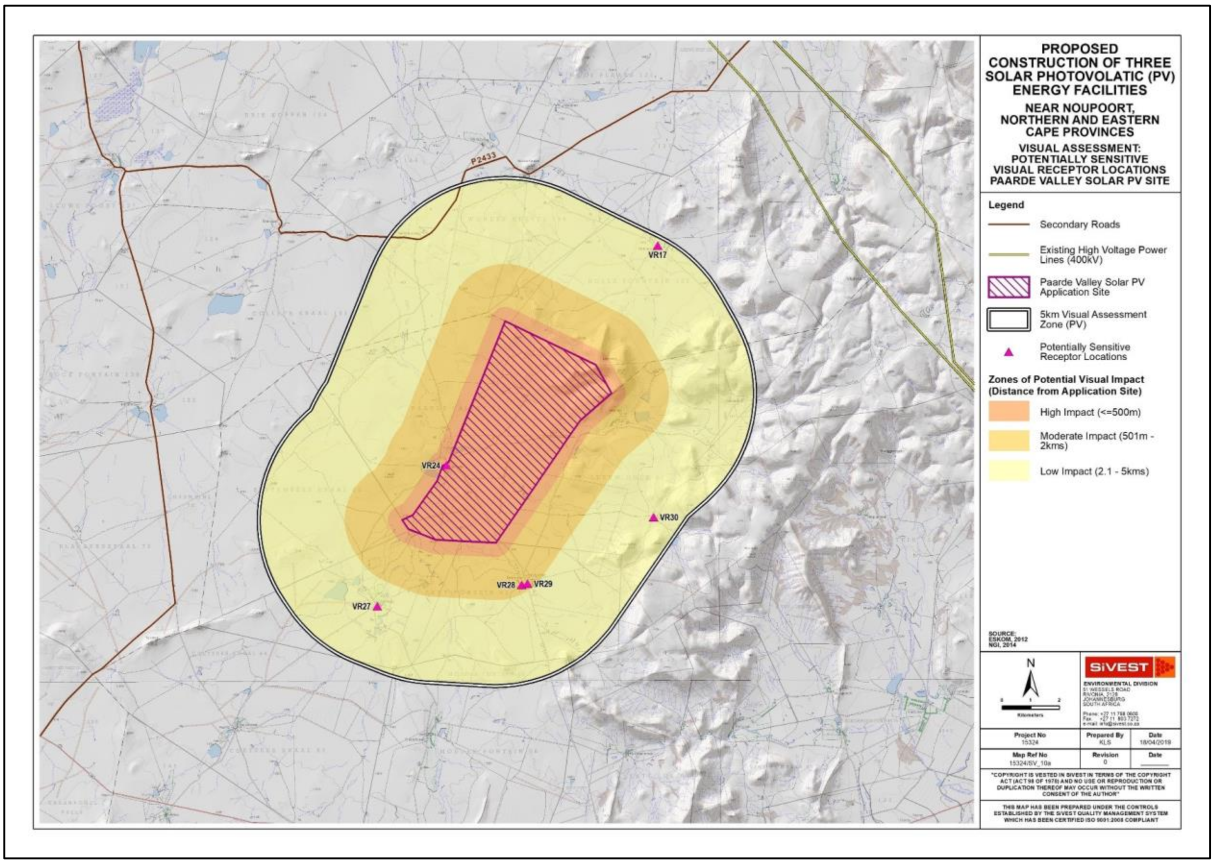

Figure 48: Potentially sensitive receptor locations within 5kms of Paarde Valley PV application site

5.13 Heritage

The scoping phase Heritage Impact Assessment (HIA) was conducted by Wouter Fourie of PGS Heritage (Pty) Ltd. The full scoping phase HIA Report is included in **Appendix 6D**. Due to the prohibitive size of the application area during the scoping phase, it was agreed that fieldwork related to the heritage assessment will only be done in the EIA phase when the footprint areas have been determined and significantly reduced, based on environmental sensitive areas determined by the other specialists.

The environmental baseline from a heritage perspective is presented below.

The examination of heritage databases, historical data and cartographic resources represents an additional critical tool for locating and identifying heritage resources and in determining the historical and cultural context of the study area. Therefore, an Internet literature search was conducted, and relevant archaeological and historical texts were also consulted. Relevant topographic maps and satellite imagery were studied.

Researching the SAHRA Archaeology, Palaeontology and Meteorites (APM) Report Mapping Project records and the SAHRIS online database (http://www.sahra.org.za/sahris), will assist in determining what types of archaeological or historical studies have been performed within the wider vicinity of the study area. Previous studies listed for the area in the APM Report Mapping will be listed in the HIA as background to the study area.

5.13.1 Findings from the studies

- **Palaeontology**

The following is extracted from the Palaeontological Impact Assessment (PIA) completed by Elize Butler of Banzai Environmental (Pty) Ltd for PGS Heritage. The full PIA Report can be viewed in **Appendix 6E**.

'The proposed development is underlain by the continental sediments of the Latest Permian sediments of the Balfour Formation (Upper Beaufort Group, Adelaide Subgroup) and earliest Triassic sediments of the Katberg Formation (Upper Beaufort Group, Tarkastad Subgroup, Karoo Supergroup) as well as Jurassic Karoo Dolerite. These sediments are generally mantled by a thick layer of Quaternary to Recent colluvium and alluvium. The uppermost Balfour and Katberg Formations are of extraordinary interest in that they provide some of the best existing information on ecologically-complex terrestrial ecosystems during the catastrophic end-Permian mass extinction. According to the PalaeoMap of the South African Heritage Resources Information System (SAHRIS), the Palaeontological Sensitivity of the Tarkastad and Adelaide Subgroups has a Very High Palaeontological Sensitivity, while that of the Quaternary superficial deposits of the Central interior is high and the Karoo dolerite (igneous rocks) is insignificant and rated as zero'.

A site-specific field survey of the development footprint was conducted on foot and by motor vehicle from the 24th – 28th January 2019. Elsewhere in the Karoo Basin numerous fossils have been uncovered in these geological sediments but only two sites on koppies with fossiliferous outcrops were identified. These fossiliferous sites have been identified as Highly Sensitive and No-go areas. It is recommended that a 50 m buffer will be placed around these areas. In the event that construction is necessary in these sensitive areas it is recommended that the fossils will be collected by a professional palaeontologist. Preceding excavation of any fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an accredited collection (museum or university collection), while all fieldwork and reports should meet the minimum standards for palaeontological impact studies suggested by SAHRA.

5.13.2 Heritage Sensitivities

The evaluation of the possible heritage resource finds, and their heritage significance linked to mitigation requirements was linked to types of landscape. The heritage sensitivity rating does not indicate 'no-go' areas but the possibility of finding heritage significant site that could require mitigation work.

5.13.3 Possible Finds

Evaluation of aerial photography has indicated that certain areas may be sensitive from an archaeological perspective. The analysis of the studies conducted in the area assisted in the development of the following landform type to heritage find matrix in **Table 17** below.

Table 17: Landform to heritage matrix

LAND FROM TYPE	HERITAGE TYPE
Crest and foot hill	LSA and MSA scatters
Crest of small hills	Small LSA sites – scatters of stone artefacts, ostrich eggshell, pottery and beads
Pans	Dense LSA sites
Outcrops	Occupation sites dating to LSA
Farmsteads	Historical archaeological material

To be able to compile a heritage management plan to be incorporated into the Environmental Management Programme (EMPr), the following further work will be required for the EIA:

- Archaeological walk through of the areas where the project will be impacting; and
- Palaeontological desktop assessment of the area and selective site visit where required by the palaeontologist.

5.14 Palaeontology

As mentioned, the Palaeontological Impact Assessment (PIA) was completed by Elize Butler of Banzai Environmental (Pty) Ltd for PGS Heritage. The full PIA Report can be viewed in **Appendix 6E**. A site-specific field survey of the development footprint was conducted on foot and by motor vehicle from the 24th – 28th January 2019.

The environmental baseline from a palaeontological perspective is presented below.

5.14.1 Geological and Palaeontological History

The proposed development is underlain by the continental sediments of the Latest Permian sediments of the Balfour Formation (Upper Beaufort Group, Adelaide Subgroup) and earliest Triassic sediments of the Katberg Formation (Upper Beaufort Group, Tarkastad Subgroup, Karoo Supergroup) as well as Jurassic Karoo Dolerite. These sediments are generally mantled by a thick layer of Quaternary to Recent colluvium and alluvium. The uppermost Balfour and Katberg Formations are of extraordinary interest in that they provide some of the best existing information on ecologically-complex terrestrial ecosystems during the catastrophic end-Permian mass extinction.

5.14.1.1 Geology

The development area is underlain by a series of Karoo sandstones, mudstones and shales, deposited under fluvial environments of the Adelaide Subgroup that forms part of the Beaufort Group. The Beaufort group overlays the Ecca Group and consists essentially of sandstones and shales, deposited in the Karoo Basin from the Middle Permian to the early part of the Middle Triassic periods and was deposited on land through alluvial processes. The Beaufort Group covers a total land surface area of approximately 200 000km^2 in South Africa and is the first fully continental sequence in the Karoo Supergroup. The Beaufort Group is divided into the Adelaide subgroup and the overlying Tarkastad subgroup.

The Adelaide subgroup rocks were deposited under a humid climate that allowed for the establishment of wet floodplains with high water tables and are interpreted to be fluvio-lacustrine sediments. The Balfour Formation forms the upper part of the Adelaide Subgroup and part of what was called lower to middle Beaufort. The Adelaide Subgroup contains alternating greyish-red, bluish-grey, or greenish-grey mudrocks in the southern and central parts of the Karoo Basin with very fine to medium grained, grey lithofeldspathic sandstones. Thicker sandstones of the Adelaide are usually multi-storey and usually have cut-and fill features. The sandstones are characterised internally by horizontal lamination together with parting lineation and less frequent trough crossbedding as well as current ripple lamination. The bases of the sandstone units are massive beds, while ripple lamination is usually confined to thin sandstones towards the top of the thicker units.

The mudrocks of the Adelaide Subgroup usually has massive and blocky weathering apart from in the Normandien and Daggaboersnek Member. Sometimes desiccation cracks and impressions of raindrops are present. In the mudstones of the Beaufort Group calcareous nodules and concretions occur throughout.

The arenaceous Katberg Sandstone Formation of the Tarkastad Subgroup comprise of fine to medium-grained pinkish-grey sandstone with subordinate greenish-grey mudstone. The Katberg tabular sheet sandstones are vertically superimposed and divided by erosion surfaces lined with intraformational mud-pebble conglomerates. A maximum thickness of 1000m has been measured (Hiller and Stavrakis, 1984). At the end of the Permian the rivers changed from a meandering river system in the Balfour Formation to a large sand braided fan system in the Katberg Sandstone Formation.

During Jurassic times the subcontinent was inundated with basaltic lava to form the capping basalts of the Jurassic aged Drakensberg Group. During the Jurassic the volcanic Drakensberg were formed and cracks in the earth's crust were filled with molten lava that cooled to form dolerite dykes. Magma injected horizontally between sediments, cooled down and formed horizontal stills of dolerite.

The Beaufort Group is subdivided into a series of biostratigraphic units on the basis of its faunal content, namely the *Daptocephalus* Assemblage Zone (Balfour Formation) and the *Lystrosaurus* Assemblage (Katberg Formation) (**Figure 49** below).

The Tertiary to Quaternary Cenozoic superficial deposits consist of aeolian sand, alluvium (clay, silt and sand deposited by flowing floodwater in a river valley/ delta producing fertile soil), colluvium (material collecting at the foot if a steep slope), spring tufa/tuff (a porous rock composed of calcium carbonate and formed by precipitation from water, for example, around mineral springs.) and lake deposits, peats, pedocretes or duricrusts (calcrete, ferricrete), soils and gravels.

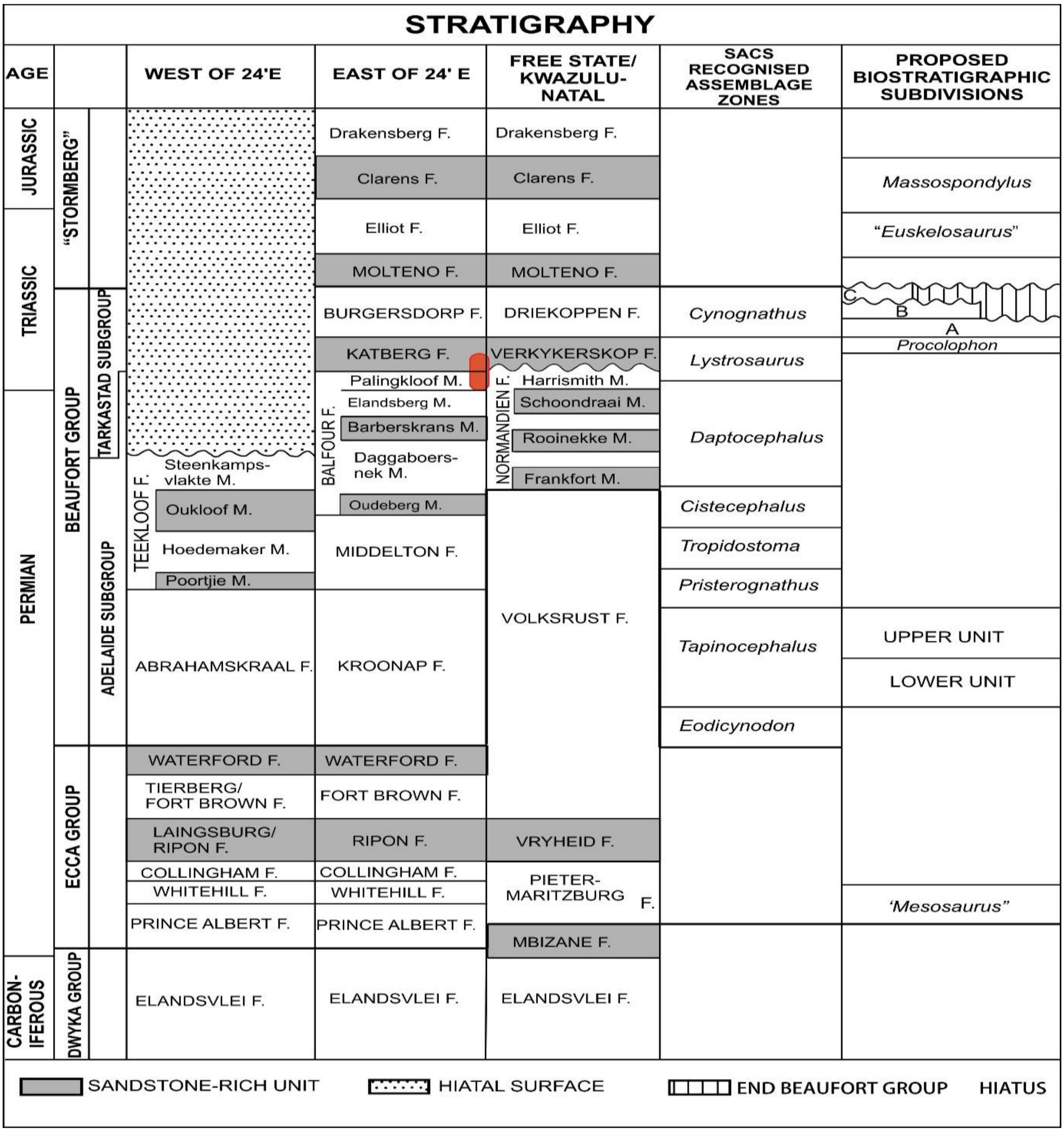

Figure 49: Lithostratigraphic (rock-based) and biostratigraphic (fossil-based) subdivisions. Beaufort Group of Karoo Supergroup with rock units and fossil assemblage zones relevant to present study marked in red (Modified from Rubidge, 1995). Abbreviations: F. = Formation, M. = Member

5.14.1.2 Palaeontology

The Beaufort Group is the third of the main subdivisions of the Karoo Supergroup. The flood plains of the Beaufort Group (Karoo Supergroup) are internationally renowned for the early diversification of land vertebrates and provide the worlds' most complete transition from early 'reptiles' to mammals. The diverse *Daptocephalus* Assemblage Zone biotas are of extraordinary interest in that they provide some of the best available information on ecologically-complex terrestrial ecosystems immediately preceding the catastrophic end-Permian mass extinction (Rubidge, 2005; Gastaldo *et al.,* 2005; Retallack *et al.,* 2006).

Sediments of the Beaufort Group are relatively rich in fossils, especially vertebrate fossils. The *Daptocephalus* Assemblage Zone is characterised by the occurrence of the two (2) therapsids namely *Dicynodon* and *Theriognathus.* The *Daptocephalus* Assemblage Zone expands into the lower Palingkloof Member of the Upper Balfour Formation. This Zone is characterised by the occurrence of the two (2) therapsids namely *Dicynodon* and *Theriognathus*. The *Daptocephalus* Zone shows the greatest vertebrate diversity and includes numerous well-preserved genera and species of dicynodonts, biarmosuchians, gorgonopsian, therocephalian and cynodont therapsid Synapsida as well as captorhinid Reptilia and less well-represented eosuchian Reptilia, Amphibia and Pisces (Kitching, 1977; National Palaeontology Museum databases). Trace fossils of vertebrates and invertebrates as well as *Glossopteris* flora plants have also been described (Bamford, 2004).

The lower Palingkloof Member is of special importance as it precedes the Permo-Triassic Extinction Event which destroyed the vertebrate fauna and extinguished the diverse glossopterid plants.

The lower *Lystrosaurus* Assemblage Zone forms part of the Katberg Formation. Fauna and flora from this assemblage zone is rare as few genera survived the Permo-Triassic Extinction Event. The *Lystrosaurus* Assemblage Zone is characterised by the dicynodont, *Lystrosaurus*, and captorhinid reptile, *Procolophon*. The biarmosuchian and gorgonopsian Therapsida did not survive into the *Lystrosaurus* Assemblage Zone although the therocephalian and cynodont Therapsida are present in moderate quantities. Captorhinid Reptilia are reduced, but this interval is characterised by a unique diversity of oversize amphibians. Fossil fish, millipedes and diverse trace fossils have also been recorded.

Quaternary fossil assemblages are generally rare and low in diversity and is spread out over a wide geographic area. These fossil assemblages may sometimes occur in extensive alluvial and colluvial deposits cut by dongas. In the past palaeontologists did not concentrate their research on Cenozoic superficial deposits although they sometimes comprise of important fossil biotas. Fossil assemblages may comprise of bones, horn corns and mammalian teeth, reptile skeletons as well as fragments of ostrich eggs. Microfossils, non- marine mollusc shells and freshwater stromatolites are also known from Quaternary deposits. Plant material such as foliage, pollens peats and wood are recovered as well as trace fossils like vertebrate tracks, burrows, termitaria (termite heaps/ mounds) and rhizoliths (root casts).

5.15 Social

The scoping phase Social Impact Assessment was conducted by Dr Neville Bews & Associates. The full scoping phase Social Impact Assessment Report is included in **Appendix 6F**. The Social Impact Assessment was undertaken via desktop means.

The environmental baseline from a social perspective is presented below.

5.15.1 Description of the Affected Environment

The Paarde Valley Solar PV Energy Facility is located within the Eastern Cape Province. In the Eastern Cape the proposed development impacts the Chris Hani district (DC13) and Inxuba Yethemba (EC131) local municipalities. The closest town to the proposed development is Middelburg in the Eastern Cape, which falls within the Karoo Region. The demographics pertaining to this area, as sourced from Statistics South Africa Census 2011, is described below.

5.15.1.1 Provincial

The Eastern Cape Province covers an area of 168 965.98km² and has a population of 6 562 053 people, resulting in a population density of 38.84 people per km² according to Census 2011 (Statistics South Africa, 2011). In respect of age structure 33% of the population of the Eastern Cape are below 16 years while 60.2% are between 15 and 64 years of age and 6.7% are above 64 years.

According to the 2018 Mid-year population estimates (Statistics South Africa, 2018a), with a population of 6 522 700 in 2018, the Eastern Cape accounts for 11.3% of the total population across the country marginally below the Western Cape with an estimated population of 6 621 100 or 11.5% of the total population of South Africa. As the Mid-year population estimates remain at a provincial level and are not projected to the district and local municipal levels, for comparative purposes, data gathered during Census 2011, will be used where appropriate, notwithstanding it being somewhat outdated.

On this basis and in respect of population groupings at 86.26%, the dominant population group in the Eastern Cape is black African. At 49.7% Afrikaans is the dominant home language spoken across the province.

The dependency ratio of the Eastern Cape, which indicates the burden placed on the population of working age, between 15 and 64 years, who support children under 15 years and people over 65 years, is 66.0. The sex ratio, which measures the proportion of males to females, in the Eastern Cape is 89.0, indicating a higher number of females in the province. Between 1996 and 2001 the population growth rate of the Eastern Cape was 0.42% p.a. while between 2001 and 2011 it was 0.44% p.a.

In 2011 the official unemployment rate in the Eastern Cape was 37.4% with the official unemployment rate amongst the youth, aged between 15 and 34 years, being 47.3%. In the 4th Quarter of 2018 the official unemployment rate in the Eastern Cape had dropped to 36.1%. These figures must, however, be considered with caution as the official unemployment rate is defined by Stats SA as follows:

'Unemployed persons are those (aged 15–64 years) who:

a) *Were not employed in the reference week and;*
b) *Actively looked for work or tried to start a business in the four weeks preceding the survey interview and;*
c) *Were available for work (i.e. would have been able to start work or a business in the reference week) or;*

d) *Had not actively looked for work in the past four weeks but had a job or business to start at a definite date in the future and were available.'* (Statistics South Africa, 2018b, p. 17).

Considering this in the 4th Quarter of 2018, the expanded unemployment rate in the Eastern Cape was 46.8%. During this period the labour absorption rate in the Eastern Cape was 32.2% while the labour force participation rate was 50.5%.

In respect of households, the 2011 Census indicated that there were 1 687 385 households in the Eastern Cape with an average household size of 3.9. Of the households in the Eastern Cape, 49.6% were female-headed, 63.2% lived in formal dwellings and 59.6% either owned or were paying off their dwelling.

Regarding household services in 2011, 40.4% of households in the Eastern Cape had flush toilets connected to the sewerage system. In respect of refuse removal 41% of households in the Eastern Cape had their refuse removed on a weekly basis. Piped water was delivered to 32.8% of households in the Eastern Cape while 75% of households in the Eastern Cape used electricity as a means of energy for lighting.

Concerning HIV prevalence amongst prenatal women in the Eastern Cape Province, in 2013 the Northern Cape had the lowest prevalence rate across South Africa at 17.5% followed by the Western Cape at 18.7%, while the Eastern Cape had an HIV prevalence rate of 31.4%. At the same point the highest level of HIV prevalence amongst antenatal women was in KwaZulu-Natal with a prevalence rate of 40.1% while the national rate was 29.7%.

The 2013 National Antenatal Sentinel HIV Prevalence Survey extended to the district level which indicated that the Chris Hani district had a relatively high level of HIV prevalence across the country at 34.5%. As the project falls within a remote area of the Chris Hani district and Inxuba Yethemba local municipalities it is likely that the level of HIV prevalence will be somewhat low in the vicinity of the project. It is probable that the high HIV levels in the district will be associated with the more densely populated urban areas of Cradock and Middelburg amongst others and is also due to the fact that the Chris Hani district serves as a linking node to all regions in the Eastern Cape. It is well documented that the spread of HIV is associated with transport corridors (Singh & Malaviya, 1994; Ramjee & Gouws, 2002; Djemai, 2018; Strauss, *et al*., 2018).

5.15.1.2 Municipal

The project impacts the district municipality of Chris Hani as well its local municipality of Inxuba Yethemba. At a local municipal level although the Inxuba Yethemba covers the largest geographical area it also has the largest population resulting in a population density of 5.62/km^2. In respect of population grouping, at 93.35% black African people are the dominant population group across all districts. isiXhosa is the dominant home language spoken across all municipalities.

The Inxuba Yethemba Local Municipality incorporates the towns of Cradock and Middelburg and the surrounding rural areas comprise mainly of commercial farms and small settlements. The economic drivers in the area are community and financial services, trade, transportation and agriculture with some tourism with the Mount Zebra National Park falling within the area.

In the Chris Hani district, which had a population of 795 461 people in 2011, 34.4% were under 16 years of age while 67.6% were between 15 and 64 years and 8.1% were over the age of 64.

Of the population of 65 560 people in the Inxuba Yethemba Local Municipality, 29.1% were under 16 years of age in 2011 while 64.6% were between 15 and 64 years and 6.2% were over the age of 64 years.

The dependency ratio, which indicates the burden of support for children under 16 years and people over 64 years placed on the working population aged between 15–64 years, is highest in the Chris Hani district at 73.8% and in Ixuba Yethemba at 54.7%. In respect of sex ratio, at 89.9, the Chris Hani has the highest proportion of females to males. Between 2001 and 2011 the Chris Hani district had a negative population growth rate at -0.06%.

The unemployment rate in the area is highest in the Chris Hani district municipality at 39%. The level of unemployment is lowest in the Inxuba Yethemba Local Municipality at 25.7%. In respect of education, at 10.75% Inxuba Yethemba has the lowest percentage of the population that has no schooling. The Inxuba Yethemba municipality has the highest percentage of the population with an education level higher than matric at 8.6%.

In respect of the local municipalities associated with the proposed development, there are 18 463 households in the Inxuba Yethemba municipality. The average household size across the local municipality is 3.6. The percentage of female-headed households in Inxuba Yethemba is 40.9%. Most households in the Inxuba Yethemba LM, at 97%, live in formal dwellings. A relatively low number of households across the study region ranging, between 60.3 and 46.7 percent, either own or are paying off their dwellings.

5.15.2 Project Footprint

The Paarde Valley facility falls within the Inxuba Yethemba non-urban (NU) area, Sub Place 278002001 according to Census 2011. With a population density of 0.89 people per square kilometre the area has a slightly higher population density than Umsobomvu NU.

The closest urban area to the Paarde Valley Solar PV Energy Facility is the town of:

- Middleburg.

Middelburg

The proposed development lies 32km north-west of Middelburg when calculated along a straight line. Established in 1852 Middelburg falls within the Inxuba Yethemba Local Municipality in the Chris Hani District Municipality of the Eastern Cape Province and serves as an administrative, educational and religious centre for the surrounding areas. Middelburg also has a certain tourist attraction due to its rich Anglo Boer War history, with the Third Manchester Regiment having been stationed just outside the town, and its central position within the Great Karoo.

5.16 Transportation

The scoping phase Transportation Impact Assessment was conducted by Merchandt Le Maitre of SiVEST. The full scoping phase Transportation Impact Assessment Report is included in **Appendix 6I**. The Transportation Impact Assessment will be externally reviewed by suitably qualified external specialist during the EIA phase, prior to the DEIAr being released for review. The Transportation Impact Assessment has been based on a desktop-level assessment supported by a site investigation which was completed between the 6th to the 8th of February 2019.

5.16.1 Existing Traffic Conditions

5.16.1.1 Roads affected by proposed Paarde Valley PV Energy Facility

Table 18: Roads Affected by Paarde Valley PV Energy Facility

Road Name	**Road Number**	**Description**	**Distance (±km)**
Paarde Valley			
Leeupoort Road	DR2433	N10 to Paarde Valley Access Rd	21
Paarde Valley Access Rd		Leeupoort Rd to Access	9
Noupoort Road	MR0617	N10 to R389 Jct.	14
Noupoort Road	MR0617	R389 Jct to Noupoort	6
N10 Freeway	N10	N1 (Hanover) Jct to N9 (Noupoort-Middelburg) Jct.	62
N9 Freeway	N10	Middelburg to Noupoort	40
TOTAL			**152**

5.16.1.2 Traffic Counts (Pre-Development)

The South African National Roads Agency Limited (SANRAL) has vehicle counting stations in the area which can be used in this report.

Table 19: Traffic Counting Stations

Traffic Counting Stations			
Counting Station	**Road Name**	**Period**	**Permanent or Temporary**
Hanover East (1477)	N10	1st Jan 2018 – 31st Dec 2018	Permanent

NR00907 / NR01005 (2733)	N9	1st Jan 2008 – 31st Dec 2013	Temporary
****			

In order to get a better understanding of when the peak periods exist in the area, the data obtained from counting station N° 1477 on the N10 in **Table 19** above was compared to manual counts complete on the 7th of February 2019 at the Leeupoort / Noupoort intersection located at Km 19.92 on section N10-5.

The comparison is as follows:

Table 20: Traffic Station Data / Counts

Traffic Station Data / Counts								
	To N9 Middelburg				To N1 Hanover			
	Average Daily Traffic (ADT)	Average Hourly Traffic	Average Daily Truck Traffic (ADTT)	Average Hourly Truck Traffic	Average Daily Traffic (ADT)	Average Hourly Traffic	Average Daily Truck Traffic (ADTT)	Average Hourly Truck Traffic
N10 @ HANOVER EAST (No 1477)								
Average Daily	282	12	136	6	145	12	145	7
N10 @ LEEUPOORT / NOUPOORT INT.								
Morning 7:00-8:00		12		4		21		17
Afternoon 16:00-17:00		18		8		14		8

From the table above it is clear that the average daily usage of the roads in the area is low. In addition, the morning and afternoon periods does have a slightly higher trip rate, compared to the average daily and therefore cognisance of this increase should be taken into account when additional traffic is generated and added to the existing road network.

5.16.2 Access Roads & Internal Roads

The Paarde Valley Solar PV Energy Facility development will gain access from the N10 freeway via the district road DR2433 which is currently a gravel road. It is the intention for the PV Facility to have a separate, individual access point to the development from the DR2433.

The district road DR2433 is a 'Proclaimed District Road' extending from the N10 freeway up to and including the DR2424 district road. The proposed solar PV energy facility and its access point is discussed below.

5.16.2.1 Paarde Valley Solar PV Facility – Development Access

Access to this facility will be via the existing gravel road (DR2433) which is located approximately 4km north of the proposed PV facility. Only one (1) access point has been identified and the final position of this access point will be dependent on the location of the PV fields in relation to the DR2433. We note that this development is not located adjacent to the DR2433 and hence will require 'right of way' agreements with the following properties;

- Remainder of the Farm Wonder Heuvel No. 140;
- Remainder of the farm Colletts Kraal No. 131; and
- Remainder of the farm Paarde Valley No. 62.

A summary of the proposed access point is summarised in **Table 21** below.

Table 21: Paarde Valley Solar PV Facility – Proposed Access Point

Paarde Valley Solar PV Facility – Proposed Access Point	
Access Point	**Description**
1	• Gravel Road access point • Existing access point to the north of the farm where a PV field could be considered. • The prescribed sight distances of 300m can be achieved • Priority controlled intersection is recommended with the District Road being priority. • Flood lines could affect the position of the PV fields

5.16.2.2 Internal Roads Layout and Specifications

An internal network of roads has been assumed to be in a traditional grid pattern formation and will mainly consist of 4-10m wide gravel roads. These roads will have designed horizontal and vertical alignments to accommodate the normal and abnormal vehicles intended to be used for the delivery and maintenance of the PV equipment.

It is recommended that all internal access roads take into account where possible and applicable, the PV facility stormwater management plan so as to reduce the risks of possible erosion.

For the purpose of this assessment, it is assumed that the insitu material below the topsoil is of 'G7' quality and can be used as a suitable road subgrade material, followed by an imported 'G5' quality material as a gravel wearing course.

A suitable geotechnical study will however be required at the pre-design stage to better understand the design limitations on the development followed by a preliminary design to 'value' Engineer the project.

6 ENVIRONMENTAL IMPACT ASSESSMENT

6.1 Methodology for Assessing Impacts

The EIA Methodology assists in evaluating the overall effect of a proposed activity on the environment. Determining the significance of an environmental impact on an environmental parameter is determined through a systematic analysis of the various components of the impact

6.1.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale (i.e. site, local, national or global), whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in **Table 22** below.

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

6.1.2 Impact Rating System

The impact assessment must take account of the nature, scale and duration of effects on the environment and whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the various project stages, as follows:

- Planning;
- Construction;
- Operation; and
- Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

The significance of Cumulative Impacts has also been rated.

6.1.2.1 Rating System Used to Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the possible mitigation of the impact. Impacts have been consolidated into one

(1) rating. In assessing the significance of each issue, the following criteria (including an allocated point system) is used:

Table 22: Rating of Impacts Criteria

ENVIRONMENTAL PARAMETER		
A brief description of the environmental aspect likely to be affected by the proposed activity (e.g. Surface Water).		
ISSUE / IMPACT / ENVIRONMENTAL EFFECT / NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity (e.g. oil spill in surface water feature).		
EXTENT (E)		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY (P)		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY (R)		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible, and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES (L)		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.

2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION (D)		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
INTENSITY / MAGNITUDE (I / M)		
Describes the severity of an impact (i.e. whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily).		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.

4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible, rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE (S)

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

Significance = (Extent + probability + reversibility + irreplaceability + duration) x magnitude/intensity.

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Significance Rating	Description
5 to 23	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
5 to 23	Positive Low impact	The anticipated impact will have minor positive effects.
24 to 42	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
24 to 42	Positive Medium impact	The anticipated impact will have moderate positive effects.
43 to 61	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
43 to 61	Positive High impact	The anticipated impact will have significant positive effects.
62 to 80	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
62 to 80	Positive Very high impact	The anticipated impact will have highly significant positive effects.

6.2 Environmental Impact Assessment

Specialist studies have been conducted in terms of the stipulations contained within **Appendix 6** of the EIA Regulations, 2014 (as amended). Specialist assessments were commissioned during the Scoping phase.

As previously mentioned, the following specialist assessments were conducted prior to and during the Scoping Phase to identify and assess the issues associated with the proposed development:

- Terrestrial Ecology Impact Assessment;
- Avifauna Impact Assessment;
- Surface Water Impact Assessment;
- Desktop Agricultural and Soils Impact Assessment;
- Visual Impact Assessment;
- Desktop Heritage Impact Assessment; - detailed assessment (including ground-truthing) to follow in EIA phase
- Palaeontology Impact Assessment;
- Social Impact Assessment;
- Desktop Geotechnical Impact Assessment; and
- Transportation Impact Assessment.

These above-mentioned specialist assessments have been used to identify issues at an EIA level. These assessments were also undertaken to inform the impact assessment to take place in the EIA phase of the proposed development. In the scoping phase, the specialists assessed the entire application site as the layout of the proposed solar PV energy facility (number of panels, generation capacity and layout of arrays) will be dependent on the outcome of the specialist assessments, as well as the area available for the erection of PV panels (referred to as the PV development area).

As mentioned, another round of surveys for the Avifauna Impact Assessment is planned for May 2019. The Avifauna Impact Assessment will be supplemented with site-specific information and impact ratings during the EIA phase of the proposed development. In addition, further field truthing will be undertaken for the Heritage Impact Assessment, through an archaeological walk down and palaeontological study covering the site[8].

The identified impacts, thus far, are elaborated on in the sub-sections below.

6.2.1 Terrestrial Ecological Impacts

Potential issues relevant to impacts on the ecology of the study area, and which will be further investigated in the EIA phase, include the following:

[8] Aim will be to compile a comprehensive database of heritage sites in the study area, with the aim of developing a heritage management plan for inclusion in the EMPr as derived from the EIA. The field truthing exercise can only be undertaken once the layout of the solar PV energy facility and associated infrastructure has been determined, based on the findings of the other specialist studies.

- Impacts on biodiversity: this includes any impacts on populations of individual species of concern (flora and fauna), including protected species, and on overall species richness. This includes impacts on genetic variability, population dynamics, overall species existence or health and on habitats important for species of concern.
- Impacts on sensitive habitats: this includes impacts on any sensitive or protected habitats, including indigenous grassland and wetland vegetation that leads to direct or indirect loss of such habitat.
- Impacts on ecosystem function: this includes impacts on any processes or factors that maintain ecosystem health and character, including the following:
    - disruption to nutrient-flow dynamics;
    - impedance of movement of material or water;
    - habitat fragmentation;
    - changes to abiotic environmental conditions;
    - changes to disturbance regimes (e.g. increased or decreased incidence of fire);
    - changes to successional processes;
    - effects on pollinators; and
    - increased invasion by alien plants.

Changes to factors such as these may lead to a reduction in the resilience of plant communities and ecosystems or loss or change in ecosystem function.

- Secondary and cumulative impacts on ecology: this includes an assessment of the impacts of the proposed development taken in combination with the impacts of other known developments for the area or secondary impacts that may arise from changes in the social, economic or ecological environment.
- Impacts on the economic use of vegetation: this includes any impacts that affect the productivity or function of ecosystems in such a way as to reduce the economic value to users (e.g. reduction in grazing capacity, loss of harvestable products.) It is a general consideration of the impact of a proposed development on the supply of so-called ecosystem goods and services.

6.2.1.1 Potential Sensitive Receptors in the General Study Area

A summary of the potential ecological issues for the study area is as follows (issues assessed by other specialists, e.g. on birds and on wetland and hydrological function, are not included here):

- Presence of shallow drainage valleys and associated vegetation on site, assessed as being sensitive to impacts associated with development as well as being important habitat for various plant and animal species.
- Potential presence of one (1) protected frog species, namely the Giant Bullfrog, not listed, but protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004).
- Presence of two (2) mammal species of concern, the Black-footed Cat (Vulnerable), and Cape Clawless Otter (Near Threatened), both protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004).
- Potential presence of other mammal species of concern, the South African Hedgehog (Near Threatened), Grey Rhebok, White-tailed Rat (Vulnerable) and Spectacled Dormouse (Near

Threatened), the first three (3) also protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004).

- Potential invasion of natural habitats by alien invasive plants, thus causing additional impacts on biodiversity features. There are a large number of alien invasive species present on site or in neighbouring areas, all of which have the potential to invade more widely, given the right circumstances.

6.2.1.2 Construction Phase Impacts

Direct impacts

1. Loss and/or fragmentation of indigenous natural vegetation due to clearing;
2. Loss of individuals of plant species of conservation concern and/or protected plants;
3. Loss of faunal habitat and refugia;
4. Direct mortality of fauna due to machinery, construction and increased traffic;
5. Displacement and/or disturbance of fauna due to increased activity and noise levels; and
6. Increased poaching and/or illegal collecting due to increased access to the area.

6.2.1.3 Operational Phase Impacts

On-going Direct impacts

1. Direct mortality of fauna through traffic, illegal collecting, poaching and collisions and/or entanglement with infrastructure.

Indirect impacts

1. Establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors; and
2. Runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape.

6.2.1.4 Decommissioning Phase Impacts

Direct impacts

1. Loss and disturbance of natural vegetation due to the removal of infrastructure and need for working sites;
2. Direct mortality of fauna due to machinery, construction and increased traffic; and
3. Displacement and/or disturbance of fauna due to increased activity and noise levels.

Indirect impacts due to renewed disturbance due to decommissioning activities

1. Continued establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors;
2. Continued runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape;

6.2.1.5 Assessment of Impacts

There are various impacts that have been assessed as having medium significance prior to mitigation, but for which the significance is low after mitigation. This means that, with one (1) exception, all impacts are assessed as having low significance after mitigation. The exception is the impact on indigenous natural vegetation, with a significance of medium before and after mitigation, where construction will lead to a loss of vegetation. The impact will occur, it will be permanent and is irreversible, and no mitigation can change these factors.

Please refer to **Table 23** on **page 188** for the results of the assessment of significance of ecological impacts for the solar PV energy facility.

6.2.2 Avifaunal Impacts

The Pre-Construction Avifaunal Impact Assessment is currently underway. As mentioned, a visit to the site and general area was conducted on 15 and 16 January 2019, followed up by on-site surveys from 17 - 19 January 2019. Another round of surveys was undertaken from 9-12 May 2019 and the results will be presented in the EIA phase.

6.2.2.1 Impacts of Solar PV Facilities and Associated Infrastructure on Avifauna

Increasingly, human-induced climate change is recognised as a fundamental driver of biological processes and patterns. Historic climate change is known to have caused shifts in the geographic ranges of many plants and animals, and future climate change is expected to result in even greater redistributions of species (National Audubon Society, 2015). In 2006, the WWF Australia produced a report on the envisaged impact of climate change on birds worldwide (Wormworth, J. & Mallon, K., 2006). The report found that:

- Climate change now affects bird species' behaviour, ranges and population dynamics;
- Some bird species are already experiencing strong negative impacts from climate change;
- In future, subject to greenhouse gas emissions levels and climatic response, climate change will put large numbers bird species at risk of extinction, with estimates of extinction rates varying from 2 to 72%, depending on the region, climate scenario and potential for birds to shift to new habitat.

Using statistical models based on the North American Breeding Bird Survey and Audubon Christmas Bird Count datasets, the National Audubon Society assessed geographic range shifts through the end of the century for 588 North American bird species during both the summer and winter seasons under a range of future climate change scenarios (National Audubon Society, 2015). Their analysis showed the following:

- 314 of 588 species modelled (53%) lose more than half of their current geographic range in all three (3) modelled scenarios.

- For 126 species, loss occurs without accompanying range expansion.
- For 188 species, loss is coupled with the potential to colonise new areas.

Climate sensitivity is an important piece of information to incorporate into conservation planning and adaptive management strategies. The persistence of many birds will depend on their ability to colonise climatically suitable areas outside of current ranges and management actions that target climate change adaptation.

South Africa is among the world's top ten (10) developing countries required to significantly reduce their carbon emissions (Seymore *et al.*, 2014), and the introduction of low-carbon technologies into the country's complement of power generation will greatly assist with achieving this important objective (Walwyn & Brent, 2015). Given that South Africa receives among the highest levels of solar radiation on earth (Fluri 2009; Munzhedi *et al*., 2009), it is clear that solar power generation should feature prominently in future efforts to convert to a more sustainable energy mix in order to combat climate change, also from an avifaunal impact perspective. However, while the expansion of solar power generation is undoubtedly a positive development for avifauna in the longer term in that it will help reduce the effect of climate change and thus habitat transformation, it must also be acknowledged that renewable energy facilities, including solar PV facilities, in themselves have some potential for negative impacts on avifauna.

A literature review reveals a scarcity of published, scientifically examined information regarding large-scale PV plants and birds. The reason for this is mainly that large-scale PV plants are a relatively recent phenomenon. The main source of information for these types of impacts are from compliance reports and a few government-sponsored studies relating to recently constructed solar plants in the south-west United States. In South Africa, only one published scientific study has been completed on the impacts of PV plants in a South African context (Visser *et al.*, 2019).

In summary, the potential impacts of PV plants on avifauna which have emerged so far include the following:

- Displacement due to disturbance and habitat transformation associated with the construction of the solar PV plant and associated infrastructure;
- Collisions with the solar panels;
- Entrapment in perimeter fences;
- Collisions with the associated power lines; and
- Electrocutions on the associated power lines.

<u>Impacts Associated with PV Plants</u>

- *<u>Impact Trauma (Collisions)</u>*

This impact refers to collision-related fatality [i.e. fatality resulting from the direct contact of the bird with a project structure(s)]. This type of fatality has been occasionally documented at solar projects of all technology types (McCrary *et al.*, 1986; Hernandez *et al*., 2014; Kagan *et al*., 2014). In some instances, the bird is not killed outright by the collision impact, but succumbs to predation later, as it cannot avoid predators due to its injured state.

Sheet glass used in commercial and residential buildings has been well established as a hazard for birds. When the sky is reflected in the sheet glass, birds fail to see the building as an obstacle and attempt to fly through the glass, mistaking it for empty space (Loss *et al*., 2014). Although very few cases have been reported it is possible that the reflective surfaces of solar panels could constitute a similar risk to avifauna.

An extremely rare but potentially related problem is the so-called 'lake effect' i.e. it seems possible that reflections from solar facilities' infrastructure, particularly large sheets of dark blue photovoltaic panels, may attract birds in flight across the open desert, who mistake the broad reflective surfaces for water (Kagan *et al.*, 2014)[9]. The unusually high percentage of waterbird mortalities at the Desert Sunlight PV facility (44%) may support the 'lake effect' hypothesis (West, 2014). Although in the case of Desert Sunlight, the proximity of evaporation ponds may act as an additional risk increasing factor, in that birds are both attracted to the water feature and habituated to the presence of an accessible aquatic environment in the area. This may translate into the misinterpretation of diffusely reflected sky or horizontal polarised light source as a body of water. However, due to limited data it would be premature to make any general conclusions about the influence of the 'lake effect' or other factors that contribute to fatality of water-dependent birds. The activity and abundance of water-dependent species near solar facilities may depend on other site-specific or regional factors, such as the surrounding landscape (Walston *et al*., 2015). However, until such time that enough scientific evidence has been collected to discount the 'lake effect' hypothesis, it must be considered as a potential source of impacts.

Weekly mortality searches at 20% coverage were conducted at the 250MW, 1300ha California Valley Solar Ranch PV site (Harvey & Associates 2014a and 2014b). According to the information that could be sourced from the internet (two quarterly reports), 152 avian mortalities were reported for the period 16 November 2013 – 15 February 2014, and 54 for the period 16 February 2014 – 15 May 2014, of which approximately 90% were based on feathers spots which precluded a finding on the cause of death. These figures give an estimated unadjusted 1 030 mortalities per year, which is obviously an underestimate as it does not include adjustments for carcasses removed by scavengers and missed by searchers. The authors stated clearly that these quarterly reports do not include the results of searcher efficiency trials, carcass removal trials, or data analyses, nor does it include detailed discussions.

In a report by the National Fish and Wildlife Forensic Laboratory (Kagan *et al.*, 2014), the cause of avian mortalities was estimated based on opportunistic avian carcass collections at several solar facilities, including the 550MW, 1 600ha Desert Sunlight PV plant. Impact trauma emerged as the highest identifiable cause of avian mortality, but most mortality could not be traced to an identifiable cause.

Walston *et al*. (2015) conducted a comprehensive review of avian fatality data from large-scale solar facilities (all technology types) in the USA. Collision as cause of death (19 birds) ranked second at Desert Sunlight PV plant and California Valley Solar Ranch (CVSR) PV plant, after unknown causes. Cause of death could not be determined for over 50% of the fatality observations and many carcasses included in these analyses consisted only of feather spots (feathers concentrated together in a small

[9] This could either result in birds colliding directly with the solar panels or getting stranded and unable to take off again because many aquatic bird species find it very difficult and sometimes impossible to take off from dry land e.g. grebes and cormorants. This exposes them to predation, even if they do not get injured through direct collisions with the panels.

area) or partial carcasses, thus making determination of cause of death difficult. It is anticipated that some unknown fatalities were caused by predation or some other factor unrelated to the solar project. However, they found that the lack of systematic data collection and standardisation was a major impediment in establishing the actual extent and causes of fatalities across all projects.

The only scientific investigation of potential avifaunal impacts that has been performed at a South African PV facility was completed in 2016 at the 96MW Jasper PV solar facility (28°17′53″S, 23°21′56″E) which is located on the Humansrus Farm, approximately 4km south-east of Groenwater and 30km east of Postmasburg in the Northern Cape Province (Visser *et al*., 2019). The Jasper PV facility contains 325 360 solar panels over a footprint of 180ha with the capacity to deliver 180 000 MWh of renewable electricity annually. The solar panels face north at a fixed 20° angle, reaching a height of approximately 1.86m relative to ground level with a distance of 3.11m between successive rows of panels. Mortality surveys were conducted from the 14th of September 2015 until the 6th of December 2015, with a total of seven (7) mortalities recorded among the solar panels which gives an average rate of 0.003 birds per ha surveyed per month. All fatalities were inferred from feather spots. Extrapolated bird mortality within the solar field at the Jasper PV facility was 435 birds/yr (95% CI 133 - 805). The broad confidence intervals result from the small number of birds detected. The mortality estimate is likely conservative because detection probabilities were based on intact birds, and probably decrease for older carcasses and feather spots. The study concluded *inter alia* that the short study period, and lack of comparable results from other sources made it difficult to provide a meaningful assessment of avian mortality at PV facilities. It further stated that despite these limitations, the few bird fatalities that were recorded might suggest that there is no significant collision-related mortality at the study site. The conclusion was that to understand the risk of solar energy development on birds fully, further collation and analysis of data from solar energy facilities across spatial and temporal scales, based on scientifically rigorous research designs, is required (Visser *et al*., 2019).

The results of the available literature lack compelling evidence of collisions as a cause of large-scale mortality among birds at PV facilities. However, it is clear from this limited literature survey that the lack of systematic and standardised data collection is a major problem in the assessment of the causes and extent of avian mortality at all types of solar facilities, regardless of the technology employed. Until statistically tested results emerge from existing compliance programmes and more dedicated scientific research, conclusions will inevitably be largely speculative and based on professional opinion.

- *Entrapment in Perimeter Fences*

Visser *et al* (2019) recorded a fence-line fatality (Orange River Francolin *Scleroptila gutturalis*) resulting from the bird being trapped between the inner and outer perimeter fence of the facility. This was further supported by observations of large-bodied birds unable to escape from between the two (2) fences (e.g. Red-crested Korhaan *Lophotis ruficrista*) (Visser *et al.*, 2019). Considering that one would expect the birds to be able to take off in the lengthwise direction (parallel to the fences), it seems likely that the birds panicked when they were approached by observers and thus flew into the fence.

- *Displacement due to Disturbance and Habitat Transformation Associated with the Construction of the Solar PV Facility*

Ground-disturbing activities affect a variety of processes in arid areas, including soil density, water infiltration rate, vulnerability to erosion, secondary plant succession, invasion by exotic plant species, and stability of cryptobiotic soil crusts. These processes have the ability, individually and together, to alter habitat quality, often to the detriment of wildlife, including avifauna. Any disturbance and alteration to the desert landscape, including the construction and decommissioning of utility-scale solar energy facilities, has the potential to increase soil erosion. Erosion can physically and physiologically affect plant species and can thus adversely influence primary production and food availability for wildlife (Lovich & Ennen, 2011).

Solar energy facilities require substantial site preparation (including the removal of vegetation) that alters topography and, thus, drainage patterns to divert the surface flow associated with rainfall away from facility infrastructure. Channelling runoff away from plant communities can have dramatic negative effects on water availability and habitat quality in arid areas. Areas deprived of runoff from sheet flow support less biomass of perennial and annual plants relative to adjacent areas with uninterrupted water-flow patterns (Lovich & Ennen, 2011).

The activities listed below are typically associated with the construction and operation of solar facilities and could have direct impacts on avifauna (County of Merced, 2014):

- Preparation of solar panel areas for installation, including vegetation clearing, grading, cut and fill;
- Excavation/trenching for water pipelines, cables, fibre-optic lines, and the septic system;
- Construction of piers and building foundations;
- Construction of new dirt or gravel roads and improvement of existing roads;
- Temporary stockpiling and side-casting of soil, construction materials, or other construction wastes;
- Soil compaction, dust, and water runoff from construction sites;
- Increased vehicle traffic;
- Short-term construction-related noise (from equipment) and visual disturbance;
- Degradation of water quality in drainages and other water bodies resulting from project runoff;
- Maintenance of fire breaks and roads; and
- Weed removal, brush clearing, and similar land management activities related to the ongoing operation of the project.

These activities could have an impact on birds breeding, foraging and roosting in or in close proximity through disturbance and transformation of habitat, which could result in temporary or permanent displacement.

In a study comparing the avifaunal habitat use in PV arrays with adjoining managed grassland at airports in the USA, DeVault *et al.* (2014) found that species diversity in PV arrays was reduced compared to the grasslands (37 vs 46), supporting the view that solar development is generally detrimental to wildlife on a local-scale.

In order to identify functional and structural changes in bird communities in and around the development footprint, Visser *et al.* (2019) gathered bird transect data at the 180ha, 96MW Jasper PV solar facility in the Northern Cape, representing the solar development, boundary, and untransformed landscape. The study found both bird density and diversity per unit area was higher in the boundary and untransformed landscape, however, the extent therefore was not considered to be statistically significant. This indicates that the PV facility matrix is permeable to most species. However, key environmental features, including available habitat and vegetation quality are most likely the overriding factors influencing species' occurrence and their relative density within the development footprint. Her most significant finding was that the distribution of birds in the landscape changed, from a shrubland to open country and grassland bird community, in response to changes in the distribution and abundance of habitat resources such as food, water and nesting sites. These changes in resource availability patterns were detrimental to some bird species and beneficial to others. Shrubland specialists appeared to be negatively affected by the presence of the PV facility. In contrast, open country / grassland and generalist species, were favoured by its development (Visser *et al.*, 2019).

It is highly likely that the same pattern of reduced avifaunal densities and possible changes in densities and composition favouring grassland species will manifest itself at the proposed Paarde Valley development.

6.2.2.2 Discussion of Impacts: Paarde Valley PV Facility

The section below provides an overview of the envisaged impacts of the proposed Paarde Valley PV facility on solar species.

Displacement due to disturbance associated with the construction and de-commissioning of the PV plants and associated infrastructure (construction and decommissioning)

The construction (and decommissioning) of the PV plants and associated infrastructure will result in a significant amount of movement and noise, which will lead to the displacement of avifauna from the development footprints. It is highly likely that most priority species potentially occurring on the site will vacate the development footprints for the duration of these activities.

Displacement due to habitat transformation associated with the PV plant and associated infrastructure (operation)

The construction of the PV plants and associated infrastructure will result in the radical transformation of the existing natural habitat. The vegetation will be cleared prior to construction commencing. Once operational, less sunlight will reach the vegetation below the solar panels, which is likely to result in stunted vegetation growth and possibly complete eradication of some plant species. The natural vegetation is likely to persist in the rows between the solar panels, but it will be different to what was available before the construction of the plant, in that it will be short grassland with few (if any) shrubs.

Small to medium-sized birds are often capable of surviving in small pockets of suitable habitat and are therefore generally less affected by habitat fragmentation than larger species. It is, therefore, possible that the smaller and medium-sized species (e.g. passerines) recorded at the site will continue to use the habitat available within the solar facility, albeit at reduced densities for some, especially as far as shrubland specialists are concerned (e.g. Rufous-eared Warbler *Malcorus pectoralis*).

Larger priority species which require contiguous, un-fragmented tracts of suitable habitat (e.g. large raptors, korhaans and bustards) are likely to occur at vastly reduced densities in the proposed facilities or may even be totally displaced. The only larger priority species, which was regularly encountered during surveys at the site, was the locally Near Threatened Blue Crane. According to Marnewick *et al.*

(2015) the Karoo population is estimated to be around 10 800 birds and relatively stable in largely untransformed landscapes. The displacement impact on the regional population, should it occur, should therefore be low. Two (2) other large terrestrial species were recorded in the study area, namely the locally Endangered Ludwig's Bustard and locally Vulnerable Secretary bird. None of these two (2) wide-ranging species is likely to be severely impacted on a regional level by the likely displacement resulting from the transformation of 4 800ha of Grassy Karoo habitat.

In the case of some priority raptors (e.g. Southern Pale Chanting Goshawk, Lanner Falcon, Jackal Buzzard, Black-shouldered Kite and Steppe Buzzard) the potential availability of carcasses or injured birds due to collisions with the solar panels, and enhanced prey visibility (e.g. insects, reptiles and rodents) in the short grassland between the solar panels may attract them to the area. Jeal (2017) recorded large numbers of Barn Owls at the Bokpoort parabolic trough CSP facility near Groblershoop in the Northern Cape, roosting in the 'torque tubes' that support the parabolic mirrors. While this influx of owls may have been because of a lack of suitable roosting substrate in the surrounding rangeland, the enhanced prey visibility due to the sparse vegetation cover in the plant itself may also have played a role in attracting the owls. Greater Kestrel and Rock Kestrel could also be attracted to the solar panels as perches from where to hunt for rodent and insect prey.

Cape Sparrows (*Passer melanurus*), Cape Turtle Doves (*Streptopelia capicola*) and other small birds will very likely attempt to nest underneath the solar panels to take advantage of the shade, but this should not adversely affect the operation of the equipment.

Table 12 in **Section 5.8.1** on **page 99** lists the solar priority species that could potentially be displaced due to habitat transformation[10].

<u>Collisions with the solar panels (operation)</u>

The priority species that may possibly occur in the development area which could potentially be exposed to collision risk are listed in **Table 12** in **Section 5.8.1** on **page 99**. In addition, the so-called 'lake effect' could act as a potential attraction to water birds. It is not possible to tell whether this will happen until post-construction monitoring reveals actual mortality at the site, but the lack of permanent waterbodies with large waterbird populations in close vicinity to the proposed development area decreases the probability of the lake effect being a major source of mortality.

<u>Entrapment in perimeter fences</u>

Priority species such as Karoo Korhaan, Northern Black Korhaan, Blue Korhaan and Ludwig's Bustard may be vulnerable to entrapment between double perimeter fences. The possibility of using a single perimeter fence should be investigated. Alternatively, the two (2) fences should be placed far apart enough for birds to able to take off if they somehow end up between the two (2) fences. In addition, staff should be sensitised not to panic birds when they discover them trapped between the fences but to approach them with caution to give them time to escape by taking off in a lengthwise direction.

[10] In some instances, the displacement will not be complete, but will result in lower densities.

Impact on the solar infrastructure

An impact that could potentially materialise is the pollution of the solar panels by faecal deposits of large birds, particularly Pied Crows and raptors, if they regularly perch on the panels. It is expected that the regular cleaning and maintenance activities should prevent this from becoming a problem.

The significance of the avifaunal related impacts associated with the proposed PV facility are detailed in **Table 23** on **page 188**.

6.2.3 Surface Water Impacts

As mentioned, a site visit was undertaken from the 05th to the 07th of February 2019. The following surface water-related impacts are discussed in detail below.

From a watercourse perspective, this section will identify and contextualise the potential impacts within the context of the proposed development and the identified watercourses and wetland. This section will rate the impacts according to an impact rating system, determine the effect of the environmental impact, and provide recommendations towards mitigating the anticipated impact. The identification and rating of impacts will be undertaken (where applicable) for the construction and operation phases of the proposed development. It must be noted that the impact assessment determines a pre-mitigation rating (impacts based on current layout as is) and post-mitigation impact rating (impacts based on implementation of mitigation measures). Therefore, the impact assessment assumes automatic implementation of mitigation measures for the post-mitigation ratings.

6.2.3.1 Construction Phase Potential Impacts

Impacts to the Watercourses

During the construction phase, watercourses may be disturbed due to nearby construction. Note that no direct clearance of watercourses will take place, as the development footprint has been positioned outside of the extent of the delineated watercourse. Limited clearance of vegetation in the terrestrial area will be undertaken where the PV panels, operation and maintenance building, underground cable trenching and internal roads are to be constructed. It is expected that vegetation clearance will only take place potentially up to the edge of the watercourses. Edge effects afford opportunities to alien vegetation to colonise the Watercourses. Additionally, the disturbance may result in temporary displacement of the biota inhabiting the watercourses during construction. However, these biota may well return following the construction phase.

Impacts to the Hydrology of the Watercourse

With the clearance of vegetation and increased run-off potential, the alteration of the hydrology of the watercourses can be expected. Increased flood peaks during and following rainfall events are likely whilst surfaces remain exposed following clearance and compaction during construction. However, it must be noted that the region is semi-arid, and the watercourses are non-perennial systems. Hence, flows are fairly infrequent and the impacts to the hydrology will be temporary / short-lived. Should adequate measures be implemented, the potential impacts can be successfully mitigated.

Impacts to Water Quality

During the construction process, potential contamination impacts can be expected as a result of stored oils, fuels, and other hazardous substances or materials being transported *via* stormwater run-off and / or direct leaks from construction vehicles and machinery. Should this occur, contamination impacts are likely to occur.

Water quality impacts can also result from workers using the watercourses for various purposes (such as for sanitation). Usage of sanitary substances (for example, soap) in the watercourses can alter the chemical balance or water quality thereby causing pollution to these hydrological systems. Additionally, usage of watercourses for urine and faecal waste is another potential negative water quality impact. Use of water for building purposes can also lead to impaired water quality.

Mixing cement and cleaning construction tools in the watercourses can furthermore affect the water quality. Impacts to the water quality may affect any organisms or vegetation inhabiting these systems *via* contamination impacts.

Lastly, water quality can be impaired as a result of sedimentation. Additional sediment loads emanating from construction areas that are contained in run-off entering watercourses can be regarded as pollution in accordance with the NWA, and therefore requires mitigation.

6.2.3.2 Operational Phase Potential Impacts

Impacts to the Hydrology of the Watercourse

During the construction phase, watercourses may be disturbed due to nearby construction. Note that no direct clearance of watercourses will take place, as the development footprint has been positioned outside of the extent of the delineated watercourse. Limited clearance of vegetation in the terrestrial area will be undertaken where the PV panels, operation and maintenance building, underground cable trenching and internal roads are to be constructed. It is expected that vegetation clearance will only take place potentially up to the edge of the watercourses. Edge effects afford opportunities to alien vegetation to colonise the Watercourses. Additionally, the disturbance may result in temporary displacement of the biota inhabiting the watercourses during construction. However, these biota may well return following the construction phase.

6.2.3.3 Decommissioning Phase Potential Impacts

Decommissioning Impacts

Should the proposed development need to be decommissioned, the same impacts as identified for the construction phase of the proposed development can be anticipated. Similar potential impacts can therefore be expected to occur and the stipulated mitigation measures (where relevant) must be employed as appropriate to minimise impacts.

The significance of the surface water-related impacts associated with the proposed PV facility are detailed in **Table 23** on **page 188**.

6.2.4 *Agricultural and Soils Impacts*

6.2.4.1 Identification and Assessment of Impacts on Agriculture

The focus and defining question of an agricultural impact assessment is to determine to what extent a proposed development will compromise (negative impacts) or enhance (positive impacts) current and/or future agricultural production. The significance of an impact is therefore a direct function of the degree to which that impact will affect current or future agricultural production. If there will be no impact on production, then there is no agricultural impact. Impacts that degrade the agricultural resource base pose a threat to production and therefore are within the scope of an agricultural impact assessment. Lifestyle impacts on the resident farming community, for example visual impacts, do not necessarily impact agricultural production and, if they do not, are not relevant to and within the scope of an agricultural impact assessment. Such impacts are better addressed within the impact assessments of other disciplines included in the EIA process.

For agricultural impacts, the exact nature of the different infrastructure within the facility has very little bearing on the significance of impacts. What is of most relevance is simply the occupation of the land, and whether it is being occupied by a solar array, a road, a building or a substation makes no difference. What is of most relevance therefore is simply the total footprint of the facility.

The ways in which the proposed development can impact on soils, agricultural resources and productivity are:

- Occupation of the land by the total physical footprint of the proposed development including all PV panels, roads and electrical infrastructure; and
- Disturbance and changes to the land surface characteristics and soil profile from constructional activities such as levelling and excavations as well as the establishment of hard surfaces. These may lead to erosion and land degradation.

The significance of all potential agricultural impacts is kept low by the low agricultural potential of the land and the consequent low agricultural sensitivity to the loss of this land for agriculture.

Impacts of the Solar PV Facility

Three (3) potential agricultural impacts have been identified. Two (2) of these are direct, negative impacts and apply to all three (3) phases of the proposed development (namely construction, operational and decommissioning). They are:

- *Loss of agricultural land use:*
  Agricultural grazing land directly occupied by the development infrastructure will become unavailable for agricultural use.
- *Soil degradation:*
  Soil degradation can result from erosion and topsoil loss. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by construction-related land surface disturbance, vegetation removal, and the establishment of hard surface areas including roads. Loss of topsoil can result from poor topsoil management during construction related soil profile disturbance. Soil degradation will reduce the ability of the soil to support vegetation growth.

The third impact is a positive, indirect impact and only applies to the operational phase:

- *Increased financial security for farming operations:*
  Reliable income will be generated by the farming enterprises through the lease of the land to the energy facility. This is likely to increase their cash flow and financial security and thereby improve farming operations.

The significance of the agricultural and soils related impacts associated with the proposed PV facility are detailed in **Table 23** on **page 188**.

6.2.5 Geotechnical Impacts

The geotechnical related impacts associated with the proposed development are discussed in detail below.

6.2.5.1 Preliminary Geological & Geotechnical Impact Assessment

From a geological / geotechnical perspective, no fatal flaws have been identified that would prevent the construction of the proposed development at this site.

Further intrusive investigation is recommended for detailed design purposes.

Impact of the Proposed Development on the Geological Environment

The impact of the project alternatives on the geological environment will predominantly relate to the impact that the proposed development will have on the soils/rock units beneath the site. Various outcrops/ boulders have been noted across the sites generally associated with ridges. Removal of the boulders (during site clearing) and construction on hilltops and ridge tops, may have a negative (aesthetic/visual) impact on the environment (besides increasing the cost of site preparation in these areas). It is assumed that a visual impact will be undertaken by others.

Both vertebrate and invertebrate fossils have also been found in the Beaufort Group of the Karoo Supergroup. Reptiles, mammal-like reptile (therapsid), amphibian, fish, insect and plant fossils have been discovered (Johnson, 2006). Excavation into the rock and removal of the material will potentially result in damage/destruction of the fossils. The locations of the fossils will have to be determined during an archaeological/palaeontological investigation.

The main potential impact of the project on the geological environment will be the increased potential for soil erosion, caused by the removal of vegetation and the construction activities. Removal of vegetation for terrace preparation and compaction during earthworks will reduce the infiltration of rainwater and therefore increase surface runoff. An increase in runoff will lead to an increase in erosion. Potential impacts of the proposed development on the soils are provided below. The proposed duration of the construction phase was not provided at the time that this report was compiled. For the purpose of the assessment, a construction duration of one (1) year was assumed. Please note that the impact rating will change should the construction duration increase. A description of the weighting system and description of terms used is attached in Annexure A of the scoping phase Geotechnical Impact Assessment Report.

The impact of the Paarde Valley PV facility on the general environment was found to be 'Low'. Areas with steep slopes associated with slope instability and surface bedrock/boulders associated with ridges, where construction will be difficult, have been identified.

It is the specialist's professional opinion that the proposed development of the Paarde Valley PV Facility may go ahead, if all mitigation measures given in this report are implemented.

The significance of the geotechnical related impacts associated with the proposed PV facility are detailed in **Table 23** on **page 188**.

6.2.6 Visual Impacts

The visual impacts associated with the proposed development are discussed in detail below.

6.2.6.1 Generic Visual Impacts Associated with the Solar PV Energy Facility

In this section, the typical visual issues related to the establishment of solar PV facilities proposed are discussed. It is important to note that the renewable energy industry is still relatively new in South Africa and as such this report draws on international literature and web material (of which there is significant material available) to describe the generic impacts associated with solar energy facilities.

Solar PV Fields

The solar power component of the proposed energy generation facility consists of PV panels, which grouped together form a 'solar field'. Each PV panel is a large structure that is typically up to 4m high (equivalent in height to a one-storey building). The height of these objects will make them visible, especially in the context of a relatively flat landscape.

More importantly, the concentration of these panels will make them highly visible, depending on the number of panels in each solar field. Solar fields with a large spatial extent (footprint) will become distinctly visible features that contrast with the landscape, especially where the landscape is natural in character or undeveloped. In this context the solar field could be considered to be a visual intrusion, potentially altering the visual environment towards a more industrial character.

The establishment of PV facilities generally requires the clearance of taller vegetation such as trees and shrubs. This will intensify the visual prominence of the solar energy facility, particularly in natural locations where little transformation has taken place.

Associated On-Site Infrastructure

The infrastructure typically associated with a solar PV energy facility will include the following:

- Internal access roads between 4m and 10m wide;
- Temporary construction laydown/staging areas;
- Operation and maintenance buildings; and
- Medium voltage, underground cabling (where feasible) connecting the PV plant to the grid connection infrastructure.

Surface clearance for cable trenches, access roads and laydown areas may result in the increased visual prominence of these features, thus increasing the level of contrast with the surrounding landscape. Buildings placed in prominent positions such as on ridge tops may break the natural skyline, drawing the attention of the viewer. In addition, security lighting on the site may impact on the nightscape (refer to **Section 6.2.6.2** below).

6.2.6.2 Night-Time Impacts

The visual impact of lighting on the nightscape is largely dependent on the existing lighting present in the surrounding area at night. The night scene in areas where there are numerous light sources will be visually degraded by the existing light pollution and therefore additional light sources are unlikely to have a significant impact on the nightscape. In contrast, introducing new light sources into a relatively dark night sky will impact on the visual quality of the area at night. It is thus important to identify a night-time visual baseline before exploring the potential visual impact of the proposed wind farm at night.

Much of the study area is characterised by natural areas with pastoral elements and low densities of human settlement. As a result, relatively few light sources are present in the broader area surrounding the proposed development site. The closest built-up areas are the towns of Noupoort and Middelburg which are both situated more than 30km from the application sites and are thus too far away to have significant impacts on the night scene. At night, the general study area is characterised by a picturesque dark starry sky and the visual character of the night environment across the broader area is largely ‘unpolluted’ and pristine. Sources of light in the area are largely limited to isolated lighting from surrounding farmsteads.

Given the scale of the proposed solar PV facilities, the operational and security lighting required for the proposed development is likely to intrude on the nightscape and create glare, which will contrast with the dark backdrop of the surrounding area.

Power lines and associated towers or pylons are not generally lit up at night and, thus light spill is likely to emanate from the proposed on-site and collector substations. Lighting from these facilities is therefore expected to intrude on the nightscape to some degree. It should however be noted that the grid connection infrastructure will only be constructed if the proposed solar PV facilities are developed and thus the lighting impacts from the proposed substations would be subsumed by the glare and contrast of the lights associated with the PV facilities. As such, the grid connection infrastructure is not expected to result in significant lighting impacts.

6.2.6.3 Overall Visual Impact Rating

The EIA Regulations, 2014 (as amended) require that an overall rating for visual impact be provided to allow the visual impact to be assessed alongside other environmental parameters. **Table 23** on **page 188** presents the impact matrix for visual impacts associated with the proposed construction and operation of the Paarde Valley Solar PV Energy Facility. Preliminary mitigation measures have determined based on best practice and literature reviews.

6.2.7 Heritage Impacts

6.2.7.1 Impact Ratings

The significance of the heritage impacts associated with the proposed PV facility are detailed in **Table 23** on **page 188**. The impact ratings are based on the completed desktop base assessment but is indicative of the type of impact expected and to be confirmed on the fieldwork to be done on the final layouts.

NOTE: After consideration of the proposed layout in relation to the heritage fieldwork to be completed during the EIA phase, impact rating tables will be developed for each of the alternatives.

6.2.8 Palaeontological Impacts

Impact on Palaeontological Heritage will only occur during the construction phase of the proposed development with no impacts on the pre-construction, operational and decommissioning phases. Impacts will only occur when the vegetation is cleared and levelled, and excavations into the bedrock will occur

The Nature of the Impact is to Damage, destroy or permanently seal-in fossils at or below the ground surface that are unavailable for scientific study, this will occur during vegetation clearance or during the construction phase. The extent will have an effect nationally (3). Since fossil heritage is known from these formations the probability of impacts on palaeontological heritage during the construction phase is probable (3). Impacts on fossil heritage are generally irreversible (4). By taking a precautionary approach, an insignificant loss of fossil resources is expected (No Loss). (1). The expected duration of the impact is assessed as potentially permanent to long term. In the absence of mitigation procedures (should fossil material be present within the affected area) the damage or destruction of any palaeontological materials will be permanent. (4).

The cumulative effect of the development of the SEF and associated infrastructure within the proposed location is considered to be low. This is as a result of the broader Middelburg and Noupoort areas being considered as fossiliferous (3). Probable significant impacts on palaeontological heritage during the construction phase are high, but the intensity of the impact on fossil heritage is rated as medium as fossil heritage is common in the greater Middelburg and Noupoort area (2).

Should the proposed development progress without due care to the possibility of fossils being present at the proposed site the resultant damage, destruction or inadvertent relocation of any affected fossils will be permanent and irreversible. Thus, any fossils occurring within the area are potentially scientifically and culturally significant and any negative impact on them would be of high significance (without the implementation of mitigation measures).

6.2.8.1 Impact Ratings

The significance of the palaeontological impacts associated with the proposed PV facility are detailed in **Table 23** on **page 188**.

6.2.9 Social Impacts

The social impacts associated with the proposed development are discussed in detail below.

6.2.9.1 Identification of Potential Impacts

The social impact variables considered across the proposed development are in accordance with Vanclay's list of social impact variables clustered under the following main categories as adapted by Wong (Vanclay, 2002; Wong, 2013) and include;

1. Health and social well-being;
2. Quality of the living environment (Liveability);
3. Economic; and
4. Cultural.

These categories are not exclusive and at times tend to overlap as certain processes may have an impact within more than one (1) category.

Under the following section the solar PV energy facility and associated infrastructure is considered and assessed in respect of these impacts.

1) <u>Health and Social Wellbeing</u>

The health and social wellbeing impacts related to the proposed development include:

- Annoyance, dust noise and shadow flicker;
- Increase in crime;
- Increased risk of HIV infections;
- Influx of construction workers and job seekers; and
- Hazard exposure.

Annoyance, Dust and Noise

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

Over the operational phase of the proposed development far less disruptions, dust and noise is expected in the vicinity of the project site, however, along the unsealed access road dusts and noise can be generated by traffic travelling to and from the project site. Even at low speeds heavy vehicles could generate noise in what is a remote area, particularly if they need to at times engage low gear ratios.

Increase in Crime

The proposed development fall within the Noupoort Precinct which, according to Crime Stats SA, has a relatively high level of crime with a total of 530 reported crimes in 2018[11]. The surrounding precincts of Hanover and Middelburg also have relatively high levels of reported crime at 428 and 1 474 respectively. It is likely that these crimes are associated with the more densely populated urban areas and that the level of crime in the sparsely populated urban areas would be lower, however, there are no available statistics to confirm this. It is often opportunistic crime, stock theft, the abuse of alcohol and relationship related crimes that are associated with construction activities.

Considering the relative remoteness of the proposed development it is unlikely that the proposed development will lead to any significant increase in crime levels in the area, however, it would be prudent for the developers to ensure that processes are put in place through which any suspected criminal activates associated with the proposed development can be easily communicated and swiftly addressed. The construction phase carries with it a higher risk of associated criminal activates than would be associated with the operational phase.

Increased Risk of HIV Infections

The Eastern Cape Province has the third highest provincial HIV prevalence rate when compared to all other South African provinces and the Chris Hani DM the 14th highest district level prevalence rate, each with relative HIV prevalence rates of 31.4 and 34.5%. These higher prevalence rates are likely to occur within the higher density urban areas and along transport corridors. As the proposed project site falls within a sparsely populated rural area, the HIV prevalence rate within the immediate vicinity of the proposed development is likely to be low. Considering this together with the fact that sexually transmitted diseases tend to be spread by construction and transport workers (Singh & Malaviya, 1994; Ramjee & Gouws, 2002; Meintjes, Bowen, & Root, 2007; World Bank Group, 2016; Bowen, Dorrington, Distiller, Lake, & Besesar, 2008; Bowen P., Govender, Edwards, & Cattell, 2016; Kikwasi & Lukwale,

[11]According to Crime Stats SA as at 28 April 2018 www.crimestatssa.com/precinct.php?id=798

2017; Bowen P., Govender, Edwards, & Lake, 2018) and the high prevalence of HIV across the Eastern Cape, opens the area to a high risk of HIV infections. This risk is likely to peak during the construction phase of the proposed development as the conduction workforce increases and material and equipment is delivered to site but is likely to subside during the operational phase.

Due to the low HIV prevalence in the area it is important that this issue be given serious attention and that the appropriate mitigation measures are implemented, and the situation is closely monitored throughout the construction and operational phases of the proposed development. The risk of the spread of HIV is most prevalent on a cumulative basis and is addressed as such under **section 6.3.7.2**.

Influx of Construction Workers and Job Seekers

It is estimated that over the construction period of the solar PV facility, the construction workforce will average approximately 126 workers peaking at approximately 297 workers. It is likely that 75% of this workforce will be recruited from within local communities. The influx of workers could lead to the disruption of social networks with the formation of temporary relationships and an increase in pregnancy which may place pressures on local family units. Apart from this the arrival of construction workers may result in the formation of a subculture that could manifest in antisocial behaviour which conflicts with the expectations of local communities. This may result in these local communities, who are accustomed to a quiet, rural environment, becoming dissatisfied with the neighbourhood. These disruptions are, however, more likely to occur in the nearby urban areas such as Noupoort, Hanover and to a lesser degree due to the size of the population, in Middleburg, when workers seek recreational activities.

During the operational phase of the proposed development the workforce will be comprised of approximately 16 workers who will be accommodated off-site. Consequently, the risks associated with disruptions to social networks will be minimal over the operation phase of the proposed development.

Hazard Exposure

The use of heavy equipment and vehicles and an increase in vehicle traffic within the vicinity of the construction site will result in an increased risk to the personal safety of people and animals. Of particular concern are increased hazards faced by pedestrians, cyclists and motorists with emphasis on vulnerable groups such as children and the elderly. Excavation work and trenches also pose a hazard to the safety of people, particularly children and animals, who may fall into these works and may have difficulty in getting out. However, due to the low population numbers within the vicinity of the proposed development this risk is likely to be low and the appropriate mitigation measure, such as fencing, can reduce the impact further. There will also be an increased risk of fires brought about through construction workers lighting fires for cooking and for warmth during cold periods. Nevertheless, with the recommended mitigation measures being successfully put in place this can be controlled.

2) Quality of the Living Environment

The following quality of the living environment impacts are related to the proposed development:

- Disruption of daily living patterns
- Disruptions to social and community infrastructure
- Transformation of the sense of place.

Disruption of Daily Living Patterns

If there are any disruptions to daily living patterns these are likely to be minimal and restricted to the construction phase of the proposed development. This impact will be mainly associated with the site and the main access roads. These disruptions are only likely to be associated with the delivery of materials and machinery to site and the transportation of workers to and from site.

Disruptions of daily living patterns are likely to be negligible during the operation phase of the proposed development as these will be associated with maintenance and repair activities which will be far less frequent and intense than construction activities are likely to be.

Disruption to Social and Community Infrastructure

An increase in the population of the area as a result of the workforce associated with the proposed development has the potential to place pressure on existing community services supplies and infrastructure such as schools, health care facilities, access to water, electricity and sanitary services. With the workforce associated with the construction phase of the solar PV facility peaking at approximately 297 people, of which 75% are likely to be recruited locally, it is unlikely that in isolation the proposed development will have any significant effect on social and community infrastructure in the area. However, on a cumulative basis, considering the activities taking place and planned for the area, there is likely to be a significant impact in this regard. This impact is dealt with in greater depth under **section 6.3.7**.

Over the operational phase of the project, with a smaller workforce being recruited locally, it is unlikely that there will be significant disruptions to community and social infrastructure.

Transformation of the Sense of Place

Within a social context a sense of place includes a wide range of criteria, all or some of which add meaning to a particular area for individuals and groups. These criteria may include the vista, geography, urban layout, flora and fauna, community, history and fragrance of a place amongst many others and are uniquely interpreted on an individual basis. Some individuals may embrace changes to the sense of place that others may reject and for some it may merely be a change in the demographics of an area that leaves them feeling threatened, vulnerable and insecure. Groups and group membership can help to reinforce the sense of place of an area and can also serve to reinforce fears and suspicions associated with pending changes to the sense of place. A sense of place has much to do with unique individual perceptions attached to the location and is subjective by nature.

One of these criteria is the visual aspect, which was the subject of the Visual Impact Assessment specialist report in which it is indicated that:

"*The area is not typically valued for its tourism significance and there is limited human habitation resulting in relatively few potentially sensitive receptors in the area. A total of twenty-six (26) potentially sensitive receptors were identified in the combined study area, three (3) of which are considered to be sensitive receptors as they are linked to leisure/nature-based tourism activities in the area. None of the receptors are however expected to experience high levels of visual impact from any of the proposed PV facilities or the grid connection infrastructure.*" (SiVEST SA (Pty) Ltd, 2019b, p. 116).

Notwithstanding this, however, the issue regarding the sense of place is likely to remain controversial as a sense of place is personal and subjective with some accepting changes to the landscape in support of renewable energy while others may reject them (Farhar, Hunter, Kirkland, & Tierney, 2010; Carlisle, Kane, Solan, & Joe, 2014).

3) Economic

The economic impacts related to the proposed development include:

- Job creation and skills development; and
- Socio-economic stimulation.

Job Creation and Skills Development

The proposed development will lead to the creation of both direct and indirect job which will have a positive economic benefit within the region. In this regard there are approximately 297 jobs associated with the construction phase of the solar PV facility and 16 with the operational phase of the facility. During construction approximately 3 569 person-months are likely to be created of which approximately 2 679 or approximately 75% will be allocated to local communities creating employment opportunities for residents of Middelburg, Noupoort and Hanover. Many of the beneficiaries are likely to be historically disadvantaged members of the community and the proposed development will provide opportunities to develop skills amongst these people. The operational phase will employ approximately 16 people full time for a period of up to 20 years.

Socio-Economic Stimulation

Apart from these jobs the proposed development is also likely to stimulate the local economy and again this is likely to be most significant at a cumulative level. Nevertheless, there will be a significant economic contribution attached to the solar PV facility. This contribution will be in the form of disposable salaries and the purchases of services and supplies from the local communities in and around the towns of Noupoort, Hannover and Middleburg estimated at 40% of the total project value yet to be finalised.

Apart from job creation and procurement spend the proposed development will also have broader positive socio-economic impacts as far as socio-economic development contributions are concerned. Although, at the point of writing, the project developer had not as yet put a corporate social responsibility plan in place the intention is to either, fall in line with the REIPPPP BID guidelines or put an equivalent plan in place. This will create an opportunity to support the local community over the life span of the operational phase of the proposed development which will stretch over a 20-year period. At a national level the proposed development also has the potential to contribute towards the national grid requirements as part of the Government’s vision to source 10.5% of the country’s energy through solar power by 2030 (Department of Energy Republic of South Africa, 2018, p. 41).

4) Cultural Impacts

At a social level it is likely that any cultural impacts would be associated with sensitive archaeological and/or heritage sites that may be found. In this regard, a Heritage Impact Assessment was undertaken, and it was found that:

“*The projected impact assessment indicates that unmitigated impacts during construction can be MEDIUM to HIGH but reduced to LOW with the implementation of management measures. Impacts during the operational and decommissioning phase is projected to be LOW with the implementation of management measures.*

These findings provide the basis for the recommendation:

- *further field truthing through an archaeological walk down. The aim of this will be to compile a comprehensive database of heritage sites within the PV development area, with the aim of developing a heritage management plan for inclusion in the Environmental Management Plan* (PGS Heritage (Pty) Ltd, 2019, p. 37*).*

At this point no heritage resources have been identified that could have cultural significance. If these are identified at a later point, they can be addressed in the heritage report and as such will not be pursued any further at the social level.

6.2.9.2 Impact Assessment

These impacts are assessed in respect of the following phases of the proposed development:

- Planning and design
- Construction
- Operational
- Decommissioning, and
- The 'no go" option.

<u>Planning and Design Phase</u>

It is evident that the proposed development fits with legislation and key planning and policy documentation. In this regard renewable energy facilities are supported on a national, provincial and municipal level.

However, provincial and municipal documentation also regards tourism as an important resource for the area. In addition to this there have been concerns raised regarding the cumulative effect of the proliferation of renewable energy in the region and the impact that this may have on the sense of place of the area.

<u>Construction Phase</u>

Most of the impacts discussed above apply over the short-term to the construction phase of the proposed development and include:

- Annoyance, dust and noise
- Increase in crime
- Increased risk of HIV infections
- Influx of construction workers and job seekers
- Hazard exposure
- Disruption of daily living patterns
- Disruptions to social and community infrastructure
- Job creation and skills development
- Socio-economic stimulation.

<u>Operational Phase</u>

The social impacts that apply to the operational phase of the proposed development are:

- Transformation of the sense of place; and
- Economic.
  - Job creation and skills development.
  - Socio-economic stimulation.

Decommissioning Phase

If the proposed development were to be completely decommissioned the major social impacts likely to be associated with this would be the loss of jobs and revenue stream that stimulated the local economy and flowed into the municipal coffers. It is estimated that the proposed development has a lifespan of approximately 20 years and there is the possibility that after this period the solar facility could be replaced with more up-to-date technology that would extend the life of the facilities. Although the loss of a job is significant and can be devastating on an individual and family level, the total number of jobs under threat could be insignificant as the operational staff complement is estimated at a total of 48 and many of these employees will be skilled and could find alternative employment.

Decommissioning will result in a limited number of jobs being created over a short period of time as components are dismantled and the site is cleared. Although positive, this will be a rather insignificant benefit considering the size of the facilities and the time period attached to decommissioning.

Considering the time period to decommissioning, the uncertainty of what would exactly occur, and the significance of the impact in isolation it would be rather meaningless to attach assessment criteria to decommissioning at this point. However, prior to decommissioning the following mitigation measures are suggested.

Decommissioning mitigation measures:

- Ensure that a retrenchment package is in place.
- Ensure that staff have been trained in a manner that would provide them with saleable skills within the job market.
- Ensure that the site is cleared responsibly and left in a safe condition.

The significance of the social impacts mentioned above which are associated with the proposed PV facility are detailed in **Table 23** on **page 188**.

6.2.10 Transportation Impacts

6.2.10.1 Additional Traffic Evaluation / Assessment

Construction Phase

Based on the traffic generation calculated (section 7 of scoping phase Transportation Impact Assessment Report), an additional ±68 vehicle trips / day will be added onto the existing public road network during the peak of construction between months 2-12 of the construction program. Of the 68 vehicle trips / day, 43 vehicle trips are for the transportation of labour and will typically be in the morning between 6:00–7:00 and in the afternoons between 16:00–17:00. The remainder of the 25 vehicle trips / day will typically occur during the 'weekday midday' and equates to ±4 vehicle trips / hour.

Therefore, in accordance with 'TMH 16 Volume 1' the warrant to complete a comprehensive 'Traffic Impact Assessment' will not be required due to the fact that the proposed development will generate less than 50 peak hour trips. It is however recommended that the intersection be discussed with SANRAL and the appropriate axillary lanes and speed reduction measures be implemented (as per Figure 8:3 in the scoping phase Transportation Impact Assessment Report) when the construction program of this development and its facilities, in addition to the adjacent developments are known.

The specific traffic needs this phase of the development will have on the environment includes, *inter alia*, the following: -

- Upgrades of existing intersections;
- Reduction in vehicle speed;
- Adequate law enforcement;
- Implementation of pedestrian safety initiatives;
- Regular maintenance of farm fence, access cattle grids;
- Adequate road signage as per the South African Road Traffic Sign Manual (SARTSM) latest edition; and
- Continuous engagement with SANRAL and the Eastern Cape Department of Roads and Public Works.

The PV facility development access will be covered under the respective headings in the sub-sections below.

<u>Operation & Maintenance Phase (O&M)</u>

From the information above it is therefore assumed that the employees will commute together and hence a total of 11 trips / day additional will be generated during this period onto the existing road network. In addition to the staff commuting will be the collection of waste and sanitation. These are assumed to generate an additional 2 vehicles / week onto the existing road network and therefore the sum of this phase will have a low to negligible impact.

The specific traffic needs this phase of the development will have on the environment is *inter alia:*

- Reduction in vehicle speed;
- Adequate law enforcement;
- Implementation of pedestrian safety initiatives;
- Regular maintenance of farm fence, access cattle grids;
- Adequate road signage as per the South African Road Traffic Sign Manual (SARTSM) latest edition; and
- Continuous engagement with SANRAL and the Eastern Cape Department of Roads and Public Works.

<u>Decommissioning Phase</u>

An additional ±10 vehicles / day over a period of 12–18 months will be generated. The material removed will be transported back to Gauteng or the Port of Ngqura for recycling. The impact of this phase will therefore be low.

The specific traffic needs this phase of the development will have on the environment is inter alia;

- Reduction in vehicle speed
- Adequate law enforcement
- Use of dust suppressant techniques.
- Implementation of pedestrian safety initiatives
- Adequate road signage as per the South African Road Traffic Sign Manual (SARTSM) latest edition.
- Continuous engagement with SANRAL, Northern Cape Department of Roads and Public Works and the Eastern Cape Department of Roads and Public Works.

6.2.10.2 Impact Rating Assessment

The Impact Rating System takes into account the nature, scale and duration of the effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages:

- Planning;
- Construction;
- Operation; and
- Decommissioning.

A rating system-based points system is applied to the potential impacts on the environment and includes objective evaluations of the mitigation of the impact.

In summary, all impacts were classified as 'Low' to 'Medium' impacts with the 'Medium' impacts changing to a 'Low' impact after the implementation of suitable mitigation measures. It should however be noted that the cumulative impact of all the surrounding developments could possibly trigger a 'High' impact and therefore effective pre-mitigation measures must be implemented.

The significance of the transportation impacts mentioned above which are associated with the proposed PV facility are detailed in **Table 23** below.

Table 23: Assessment of identified environmental impacts (all phases) associated with the Paarde Valley Solar PV Energy Facility

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Construction Phase																				
Terrestrial Ecology																				
Indigenous natural vegetation	Loss and/or fragmentation of vegetation due to clearing for construction of infrastructure.	1	4	4	2	4	2	30	-	Medium	-Use existing road infrastructure for access roads. -Avoid construction of infrastructure within sensitive habitats. -Minimise vegetation clearing and disturbance to footprint areas only. -Compile a rehabilitation programme and rehabilitate disturbed areas.	1	4	3	2	4	2	28	-	Medium
Plant species of concern and protected plants	Loss of individuals due to clearing for construction of infrastructure.	1	4	2	2	3	2	24	-	Medium	-Undertake a walk-through survey of footprint areas. -Obtain all necessary permits.	1	4	1	2	1	1	9	-	Low

Fauna	Loss of habitat due to clearing for construction of infrastructure	1	3	2	2	3	2	22	-	Low	-Use existing road infrastructure for access roads. -Avoid construction of infrastructure within sensitive habitats. -Minimise vegetation clearing and disturbance to footprint areas only. -Compile a rehabilitation programme and rehabilitate disturbed areas.	1	2	2	2	3	1	10	-	Low
Fauna	Direct mortality due to machinery, construction and increased traffic	1	2	2	2	1	2	16	-	Low	-Avoid construction of infrastructure within sensitive habitats. -Implement traffic control measures, including speed limits and no-go zones.	1	2	2	2	1	1	8	-	Low
Fauna	Displacement and disturbance due to increased activity and noise levels	1	2	2	2	1	2	16	-	Low	-Avoid construction of infrastructure within sensitive habitats. -Implement traffic control measures, including speed limits and no-go zones.	1	2	2	2	1	1	8	-	Low
Flora and fauna	Increased poaching and/or illegal collecting due to improved access to the area.	1	2	2	2	1	2	16	-	Low	-Strict access control to the site. -Environmental awareness education for staff and visitors. -Report any infringements to law enforcement.	1	2	2	2	1	1	8	-	Low
Avifauna																			
Avifauna	Displacement of priority species due to disturbance associated with the construction of the PV plants and associated infrastructure	1	3	3	4	1	3	36	-	Medium	-Construction activity should be restricted to the immediate footprint of the infrastructure. -Measures to control noise and dust should be applied according to current best practice in the industry. -Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum as far as practical. -The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of	1	3	3	2	1	3	30	-	Medium

											the construction footprint and rehabilitation of disturbed areas is concerned.									
Surface Water																				
Watercourses – Impacts to the Watercourses	Impacts associated with disturbance and edge effects to watercourses	1	3	2	2	2	2	20	-	Low	**<u>Avoiding Direct Impacts to the Watercourses</u>** – No vegetation trimming and / or pruning must take place along the existing access roads running through the extent of the watercourse. However, where nearby vegetation trimming and / or pruning is required outside the extent of the watercourse, this must take place accordance with recommendations of the vegetation specialist. **<u>Preventing Temporary Increased Run-off Impacting on Watercourses</u>** – Vegetation clearing must take place in a phased manner, only clearing areas where construction will take place and not in areas where construction will only take place in the future. **<u>Preventing Littering of Watercourses</u>** – Provide sufficient facilities for litter disposal. Regular clean-ups are required to keep the construction area and adjacent watercourses clean. **<u>Alien Eradication Programme</u>** - An Alien Eradication and Removal Programme is to be compiled prior to construction and implemented for the duration of the proposed development	1	3	1	1	2	1	8	-	Low

Watercourse – Impacts to the Hydrology of the Watercourse	Impacts associated with accelerated run-off and associated increased flood peaks to the watercourse	2	3	2	2	1	2	20	-	Low	**<u>Preventing Increased Run-off and associated Erosion Impacting on Watercourses</u>** – Adequate structures, where necessary, must be put into place (temporary or permanent where necessary in extreme cases) to deal with increased/accelerated run-off and potential erosion. The use of silt fencing and potentially sandbags or hessian "sausage" nets or other appropriate measures along the boundaries of the PV panel and power line foundations and maintenance and operation buildings can be used where required to slow run-off entering the watercourses and the associated buffer zones, thereby preventing increase in flood peaks, run-off volumes and also the likelihood of erosion. An appropriate construction stormwater management plan formulated by a suitably qualified professional must accompany the proposed development to deal with increased run-off and associated sedimentation and erosion. An Environmental Control Officer (ECO) must be appointed during the construction phase to oversee construction activities undertaken by contractors. The ECO must also monitor increased run-off and associated erosion impacts. Where additional mitigation measures are stipulated by the ECO in order to control increased run-off and erosion, this is to be undertaken accordingly.	1	2	2	2	2	1	9	-	Low

Watercourse – Impacts to Water Quality	Potential impacts associated with the leakage / spillage of oils, fuels and other potentially hazardous substances from construction vehicles / machinery entering run-off and flowing into the watercourse. Pollution from workers using the watercourse for sanitation and cleaning purposes; as well as sedimentation via run-off polluting the watercourse.	2	3	2	3	3	3	39	-	Medium	**Storage of Oils, Fuels and Hazardous Substances / Liquids** – All oils, fuels and hazardous substances or liquids must not be stored within 100m from the full extent of the watercourse and the associated buffer zone, unless such storage is unavoidable and is approved by the ECO. Where these items are stored, the storage area must be adequately bunded to contain any spillage from containers. Emergency spill kits must be available to clean up and remove spills. **Preventing Soil and Surface Water Contamination** – All vehicles and machinery operating on the study site are to be checked for oil, fuel or any other fluid leaks before entering the construction areas. All vehicles and machinery must be regularly serviced and maintained before being allowed to enter the construction areas. No fuelling, re-fuelling, vehicle and machinery servicing or maintenance is to take place within 100m of the watercourse and the associated buffer zone. The study site is to contain sufficient safety measures throughout the construction process. Safety measures include (but are not limited) oil spill kits and the availability of fire extinguishers. Additionally, fuel, oil or hazardous substances storage areas must be bunded to 110% capacity to prevent oil or fuel contamination of the ground and / or nearby watercourses and the associated buffer zones.	1	1	2	2	3	1	9	-	Low

											No cement mixing is to take place in the watercourse or the associated buffer zone. In general, any cement mixing should take place over a bin lined (impermeable) surface or alternatively in the load bin of a vehicle to prevent the mixing of cement with the ground. Cement / concrete can also be trucked in ready-mix vehicles. Importantly, no mixing of cement or concrete directly within the watercourse and associated buffer zone. No “long drop” toilets are allowed on the study site. Suitable temporary chemical sanitation facilities are to be provided. Temporary chemical sanitation facilities must be placed at least 100 meters from the watercourse and the associated buffer zone where required. Temporary chemical sanitation facilities must be checked regularly for maintenance purposes and cleaned often to prevent spills. **<u>Preventing Sedimentation Impacting on Surface Water Resources</u>** – Adequate structures, where required, must be put into place (temporary or permanent where necessary in extreme cases) to deal with sedimentation. The use of silt fencing and potentially sandbags or hessian “sausage” nets or other appropriate measures along the boundaries of the PV panel and power line foundations, and maintenance and operation buildings can be used where required to prevent and / or reduce sediments entering the watercourse and the associated buffer zone.									

											An appropriate construction stormwater management plan formulated by a suitably qualified professional must accompany the proposed development to deal with sedimentation. An ECO must be appointed during the construction phase to oversee construction activities undertaken by contractors. The ECO must also monitor sedimentation impacts. Where additional mitigation measures are stipulated by the ECO in order to control sedimentation, this is to be undertaken accordingly.									
Agriculture and Soils																				
Agricultural land	Loss of agricultural land use due to direct occupation	1	4	2	2	3	2	24	-	Medium	None	1	4	2	2	3	2	24	-	Medium
Soil	Soil degradation and erosion	1	2	2	2	2	2	18	-	Low	- Control run-off - Maintain vegetation cover - Strip, stockpile and re-spread topsoil	1	1	2	2	2	2	16	-	Low
Geotechnical																				
Soils	Soil disturbance during construction at the PV Facility may destabilise the soil and lead to soil erosion. - Increased soil erosion / runoff due to clearing of vegetation - Construction and use of access roads by heavy-duty vehicles and	1	4	2	1	1	1	9	-	Low	- Use of berms and drainage channels to direct water away from the construction areas where necessary - Minimise earthworks and levelling - Use existing access roads wherever possible - Rehabilitate disturbed areas as soon as possible after construction - Correct engineering design of stream and watercourse crossings - Correct engineering design of any new access roads - Maintain vehicles and only undertake repairs and maintenance work in	1	2	1	1	1	1	6	-	Low

	construction equipment may destabilise the soil and lead to soil erosion. - There may be spillages (petroleum/lubricants) from the vehicles - There may be siltation of watercourses due to increased runoff and dust										designated areas - Implement groundcover measures to prevent erosion such as keeping as much natural vegetation as possible, straw mulch, erosion control mats etc. - Contain and control stormwater flow									
Visual																				
▪ Potential alteration of the visual character and sense of place ▪ Potential visual impact on receptors in the study area	▪ Large construction vehicles and equipment will alter the natural character of the study area and expose visual receptors to impacts associated with construction. ▪ Construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. ▪ Dust emissions and dust plumes from	2	3	1	2	1	2	18	-	Low	▪ Carefully plan to minimise the construction period and avoid construction delays. ▪ Inform receptors of the construction programme and schedules. ▪ Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. ▪ Vegetation clearing should take place in a phased manner. ▪ Retain a buffer (approximately 100m wide) of intact natural vegetation along the perimeter of the development area (i.e. the CPV panel blocks) and along the site boundary. ▪ Maintain a neat construction site by removing rubble and waste materials regularly. ▪ Temporarily fence-off the construction site (for the duration of the construction period).	2	2	1	2	1	2	16	-	Low

	increased traffic on the gravel roads serving the construction site may evoke negative sentiments from surrounding viewers. ▪ Surface disturbance during construction would expose bare soil (scarring) which could visually contrast with the surrounding environment. ▪ Temporary stockpiling of soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.										▪ Where possible, the operation and maintenance buildings and laydown areas should be consolidated to reduce visual clutter. ▪ Buildings and similar structures must be in keeping with relevant regional planning policy documents. ▪ Where possible, underground cabling should be utilised. ▪ Make use of existing gravel access roads where possible. ▪ Limit the number of vehicles and trucks travelling to and from the construction site, where possible. ▪ Unless there are water shortages, ensure that dust suppression techniques are implemented: ○ on all access roads; ○ in all areas where vegetation clearing has taken place; ○ on all soil stockpiles.									
Heritage																				
Impact on Stone Age resources	Impact on stone age resources during earthmoving - including trenching, road making, foundation digging	1	2	4	4	4	4	60	-	High	-Assessment of designated footprint areas of the infrastructure. -Implementation of mitigation measures such as buffering, documentation and excavations and request destruction permits from SAHRA	1	1	4	4	4	2	28	-	Medium

Impact on colonial buildings	Impact on stone age resources during earthmoving - including trenching, road making, foundation digging	1	2	4	4	4	4	60	-	High	-Assessment of designated footprint areas of the infrastructure -Implementation of mitigation measures such as buffering, documentation and excavations and request destruction permits from SAHRA	1	1	4	4	4	2	28	-	Medium
Impact on chance finds	Impact on stone age resources during earthmoving - including trenching, road making, foundation digging	1	1	4	4	4	4	56	-	High	-Development of chance find procedures to be included in the EMPr -Implementation of mitigation measures such as buffering, documentation and excavations and request destruction permits from SAHRA	1	1	4	4	4	2	28	-	Medium
Palaeontology																		
Fossil Heritage	Excavations and site clearance of the development will involve substantial excavations into the superficial sediment cover as well as locally into the underlying bedrock.	1	2	4	4	4	4	60	-	High	A palaeontologist must conduct a field visit after vegetation clearance. Fossil Excavation will need a SAHRA permit. If an excavation is impossible, the fossil and locality could be protected and the development moved	1	1	4	4	4	2	28	-	Medium
Social																		
Annoyance, dust and noise	Annoyance, dust and noise generated through construction activities.	1	3	1	2	1	2	16	-	Low	-Apply appropriate dust suppressant to gravel roads on a regular basis -Ensure that vehicles used to transport sand and building materials are fitted with tarpaulins or covers. -Ensure all vehicles are roadworthy and drivers are qualified and made aware of the potential noise and dust issues. -Appoint a community liaison officer to deal with complaints and grievances from the public.	1	3	1	2	1	1	8	-	Low

Increase in crime	An increase in crime associated with the construction phase of the project.	2	3	2	2	2	3	33	-	Medium	-All workers should carry identification cards and wear identifiable clothing. -Fence off the construction site and control access to the site. -Appoint an independent security company to monitor the site. -Appoint a community liaison officer. -Encourage local people to report any suspicious activity associated with the construction site to the community liaison officer. -A grievance mechanism must be prepared and communicated to surrounding landowners and local communities, to ensure that the project proponent, EPC contractor and sub-contractors remain responsible and accountable. This will also facilitate the identification and implementation of additional mitigation measures if required. -Prevent loitering within the vicinity of the construction camp as well as construction sites by recruiting off-site via an offsite recruiting office/agent, whatever is most appropriate.	2	3	2	2	2	2	22	-	Low
Increased risk of HIV and AIDS	Increased risk of HIV and AIDS due to the influx of workers, job seekers and deliveries and availability of disposable income.	3	3	3	3	4	3	48	-	High	-Ensure that an on-site HIV and AIDS policy is in place and that construction workers are exposed to a health and HIV/AIDS awareness educational programme within the first month of construction. -Provide voluntary and free counselling, free testing and condom distribution services to the workforce. -Where feasible extend the HIV/AIDS programme into the community with specific focus on schools and youth clubs.	3	3	3	3	4	2	32	-	Medium

Influx of construction workers and job seekers	Influx of construction workers and job seekers resulting in a temporary change in demographics	2	3	2	2	2	2	22	-	Low	-Communicate, through Community Leaders and Ward Councillors, the limitation of opportunities created by the project to prevent an influx of job seekers. -Develop and implement a local procurement policy which prioritises "locals first" to reduce the movement of people into the area in search of work. -Draw up a recruitment policy in conjunction with Community Leaders and Ward Councillors and ensure compliance with this policy.	2	2	2	2	2	2	20	-	Low
Hazard exposure	Exposure to hazards associated with construction activities and the delivery of heavy machinery and equipment to site.	2	3	2	2	1	2	20	-	Low	-Ensure all construction equipment and vehicles are properly maintained at all times. -Ensure that operators and drivers are properly trained and make them aware, through regular toolbox talks, of any risk they may pose to the community. Place specific emphasis on the vulnerable sector of the population such as children and the elderly. -Ensure that fires lit by construction staff are only ignited in designated areas and that the appropriate safety precautions, such as not lighting fires in strong winds and completely extinguishing fires before leaving them unattended, are strictly adhered to. -Make staff aware of the dangers of fire during regular toolbox talks. -A grievance mechanism must be prepared and communicated to surrounding landowners and local communities, to ensure that the project proponent, EPC contractor, and sub-contractors remain responsible and accountable and to facilitate the identification and implementation of additional mitigation measures if required.	2	2	2	2	1	2	18	-	Low

											-Where necessary training should be provided on the implementation of the grievance mechanism to ensure that those who are most likely to be affected by the project are suitably equipped in the mechanism of raising concerns and having these addressed. -Compile and implement a Fire Management and Emergency Preparedness Response Plan.									
Disruption of daily living patterns	Disruption of daily living patterns due to construction activities and deliveries of machinery and heavy equipment to site.	2	3	2	2	1	2	20	-	Low	-Ensure that, at all times, people have access to their properties as well as to social facilities. -All vehicles must be roadworthy and drivers must be qualified, obey traffic rules, follow speed limits and be made aware of the potential road safety issues. -Heavy vehicles should be inspected regularly to ensure their road safety worthiness. -The developer and EPC Contractor must ensure that the roads utilised for construction activities are either maintained in the present condition or upgraded if damaged due to construction activities.	2	2	2	2	1	2	18	-	Low
Disruption of services supplies and infrastructure	Disruptions of community facilities and infrastructure due to construction activities and an influx of workers.	2	3	2	2	1	2	20	-	Low	Regularly monitor the effect that the construction activities is having on public infrastructure and immediately report any damage to infrastructure to the appropriate authority.	2	2	2	2	1	2	18	-	Low
Job creation and skills development	The creation of job opportunities and the development of skills amongst the workforce.	3	3	2	2	1	2	22	+	Low	-Wherever feasible, local residents should be recruited to fill semi and unskilled jobs. -Women should be given equal employment opportunities and encouraged to apply for positions. -A skills transfer plan should be put in place at an early stage and workers should be given the opportunity to develop skills which they	3	3	2	2	2	2	24	+	Medium

											can use to secure jobs elsewhere post-construction. -A procurement policy promoting the use of local business should, where possible, be put in place to be applied throughout the construction phase.										
Socio-economic development	Potential for positive socio-economic opportunities for the region associated with downstream business opportunities and corporate social responsibility initiatives.	3	3	2	2	2	2	24	+	Medium	A procurement policy promoting the use of local business should, where possible, be put in place to be applied throughout the construction phase.	3	3	2	2	3	2	26	+	Medium	
Transportation																					
Additional Traffic Generation	Increase in traffic	2	3	1	2	1	2	18	-	Low	-Ensure a large portion of vehicles travelling to and from the proposed development travels in the 'off-peak' periods or by us -Construction of an on-site concrete batching plant to reduce trips	2	3	1	2	1	2	18	-	Low	
Additional Traffic Generation	Increase of incidents with pedestrians and livestock	2	4	2	4	1	2	26	-	Medium	-Reduction in speed of vehicles -Adequate enforcement of the law -Implementation of pedestrian safety initiatives -Regular maintenance of farm fences, access cattle grids -Construction of an on-site concrete batching plant to reduce trips	2	3	2	4	1	1	12	-	Low	
Additional Traffic Generation	Increase in dust from gravel roads	2	3	2	2	1	2	20	-	Low	-Reduction in speed of the vehicles -Use of dust suppression techniques -Implement a road maintenance programme under the auspices of the respective transport department -Construction of an on-site concrete batching plant to reduce trips	2	3	2	2	1	2	20	-	Low	

Additional Traffic Generation	Increase in road maintenance	2	3	2	2	2	2	22	-	Low	-Implement a road maintenance programme under the auspices of the respective transport department -Construction of an on-site concrete batching plant to reduce trips	2	3	2	2	2	2	22	-	Low
Abnormal Loads	Additional abnormal loads	3	2	1	2	1	1	9	-	Low	-Ensure abnormal vehicles travel to and from the proposed development in the 'off-peak' periods -Adequate enforcement of the law	3	2	1	2	1	1	9	-	Low
Internal Access Roads	Increase in dust from gravel roads	1	4	1	1	1	2	16	-	Low	-Enforce a maximum speed limit on the development -Use of dust suppression techniques -Adequate watering by means of water bowser	1	3	1	1	1	2	14	-	Low
Internal Access Roads	New / larger access points	1	4	1	2	1	1	9	-	Low	-Adequate road signage according to the SARTSM -Approval from the respective roads department	1	4	1	2	1	1	9	-	Low
Operational Phase																				
Terrestrial Ecology																				
Fauna	Direct mortality of fauna through traffic, illegal collecting, poaching and collisions and/or entanglement with infrastructure	1	2	2	2	1	2	16	-	Low	-Implement traffic control measures, including speed limits. -Environmental awareness education for staff and visitors.	1	2	2	2	1	1	8	-	Low
Vegetation	Establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors	1	3	2	3	3	2	24	-	Medium	-Compile and implement Alien Invasive Management Plan. -Rehabilitate disturbed areas.	1	2	2	2	3	1	10	-	Low

Vegetation	Runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape	1	3	2	3	3	2	24	-	Medium	-Compile and implement a stormwater management plan, which highlights control priorities and areas and provides a programme for long-term control. -Undertake regular monitoring to detect erosion features early so that they can be controlled. -Implement control measures. -Avoid building on or near steep or unstable slopes. -Construct proper culverts, bridges and/or crossings at drainage-line crossings, and other attenuation devices to limit overland flow	1	2	2	2	3	1	10	-	Low
Avifauna																				
Avifauna	Displacement of priority avifauna due to habitat transformation associated with the PV plant and associated infrastructure	1	4	3	3	3	3	42	-	Medium	-The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint and rehabilitation of transformed areas is concerned.	1	3	2	3	3	3	36	-	Medium
Avifauna	Entrapment in perimeter fences resulting in the mortality of priority species.	1	3	1	2	3	1	10	-	Low	-A single perimeter fence should be used. Alternatively, the two (2) fences should be at least 4m apart to allow medium to large birds enough space to take off.	1	1	1	2	3	1	8	-	Low
Avifauna	Collisions of priority avifauna with the solar panels resulting in the mortality of priority species.	1	2	2	2	3	1	10	-	Low	-No mitigation is required due to the very low expected magnitude	1	2	2	2	3	1	10	-	Low
Surface Water																				

Watercourse - Impacts to the Hydrology of the Watercourse	Increased run-off as well as associated erosion and sedimentation impacts	2	3	2	2	3	3	36	-	Medium	**<u>Minimising Stormwater Impacts to Watercourses</u>** – The access roads, and maintenance and operation buildings must have energy dissipating structures where required to prevent increased run-off and sediments contained in the run-off entering adjacent areas or surface water resources. This will assist in erosion prevention as well. Structures can be in the form of hard concrete structures or soft engineering structures (such as grass blocks for example). Alternatively, a suitable operational stormwater management design or plan can be compiled and implemented that accounts for the use of appropriate alternative structures or devices that will prevent increased run-off and sediment entering the watercourses thereby, also preventing erosion. ECO monitoring is to take place during the post-construction rehabilitation phase. Monitoring is to take place for erosion as well as re-establishment of vegetation where trenching has taken place.	1	2	2	1	3	2	18	-	Low
Agriculture and Soils																			
Agricultural land	Loss of agricultural land use due to direct occupation	1	4	2	2	3	2	24	-	Medium	None	1	4	2	2	3	2	24	-	Medium
Soil	Soil degradation and erosion	1	2	2	2	2	2	18	-	Low	-Control run-off -Maintain vegetation cover -Strip, stockpile and re-spread topsoil	1	1	2	2	2	2	16	-	Low
Financial security of farming operations	Increased financial security through rental income	1	4	1	1	3	2	20	+	Low	None	1	4	1	1	3	2	20	+	Low

Geotechnical																		
Soils	Increased soil erosion / runoff due to clearing of vegetation and alteration of natural drainage (paved areas) - There may be spillages (petroleum/lubricants) from the vehicles	1	2	1	1	1	1	6	-	Low	-Use existing access roads wherever possible -Correct engineering design of stream and watercourse crossings -Correct engineering design of access roads -Maintain vehicles and only undertake repairs and maintenance work in designated areas -Implement groundcover measures to prevent erosion such as keeping as much natural vegetation as possible, straw mulch, erosion control mats etc. -Contain and control stormwater flow	1	2	1	1	1	1	6	-	Low
Visual																		
▪ Potential alteration of the visual character and sense of place. ▪ Potential visual impact on receptors in the study area. ▪ Potential visual impact on the night-time visual environment.	▪ The development may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. ▪ The proposed solar PV facility will alter the visual character of the surrounding area and expose potentially sensitive visual receptor locations to visual impacts. ▪ Dust emissions and dust plumes from maintenance vehicles accessing	2	3	3	3	3	2	28	-	Medium	▪ Restrict vegetation clearance on the site to that which is required for the correct operation of the facility. ▪ Ensure that the PV arrays are not located within 500m of any farmhouses in order to minimise visual impacts on these dwellings. ▪ Retain a buffer (approximately 100m wide) of intact natural vegetation along the perimeter of the development area (i.e. the CPV panel blocks) and along the site boundary. ▪ Where possible, the operation and maintenance buildings should be consolidated to reduce visual clutter. ▪ As far as possible, limit the number of maintenance vehicles which are allowed to access the site. ▪ Ensure that dust suppression techniques are implemented on all gravel access roads.	2	3	3	2	2	2	24	-	Medium

	the site via gravel roads may evoke negative sentiments from surrounding viewers. ▪ The night-time visual environment will be altered as a result of operational and security lighting at the proposed PV facility.										▪ As far as possible, limit the amount of security and operational lighting present on site. ▪ Light fittings for security at night should reflect the light toward the ground and prevent light spill. ▪ Lighting fixtures should make use of minimum lumen or wattage. ▪ Mounting heights of lighting fixtures should be limited, or alternatively foot-light or bollard level lights should be used. ▪ If possible, make use of motion detectors on security lighting. ▪ The operations and maintenance (O&M) buildings should not be illuminated at night. ▪ The O&M buildings should be painted in natural tones that fit with the surrounding environment. ▪ Buildings and similar structures must be in keeping with relevant regional planning policy documents.									
Heritage																				
Impact on heritage resources	Impact on heritage resources during general maintenance	1	1	4	4	4	4	56	-	High	-Development of chance find procedures to be included in the EMPr -Implementation of mitigation measures such as buffering, documentation and excavations and request destruction permits from SAHRA	1	1	4	4	4	1	14	-	Low
Social																				
Transformation of the sense of place	Transformation of the sense of place due to the nature of the project.	2	4	4	3	4	3	51	-	High	-Apply the mitigation measures suggested in the Visual Impact Assessment Report. Ensure that all affected landowners and tourist associations are regularly consulted. -A Grievance Mechanism should be put in place and all grievances should be dealt with in a transparent manner.	2	4	4	3	4	2	34	-	Medium

											-The mitigation measures recommended in the Heritage Impact Assessment should be followed.									
Job creation and skills development	The creation of job opportunities and the development of skills amongst the workforce.	2	3	2	2	3	2	24	+	Medium	-Implement a training and skills development programme for locals. -Work closely with the appropriate municipal structures in regard to establishing a social responsibility programme.	2	3	2	2	3	2	24	+	Medium
Socio-economic stimulation	Potential for positive socio-economic opportunities for the region associated with downstream business opportunities and corporate social responsibility initiatives.	3	3	2	3	3	2	28	+	Medium	-Ensure that the procurement policy supports local enterprises. -Establish a social responsibility programme either in line with the REIPPPP BID guidelines or equivalent. -Work closely with the appropriate municipal structures in regard to establishing a social responsibility programme. -Ensure that any trusts or funds are strictly managed in respect of outcomes and funds.	3	3	2	3	3	3	42	+	Medium
Transportation																				
Additional Traffic Generation	Increase in traffic	2	3	1	2	3	1	11	-	Low	-Ensure a large portion of vehicles travelling to and from the proposed development travels in the 'off-peak' periods or by bus	2	3	1	2	3	1	11	-	Low
Additional Traffic Generation	Increase in incidents with pedestrians and livestock	2	4	2	4	3	1	15	-	Low	-Reduction in speed of vehicles -Adequate enforcement of the law -Implementation of pedestrian safety initiatives -Regular maintenance of farm fences, access cattle grids	2	3	2	4	3	1	14	-	Low
Additional Traffic Generation	Increase in dust from gravel roads	2	3	2	2	3	1	12	-	Low	-Reduction in speed of vehicles -Use of dust suppressant techniques -Implement a road maintenance programme under the auspices of the respective transport department	2	3	2	2	3	1	12	-	Low

Additional Traffic Generation	Increase in road maintenance	2	3	2	2	3	1	12	-	Low	-Reduction in speed of vehicles -Use of dust suppressant techniques -Implement a road maintenance programme under the auspices of the respective transport department	2	3	2	2	3	1	12	-	Low
Abnormal Loads	Additional abnormal loads	2	1	1	1	3	1	8	-	Low	-Ensure abnormal vehicles travel to and from the proposed development in the 'off-peak' periods -Adequate enforcement of the law	2	1	1	1	3	1	8	-	Low
Internal Access Roads	New / larger access points	2	3	1	2	3	1	11	-	Low	-Adequate road signage according to the SARTSM	2	3	1	2	3	1	11	-	Low
Decommissioning Phase																				
Terrestrial Ecology																				
Vegetation	Loss and disturbance of natural vegetation due to the removal of infrastructure and need for working sites	1	3	2	2	2	2	20	-	Low	-No additional clearing of vegetation should take place without a proper assessment of the environmental impacts and authorisation from relevant authorities. -If any additional infrastructure needs to be constructed, for example overhead power lines, communication cables, etc., then these must be located next to existing infrastructure, and clustered to avoid dispersed impacts. -No driving of vehicles off-road. -Implement Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas. -Access to sensitive areas outside of development footprint should not be permitted during operation. -Surface runoff and erosion must be properly controlled and any issues addressed as quickly as possible	1	3	2	2	2	1	10	-	Low

Fauna	Direct mortality of fauna due to machinery, construction and increased traffic	1	2	2	2	3	2	20	-	Low	-Personnel and vehicles to avoid sensitive habitats. -No speeding on access roads – install speed control measures, such as speed humps, if necessary. -No illegal collecting of any individuals, particularly the Armadillo Girdled Lizard. -No hunting of protected species or hunting of any other species without a valid permit. -Personnel to be educated about protection status of species, including distinguishing features to be able to identify protected species. -Report any sitings to conservation authorities. -Prevent unauthorised access to the site – project roads provide access to remote areas that were not previously easily accessible for illegal collecting or hunting	1	2	2	1	3	1	9	-	Low
Fauna	Displacement and/or disturbance of fauna due to increased activity and noise levels	1	2	2	1	1	1	7	-	Low	-Restrict impact to development footprint only and limit disturbance spreading into surrounding areas. -Access to sensitive areas outside of infrastructure footprint should not be permitted during construction. -No speeding on access roads – install speed control measures, such as speed humps, if necessary. -No hunting of protected species. -Personnel to be educated about protection status of species, including distinguishing features to be able to identify protected species. -Report any sitings to conservation authorities	1	2	2	1	1	1	7	-	Low

Vegetation	Continued establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors	1	3	2	3	3	2	24	-	Medium	Implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control. -Undertake regular monitoring to detect alien invasions early so that they can be controlled. -Post-decommissioning monitoring should continue for an appropriate length of time to ensure that future problems are avoided. -Do NOT use any alien plants during any rehabilitation that may be required.	1	2	2	2	3	1	10	-	Low
Vegetation	Continued runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape	1	3	2	3	3	2	24	-	Medium	-Implement a stormwater management plan, which highlights control priorities and areas and provides a programme for long-term control. -Following decommissioning, undertake regular monitoring for an appropriate length of time to detect erosion features early so that they can be controlled. -Implement any control measures that may become necessary. -Avoid undertaking any activities on or near steep or unstable slopes.	1	2	2	2	3	1	10	-	Low
Avifauna																				
Avifauna	The decommissioning of the PV plant and associated infrastructure will result in a significant amount of movement and noise, which will lead to displacement of priority avifauna from the site due to disturbance. It is highly likely that most priority species will	1	3	3	4	1	3	36	-	Medium	-Activity should be restricted to the immediate footprint of the infrastructure. -Measures to control noise and dust should be applied according to current best practice in the industry. -Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum as far as practical. -The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of	1	3	3	2	1	3	30	-	Medium

	temporarily vacate the site footprint.										the footprint and rehabilitation of disturbed areas is concerned.									
Surface Water																				
Watercourses – Impacts to the Watercourses	Impacts associated with disturbance and edge effects to watercourses	1	3	2	2	2	2	20	-	Low	**Avoiding Direct Impacts to the Watercourses** – No vegetation trimming and / or pruning must take place along the existing access roads running through the extent of the watercourse. However, where nearby vegetation trimming and / or pruning is required outside the extent of the watercourse, this must take place accordance with recommendations of the vegetation specialist. **Preventing Temporary Increased Run-off Impacting on Watercourses** – Vegetation clearing must take place in a phased manner, only clearing areas where construction will take place and not in areas where construction will only take place in the future. **Preventing Littering of Watercourses** – Provide sufficient facilities for litter disposal. Regular clean-ups are required to keep the construction area and adjacent watercourses clean. **Alien Eradication Programme** - An Alien Eradication and Removal Programme is to be compiled prior to construction and implemented for the duration of the proposed development	1	3	1	1	2	1	8	-	Low

Watercourse – Impacts to the Hydrology of the Watercourse	Impacts associated with accelerated run-off and associated increased flood peaks to the watercourse	2	3	2	2	1	2	20	-	Low	**<u>Preventing Increased Run-off and associated Erosion Impacting on Watercourses</u>** – Adequate structures, where necessary, must be put into place (temporary or permanent where necessary in extreme cases) to deal with increased/accelerated run-off and potential erosion. The use of silt fencing and potentially sandbags or hessian "sausage" nets or other appropriate measures along the boundaries of the PV panel and power line foundations and maintenance and operation buildings can be used where required to slow run-off entering the watercourses and the associated buffer zones, thereby preventing increase in flood peaks, run-off volumes and also the likelihood of erosion. An appropriate construction stormwater management plan formulated by a suitably qualified professional must accompany the proposed development to deal with increased run-off and associated sedimentation and erosion. An Environmental Control Officer (ECO) must be appointed during the construction phase to oversee construction activities undertaken by contractors. The ECO must also monitor increased run-off and associated erosion impacts. Where additional mitigation measures are stipulated by the ECO in order to control increased run-off and erosion, this is to be undertaken accordingly.	1	2	2	2	2	1	9	-	Low
Watercourse – Impacts to Water Quality	Potential impacts associated with the leakage / spillage of	2	3	2	3	3	3	39	-	Medium	**<u>Storage of Oils, Fuels and Hazardous Substances / Liquids</u>** – All oils, fuels and hazardous substances or liquids must not be	1	1	2	2	3	1	9	-	Low

	oils, fuels and other potentially hazardous substances from construction vehicles / machinery entering run-off and flowing into the watercourse. Pollution from workers using the watercourse for sanitation and cleaning purposes; as well as sedimentation via run-off polluting the watercourse.										stored within 100m from the full extent of the watercourse and the associated buffer zone, unless such storage is unavoidable and is approved by the ECO. Where these items are stored, the storage area must be adequately bunded to contain any spillage from containers. Emergency spill kits must be available to clean up and remove spills. **<u>Preventing Soil and Surface Water Contamination</u>** – All vehicles and machinery operating on the study site are to be checked for oil, fuel or any other fluid leaks before entering the construction areas. All vehicles and machinery must be regularly serviced and maintained before being allowed to enter the construction areas. No fueling, refuelling, vehicle and machinery servicing or maintenance is to take place within 100m of the watercourse and the associated buffer zone. The study site is to contain sufficient safety measures throughout the construction process. Safety measures include (but are not limited) oil spill kits and the availability of fire extinguishers. Additionally, fuel, oil or hazardous substances storage areas must be bunded to 110% capacity to prevent oil or fuel contamination of the ground and / or nearby watercourses and the associated buffer zones. No cement mixing is to take place in the watercourse or the associated buffer zone. In general, any cement mixing should take place over a bin lined (impermeable) surface or									

										alternatively in the load bin of a vehicle to prevent the mixing of cement with the ground. Cement / concrete can also be trucked in ready-mix vehicles. Importantly, no mixing of cement or concrete directly within the watercourse and associated buffer zone. No "long drop" toilets are allowed on the study site. Suitable temporary chemical sanitation facilities are to be provided. Temporary chemical sanitation facilities must be placed at least 100 meters from the watercourse and the associated buffer zone where required. Temporary chemical sanitation facilities must be checked regularly for maintenance purposes and cleaned often to prevent spills. **<u>Preventing Sedimentation Impacting on Surface Water Resources</u>** – Adequate structures, where required, must be put into place (temporary or permanent where necessary in extreme cases) to deal with sedimentation. The use of silt fencing and potentially sandbags or hessian "sausage" nets or other appropriate measures along the boundaries of the PV panel and power line foundations, and maintenance and operation buildings can be used where required to prevent and / or reduce sediments entering the watercourse and the associated buffer zone. An appropriate construction stormwater management plan formulated by a suitably qualified professional must accompany the proposed development to deal with sedimentation.									

											An ECO must be appointed during the construction phase to oversee construction activities undertaken by contractors. The ECO must also monitor sedimentation impacts. Where additional mitigation measures are stipulated by the ECO in order to control sedimentation, this is to be undertaken accordingly.									
Agricultural and Soils																				
Agricultural land	Loss of agricultural land use due to direct occupation	1	4	2	2	3	2	24	-	Medium	None	1	4	2	2	3	2	24	-	Medium
Soil	Soil degradation and erosion	1	2	2	2	2	2	18	-	Low	- Control run-off - Maintain vegetation cover - Strip, stockpile and re-spread topsoil	1	1	2	2	2	2	16	-	Low
Geotechnical																				
Soils	Soil disturbance during decommissioning/deconstruction at the PV Facility may destabilise the soil and lead to soil erosion. -Contamination of soil due to chemical spillages from equipment -Construction and use of access roads by heavy-duty vehicles and construction equipment may	1	4	2	1	1	1	9	-	Low	- Use of berms and drainage channels to direct water away from the decommissioning/deconstruction areas where necessary - Minimise earthworks and levelling - use existing access roads wherever possible - Rehabilitate disturbed areas as soon as possible - Add as much natural vegetation back as possible - Try reinstate natural drainage patterns - Have chemical spill kits on site and remove all spill material when decommissioning any substations. - Maintain vehicles and only undertake repairs and maintenance work in designated areas - Contain and control stormwater flow	1	2	1	1	1	1	6	-	Low

	destabilise the soil and lead to soil erosion. -There may be spillages (petroleum/lubricants) from the vehicles -There may be siltation of watercourses due to increased runoff and dust																			
Visual																				
▪ Potential visual intrusion resulting from vehicles and equipment involved in the decommissioning process; ▪ Potential visual impacts of increased dust emissions from decommissioning activities and related traffic; and ▪ Potential visual intrusion of any remaining infrastructure on the site.	▪ Vehicles and equipment required for decommissioning will alter the natural character of the study area and expose visual receptors to visual impacts. ▪ Decommissioning activities may be perceived as an unwelcome visual intrusion. ▪ Dust emissions and dust plumes from increased traffic on the gravel roads serving the decommissioning site may evoke	2	3	1	2	1	2	18	-	Low	▪ All infrastructure that is not required for post-decommissioning use should be removed. ▪ Carefully plan to minimise the decommissioning period and avoid delays. ▪ Maintain a neat decommissioning site by removing rubble and waste materials regularly. ▪ Ensure that dust suppression procedures are maintained on all gravel access roads throughout the decommissioning phase. ▪ All cleared areas should be rehabilitated as soon as possible. ▪ Rehabilitated areas should be monitored post-decommissioning and remedial actions implemented as required.	2	2	1	2	1	2	16	-	Low

	negative sentiments from surrounding viewers. ▪ Surface disturbance during decommissioning would expose bare soil (scarring) which could visually contrast with the surrounding environment. ▪ Temporary stockpiling of soil during decommissioning may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.																			
Heritage																				
Impact on heritage resources	Impact on heritage resources during rehabilitation work associated with decommissioning - grading trench filling etc.	1	1	4	4	4	4	56	-	High	-Development of chance find procedures to be included in the EMPr -Implementation of mitigation measures such as buffering, documentation and excavations and request destruction permits from SAHRA	1	1	4	4	4	1	14	-	Low
Transportation																				

Additional Traffic Generation	Increase in traffic	2	3	1	2	1	2	18	-	Low	-Ensure a large portion of vehicles travelling to and from the proposed development travels in the 'off-peak' periods or by bus -Construction of an on-site concrete batching plant to reduce trips	2	3	1	2	1	2	18	-	Low
Additional Traffic Generation	Increase of incidents with pedestrians and livestock	2	4	2	4	1	2	26	-	Medium	-Reduction in speed of vehicles -Adequate enforcement of the law -Implementation of pedestrian safety initiatives -Regular maintenance of farm fences, access cattle grids -Construction of an on-site concrete batching plant to reduce trips	2	3	2	4	1	1	12	-	Low
Additional Traffic Generation	Increase in dust from gravel roads	2	3	2	2	1	2	20	-	Low	-Reduction in speed of the vehicles -Use of dust suppressant techniques -Implement a road maintenance programme under the auspices of the respective transport department -Construction of an on-site concrete batching plant to reduce trips	2	3	2	2	1	2	20	-	Low
Additional Traffic Generation	Increase in road maintenance	2	3	2	2	2	2	22	-	Low	-Implement a road maintenance programme under the auspices of the respective transport department -Construction of an on-site concrete batching plant to reduce trips	2	2	2	2	2	2	20	-	Low
Abnormal Loads	Additional abnormal loads	3	2	1	2	1	1	9	-	Low	-Ensure abnormal vehicles travel to and from the proposed development in the 'off-peak' periods -Adequate enforcement of the law	3	2	1	2	1	1	9	-	Low
Internal Access Roads	Increase in dust from gravel roads	1	3	1	1	1	2	14	-	Low	-Enforce a maximum speed limit on the development -Use of dust suppressant techniques -Adequate watering by means of water bowser	1	3	1	1	1	2	14	-	Low

Internal Access Roads	New / larger access points	1	4	1	2	1	1	9	-	Low	-Adequate road signage according to the SARTSM -Approval from the respective roads department	1	4	1	2	1	1	9	-	Low
Cumulative																				
Terrestrial Ecology																				
Vegetation	Loss and/or fragmentation of indigenous natural vegetation due to clearing	2	4	4	2	4	2	32	-	Medium	-Limit development within conservation zones, especially CBA1 areas.	2	4	4	2	4	1	16	-	Low
Plant species of concern and protected plants	Loss of individuals	2	4	2	3	3	2	28	-	Medium	-It is a legal requirement to obtain permits for specimens that will be lost. -Undertake a detailed pre-construction walk-through survey will be required during a favourable season to locate any additional individuals of protected plants. -This survey must cover the footprint of all approved infrastructure, including internal access roads. -Plants lost to the development can be rescued and planted in appropriate places in rehabilitation areas. This will reduce the irreplaceable loss of resources as well as the cumulative effect. -A Plant Rescue Plan must be compiled to be approved by the appropriate authorities. -Where large populations of affected species of high value are encountered, consideration should be given to shifting infrastructure to avoid such areas. -No authorisation should be given that results in the loss of populations of threatened plants.	2	4	2	2	2	1	12	-	Low

											-Infrastructure should be relocated and a suitable buffer zone maintained around such populations. -An ecological management plan must be compiled for such areas.									
Ecosystems	Changes to ecological processes at a landscape level	2	2	2	3	2	2	22	-	Low	-Limit development within conservation zones, especially CBA1 areas.	2	2	2	2	2	2	20	-	Low
Fauna	Mortality, displacement and/or disturbance	2	2	2	2	1	2	18	-	Low	-Apply site-specific mitigation measures.	2	2	2	1	1	1	8	-	Low
Vegetation, ecosystems and habitats	General increase in the spread and invasion of new habitats by alien invasive plant species	2	3	2	3	3	2	26	-	Medium	-Implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control. -Undertake regular monitoring to detect alien invasions early so that they can be controlled. -Post-decommissioning monitoring should continue for an appropriate length of time to ensure that future problems are avoided. -Do NOT use any alien plants during any rehabilitation that may be required.	2	2	2	2	3	1	11	-	Low
Ecosystems and vegetation	Reduction in the opportunity to undertake or plan conservation, including effects on CBAs and ESAs, as well as on the opportunity to conserve any part of the landscape	3	3	2	3	4	2	30	-	Medium	-Avoid development within conservation zones, especially CBA1 areas.	3	3	2	2	4	2	28	-	Medium
Surface Water																					

Watercourse - Cumulative Impacts to Hydrology of Region	Increased run-off as well as associated erosion and sedimentation impacts	2	3	2	2	3	3	36	-	Medium	**<u>Minimising Stormwater Impacts to Watercourses</u>** – The substation, access road, and maintenance and operation buildings must have energy dissipating structures where required to prevent increased run-off and sediments contained in the run-off entering adjacent areas or surface water resources. This will assist in erosion prevention as well. Structures can be in the form of hard concrete structures or soft engineering structures (such as grass blocks for example). Alternatively, a suitable operational stormwater management design or plan can be compiled and implemented that accounts for the use of appropriate alternative structures or devices that will prevent increased run-off and sediment entering the watercourses thereby, also preventing erosion. ECO monitoring is to take place during the post-construction rehabilitation phase. Monitoring is to take place for erosion as well as re-establishment of vegetation where trenching for cabling has taken place.	2	2	2	1	3	2	20	-	Low
Agriculture and Soils																					
Agricultural land	Regional loss of agricultural land and productivity	2	1	2	2	3	2	20	-	Low	-Control run-off; maintain vegetation cover; strip, stockpile and re-spread topsoil	2	1	2	2	3	2	20	-	Low
Visual																					
▪ Potential alteration of the visual character and	▪ Additional renewable energy developments in the broader area	3	3	2	3	3	2	28	-	Medium	▪ Restrict vegetation clearance on development sites to that which is required for the correct operation of the facility.	3	3	2	2	2	2	24	-	Medium

sense of place in the broader area. ▪ Potential visual impact on receptors in the study area. ▪ Potential visual impact on the night-time visual environment.	will alter the natural character of the study area towards a more industrial landscape and expose a greater number of receptors to visual impacts. ▪ Visual intrusion of multiple renewable energy developments may be exacerbated, particularly in more natural undisturbed settings. ▪ Additional renewable energy facilities in the area would generate additional traffic on gravel roads thus resulting in increased impacts from dust emissions and dust plumes. ▪ The night-time visual environment could be altered as a result of operational and security lighting at multiple renewable energy facilities in the broader area.										▪ Ensure that the PV arrays are not located within 500m of any farmhouses or national routes in order to minimise visual impacts on these dwellings and on the receptor road. ▪ Suitable buffers of intact natural vegetation should be provided along the perimeter of the development area and along the site boundary. ▪ Where possible, the operation and maintenance buildings should be consolidated to reduce visual clutter. ▪ As far as possible, limit the number of maintenance vehicles which are allowed to access the facility. ▪ Ensure that dust suppression techniques are implemented on all gravel access roads. ▪ As far as possible, limit the amount of security and operational lighting present on site. ▪ Light fittings for security at night should reflect the light toward the ground and prevent light spill. ▪ Lighting fixtures should make use of minimum lumen or wattage. ▪ Mounting heights of lighting fixtures should be limited, or alternatively foot-light or bollard level lights should be used. ▪ If possible, make use of motion detectors on security lighting. ▪ The operations and maintenance (O&M) buildings should not be illuminated at night. ▪ The O&M buildings should be painted in natural tones that fit with the surrounding environment.									

											▪ Buildings and similar structures must be in keeping with relevant regional planning policy documents.									
Heritage																				
Impact on heritage resources	Additional impact of the development on heritage resources adding to the current cumulative impact of existing or proposed developments in the region	2	2	4	4	4	2	32	-	Medium	-Assessment of designated footprint areas of the infrastructure -Implementation of mitigation measures such as buffering, documentation and excavations and request destruction permits from SAHRA	1	1	4	4	4	1	14	-	Low
Impact on palaeontological resources – fossil heritage	Excavations and site clearance of the development will involve substantial excavations into the superficial sediment cover as well as locally into the underlying bedrock.	2	2	4	4	4	2	32	-	Medium	A palaeontologist must conduct a field visit after vegetation clearance. Fossil Excavation will need a SAHRA permit. If an excavation is impossible, the fossil and locality could be protected and the development moved	1	1	4	4	4	1	14	-	Low
Palaeontology																				
Fossil Heritage	Excavations and site clearance of the development will involve substantial excavations into the superficial sediment cover as well as locally into the underlying bedrock.	2	2	4	4	4	2	32	-	Medium	A palaeontologist must conduct a field visit after vegetation clearance. Fossil Excavation will need a SAHRA permit. If an excavation is impossible, the fossil and locality could be protected and the development moved	1	1	4	4	4	1	14	-	Low
Social																				

Risk of HIV infection	Risk associated with the influx of workers in the area.	3	3	4	3	4	3	51	-	High	<u>Mitigation can only be implemented on a regional basis and are not project specific.</u> -Ensure that all companies coming into the area have and are implementing an effective HIV/AIDS policy. -Introduce HIV/AIDS awareness programs to schools and youth institutions. -Carefully monitor and report on the HIV status of citizens in the region. -Be proactive in dealing with any increase in the HIV prevalence rate in the area.	3	2	4	3	4	2	32	-	Medium
Sense of place	The transformation of the sense of place of the region.	2	4	4	3	4	3	51	-	High	<u>Mitigation measures can only be implemented on a regional basis and are not project specific.</u> -Consider undertaking a cumulative impact assessment to evaluate the changes taking place across the area on a broader scale. -Form a regional workgroup tasked with addressing the effect of changes to the sense of place of the region. -Establish grievance mechanisms to deal with complaints associated with changes to the area. -Enlighten the public about the need and benefits of renewable energy. -Engage with the tourism businesses and authorities in the region to identify any areas of cooperation that could exist.	2	4	4	3	4	2	34	-	Medium
Services, supplies and infrastructure	The influx of construction workers is likely to place pressure on accommodation and the need for both services and supplies.	2	3	2	2	2	2	22	-	Low	<u>Mitigation measures can only be implemented on a regional basis and are not project specific.</u> -Engage with the municipal authorities to ensure that they are aware of the expansion planned for the area and the possible consequences of this expansion. -Ensure that local labour is recruited in respect of these developments in the area.	2	2	2	2	2	2	20	-	Low

Economic	A proliferation of renewable energy facilities across the region is likely to result in significant and positive impacts in the area in terms of job creation, skills development, training opportunities and the creation of business opportunities for local businesses.	3	3	2	2	2	3	36	+	Medium	<u>Optimisation measures can only be implemented on a regional basis and are not project specific.</u> -Implement a training and skills development programme for locals. -Ensure that the procurement policy supports local enterprises. -Work closely with the appropriate municipal structures in regard to establishing a social responsibility programme. -Ensure that any trusts or funds are strictly managed in respect of outcomes and funds allocated.	3	3	2	2	2	4	48	+	High
Transportation																					
Additional Traffic Generation	Increase in traffic	2	3	1	2	1	4	36	-	Medium	-Ensure a large portion of vehicles travelling to and from the proposed development travels in the 'off-peak' periods or by bus -Construction of an on-site concrete batching plant to reduce trips -Coordination between all developers in the area	2	3	1	2	1	2	18	-	Low
Additional Traffic Generation	Increase of incidents with pedestrians and livestock	2	4	2	4	1	4	52	-	High	-Reduction in speed of vehicles -Adequate enforcement of the law -Implementation of pedestrian safety initiatives -Regular maintenance of farm fences, access cattle grids -Construction of an on-site concrete batching plant to reduce trips -Coordination between all developers in the area	2	3	2	4	1	2	24	-	Low
Additional Traffic Generation	Increase in dust from gravel roads	2	3	2	2	1	4	40	-	Low	-Reduction in speed of the vehicles -Use of dust suppressant techniques -Implement a road maintenance programme under the auspices of the respective transport department	2	3	2	2	1	2	20	-	Low

											-Construction of an on-site concrete batching plant to reduce trips -Coordination between all developers in the area									
Additional Traffic Generation	Increase in road maintenance	2	3	2	2	2	2	22	-	Low	-Implement a road maintenance programme under the auspices of the respective transport department -Construction of an on-site concrete batching plant to reduce trips -Coordination between all developers in the area	2	3	2	2	2	2	22	-	Low
Abnormal Loads	Additional abnormal loads	3	2	1	2	1	4	36	-	Medium	-Ensure abnormal vehicles travel to and from the proposed development in the 'off-peak' periods -Adequate enforcement of the law	3	2	1	2	1	2	18	-	Low
Internal Access Roads	Increase in dust from gravel roads	1	4	1	1	1	3	24	-	Medium	-Enforce a maximum speed limit on the development -Use of dust suppressant techniques -Adequate watering by means of water bowser	1	3	1	1	1	2	14	-	Low
Internal Access Roads	New / larger access points	1	4	1	2	1	2	18	-	Low	-Adequate road signage according to the SARTSM -Approval from the respective roads department	1	4	1	2	1	1	9	-	Low

6.3 Assessment of Cumulative Impacts

The area has seen a notable interest from developers of various renewable energy developments, which could be associated with the energy resource potential found in the region, proximity to the grid access and its evacuation capacity, as well as other factors. Such developments, whether already approved or only proposed, need to be considered as they have the potential to create cumulative impacts, whether positive or negative, if implemented. The potential cumulative impact of the proposed solar PV energy facility in combination with other renewable energy facilities in the area have been identified and assessed per environmental aspect and mitigation measures will be identified to address the cumulative impact, where possible. Cumulative impacts were also rated as part of the impact rating system and used to determine the significance of the impacts (refer to **Table 23** in **section 6.2** above).

As part of the Cumulative Impact Assessment, literature reviews of other specialist assessments / studies which were undertaken for the other renewable energy developments (both wind and solar) proposed within a 35km radius of the proposed Paarde Valley Solar PV Energy Facility application site (**Figure 50**) were undertaken by the respective specialists in order to ascertain any additional cumulative impacts that should be taken into consideration. A fair amount of information was available and was provided to the respective specialists to assess and incorporate into their respective assessment reports, where applicable. **Table 24** below highlights the renewable energy developments that are operational, being proposed and/or which are approved within a 35km radius of the proposed Paarde Valley Solar PV Energy Facility application site, as well as the various stages of the development.

Table 24: Renewable energy developments identified within a 35km radius of the proposed Paarde Valley Solar PV Energy Facility application site

Project	DEA Reference No	Technology	Capacity	Status of Application / Development
Allemans Fontein SEF	14/12/16/3/3/1/730	Solar	20MW	Approved
Carolus Poort SEF	14/12/16/3/3/1/729	Solar	20MW	Approved
Damfontein SEF	14/12/16/3/3/1/728	Solar	20MW	Approved
Gillmer SEF	14/12/16/3/3/1/735	Solar	20MW	Approved
Inkululeko SEF	14/12/16/3/3/1/553	Solar	20MW	Approved
Kleinfontein SEF	12/12/20/2654	Solar	20MW	Approved
Klip Gat SEF	14/12/16/3/3/2/354	Solar	75M	Approved
Linde SEF	12/12/20/2258	Solar	40MW	In Operation
Linde SEF (Expansion)	14/12/16/3/3/1/1122	Solar	75MW	Approved
Middelburg Solar Park 1	12/12/20/2465/2	Solar	75MW	Approved
Middelburg Solar Park 2	12/12/20/2465/1	Solar	75MW	Approved
Naauw Poort SEF	14/12/16/3/3/2/355	Solar	75MW	Approved
Toitdale SEF	12/12/20/2653	Solar	20MW	Approved
Noupoort Wind Farm	12/12/20/2319	Wind	188MW	In Operation
Phezukomoya WEF	14/12/16/3/3/1/1028	Wind	315MW	EIA in Process

San Kraal WEF	14/12/16/3/3/1/1069	Wind	390MW	EIA in Process
Umsobomvu WEF	14/12/16/3/3/2/730	Wind	140MW	Approved
Mooi Plaats Solar PV	To be Allocated	Solar	To be Determined	EIA in process
Wonderheuvel Solar PV	To be Allocated	Solar	To be Determined	EIA in process

The renewable energy development listed above are in different stages of planning, ranging from developments that have been constructed and are in operation, to developments where the EIAs / BAs are still being conducted.

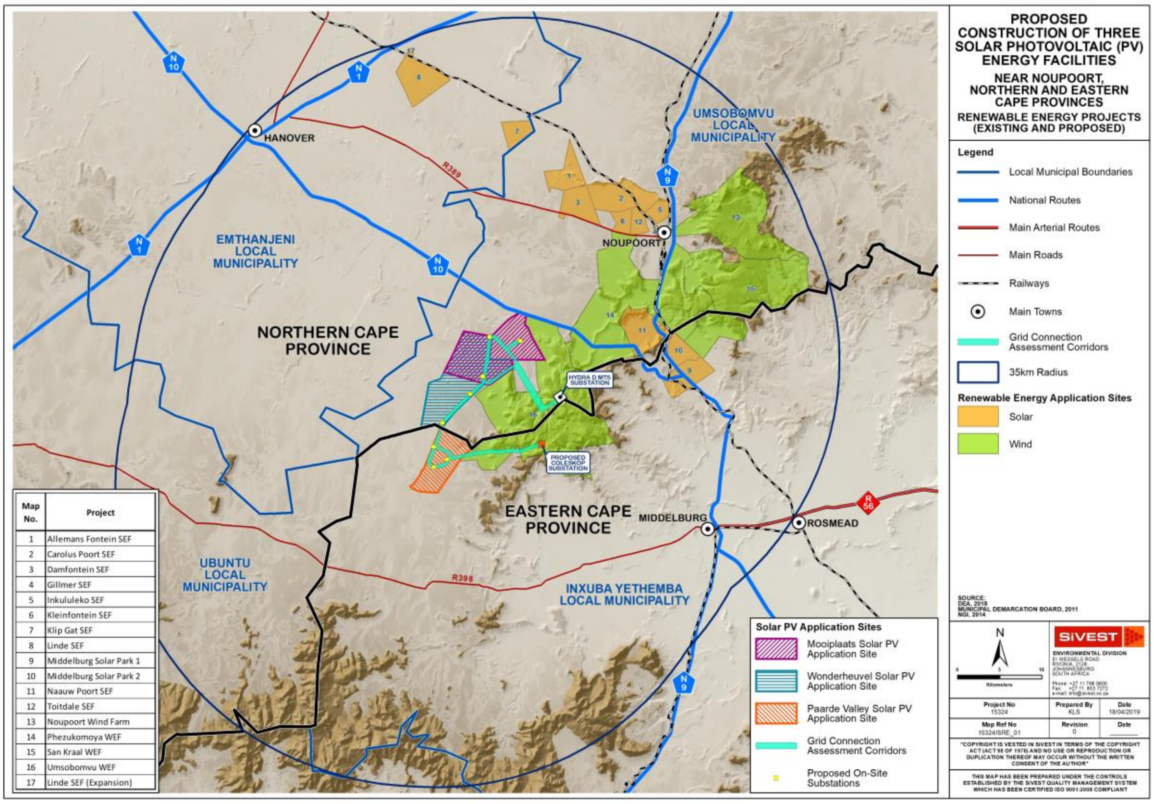

Figure 50: Map showing other proposed renewable energy developments within 35km radius of the Paarde Valley Solar PV Energy Facility application site

It should be noted that SiVEST undertook every effort to obtain the information (including specialist studies, BA / EIA / Scoping and EMPr Reports) for the surrounding developments. However, many of the documents are not currently publicly available to download. The information that could be obtained for the surrounding planned renewable energy developments was taken into account as part of the cumulative impact assessment.

The information (including specialist studies, EIA / Scoping and EMPr Reports) that could be obtained for the surrounding proposed renewable energy sites that were taken into account by the various specialists is elaborated on below.

6.3.1 Terrestrial Ecology

Environmental Impact Reports for a number of the renewable energy developments listed in **Table 24** above were made available to assess cumulative impacts for the current proposed development. A summary of the main impacts and associated mitigation measures are provided in **Table 25** below.

Table 25: Ecological impacts and proposed mitigation measures for renewable energy developments within a 35km radius of the project

Impact	Mitigation measures	Project
▪ Loss of vegetation ▪ Increase in runoff and erosion ▪ Loss of and alteration of microhabitats ▪ Establishment and spread of alien invasive species ▪ Ecological degradation and loss of ecological integrity ▪ Fragmentation and reduction in core habitat	▪ Make use of existing tracks ▪ Plant search and rescue ▪ Minimise habitat loss ▪ Remove and collect all succulent and bulbous plants from cleared areas and transplant into newly redistributed topsoils ▪ Prevent pollution of the environment ▪ Re-establish vegetation where possible ▪ Implement an invasive/exotic species eradication programme ▪ Keep new developments close to existing developed areas and/or keep components of the new development as close together as possible. ▪ New power lines should follow existing servitudes.	▪ Allemans Fontein Solar Energy Facility ▪ Carolus Poort Solar Energy Facility ▪ Damfontein PV Solar Energy Facility ▪ Gillmer Solar Energy Facility
▪ Loss of vegetation ▪ Increase in runoff and erosion ▪ Loss of and alteration of microhabitats ▪ Altered vegetation cover ▪ Altered distribution of rainfall ▪ Spread and establishment of alien invasive species ▪ Oil and chemical contamination of habitats	▪ Use existing roads ▪ Keep affected footprint to a minimum ▪ Create structures under roads to permit free-flow of water ▪ Reinforce existing roads and create berms to limit erosion ▪ Prevent leakage of oil and other chemicals ▪ Remove topsoil and redistribute to mimic microtopography of the original vegetation ▪ Monitor the establishment of alien vegetation and remove as soon as detected ▪ After decommissioning, rehabilitate disturbed areas ▪ Maintain natural vegetation cover under panels ▪ Place power line pylons as far as possible outside drainage lines	▪ Inkululeko Solar Energy Facility
▪ Loss of protected plants ▪ Loss of faunal habitat	▪ Cause minimum damage to the environment with construction equipment ▪ Restrict construction activities to development footprint ▪ Use existing roads as far as possible ▪ Check final footprint for burrows of small mammals	▪ Kleinfontein Solar Energy Facility ▪ Toitdale Solar Energy Facility
▪ Direct loss of vegetation ▪ Spread of declared weeds and alien invader plants ▪ Loss of faunal habitat	▪ Keep development impact within footprint area. ▪ Disturbed areas should be rehabilitated as soon as possible. ▪ Establish a monitoring programme to detect alien invasive plant species.	▪ Klip Gat Solar Energy Facility ▪ Tollie PV

	▪ An active re-vegetation plan should be implemented to assist the return of natural indigenous species.	
▪ Alteration of vegetation cover ▪ Erosion ▪ Disruption of ethology of species	No specific measures proposed, habitat considered to be of low value.	Nine Scatec sites
▪ Loss of individuals of species of concern ▪ Loss of habitat / indigenous natural vegetation ▪ Impacts on ecosystem function	▪ Contain impacts to within footprint of infrastructure ▪ Implement measures to minimise erosion ▪ Implement a storm-water management plan ▪ Limit disturbance to vegetation surrounding infrastructure ▪ Rehabilitate disturbed areas as quickly as possible ▪ Avoid translocating soil stockpiles from areas containing alien plants ▪ Control alien plants ▪ Establish a monitoring programme to detect and control alien plants	Middelburg Solar Park
▪ Direct loss of vegetation ▪ Disturbance to vegetation and associated habitats ▪ Spread of declared weeds and alien invasive species	▪ Search and Rescue all translocatable indigenous plants ▪ Prevent contamination by oil, diesel and other contaminants ▪ Mitigate disturbance or loss of natural vegetation ▪ Control declared weeds and alien invasive plants ▪ Mitigate loss of fauna ▪ Prevent damage to drainage systems ▪ Minimise soil degradation and erosion	Naauwpoort Solar Energy Facility
▪ Loss of natural vegetation ▪ Loss of habitat for red data and general species ▪ Loss of species richness ▪ Edge effects ▪ Erosion ▪ Introduction of exotic species ▪ Loss of habitat for fauna	▪ Maintain footprint strictly during construction ▪ Conduct walk-through survey prior to construction to conduct a search and rescue ▪ Retain indigenous vegetation, where possible ▪ Demarcate sensitive areas prior to construction ▪ Vegetation to be removed only when necessary ▪ No vegetation to be used for firewood ▪ Implement a programme of weed control ▪ Grass soil stockpiles to prevent weed invasion ▪ Avoid emergence of alien invasive species ▪ Use existing access roads ▪ Compile a rehabilitation plan ▪ Revegetate any disturbed areas as a priority to avoid erosion ▪ Put in place suitable stormwater / wind controls until rehabilitation is completed	Noupoort Wind Farm
▪ Faunal habitat loss ▪ Loss of vegetation and listed/protected plant species ▪ Impacts on fauna	▪ Avoid placement of infrastructure within High sensitivity areas and drainage lines ▪ Preconstruction walk-through of approved development footprint ▪ Rehabilitate disturbed areas, for example laydown areas, after use ▪ Minimise development footprint	▪ Phezukomoya Wind Energy Facility ▪ San Kraal Wind Farm

	▪ Rehabilitate disturbed areas that are no longer required by the operational phase of the development ▪ Exact routing of roads should be adjusted to avoid sensitive habitats ▪ Preconstruction environmental induction for all construction staff ▪ Demarcate sensitive areas in close proximity to the development footprint as no-go areas ▪ During construction, any fauna directly threatened by construction activities should be removed to a safe location ▪ Illegal collection, hunting or harvesting should be strictly forbidden ▪ No fires in open veld ▪ No fuelwood collection on site ▪ No dogs or cats should be allowed on site ▪ Control type, nature and timing of night-time lighting ▪ Store all hazardous materials in an appropriate manner ▪ No unauthorised persons to be allowed on site and implement site access control ▪ Enforce speed limits ▪ If electric fencing is required anywhere, this should be designed to minimise impacts on fauna ▪ Manage erosion according to an Erosion Management Plan and Rehabilitation Plan ▪ All roads and hardened surfaces should have runoff control features ▪ Regular monitoring of erosion ▪ All cleared areas should be revegetated with indigenous species from the local area ▪ Wherever excavation is necessary, topsoil should be set aside and replaced after construction ▪ Implement a long-term alien plant management plan ▪ Regular monitoring for alien plants within the development footprint as well as surrounding areas ▪ Undertake regular clearing of alien plants using best-practice methods for the species concerned ▪ No excavated holes or trenches should be left open for extended periods ▪ Regular monitoring for at least two years after decommissioning to ensure that no erosion problems develop ▪ All erosion problems observed should be rectified as soon as possible using appropriate erosion control methods	

Note that none of the projects recorded threatened plant species or protected trees.

6.3.1.1 Description of Cumulative Impacts

There are various cumulative impacts that may occur as a result of the combined impact of a number of similar projects in the area, as follows:

1. Loss and/or fragmentation of indigenous natural vegetation due to clearing;
2. Loss of individuals of plant species of conservation concern and/or protected plants;
3. Changes to ecological processes at a landscape level;
4. Mortality, displacement and/or disturbance of fauna;
5. General increase in the spread and invasion of new habitats by alien invasive plant species;
6. Reduction in the opportunity to undertake or plan conservation, including effects on CBAs and ESAs, as well as on the opportunity to conserve any part of the landscape; and
7. Positive cumulative impact on climate change.

Cumulative impacts on indigenous natural vegetation

The regional terrestrial vegetation types in the broad study area are listed as Least Threatened and generally have large areas. Loss of habitat will definitely occur for each project, each of which will be a small area in comparison to the total area of the vegetation type. The total loss of habitat due to a number of projects together will be greater than for any single project, so a cumulative effect will occur. However, the area lost in total will be small compared to the total area of the vegetation types concerned. Of more concern is the total degree of fragmentation due to the combination of all projects, which will be much more significant than gross loss of habitat, measured in hectares. Direct loss of habitat will not result in a change in the conservation status of the vegetation types, but overall degradation due to fragmentation effects may be cause for concern. The cumulative effect will therefore be low for vegetation loss, but possibly significant for fragmentation. In addition, the current project is located in a rural area with the no existing infrastructure nearby, as is the case with all the other proposed projects. This will fundamentally change the character of this area in terms of its remoteness and natural state.

Cumulative impacts on plant species of concern and protected plant species

There are no plant species of conservation concern for the site, but there are various protected plant species that may occur in the study area, all of which are relatively widespread. Constructing the current project increases the likelihood of individuals being affected, but unless large numbers of individuals are directly affected, there will only be small cumulative effects.

Cumulative impacts on ecological processes

There are various ecological processes that may be affected at a landscape level by the presence of multiple projects. This includes obvious processes, such as migration, pollination and dispersal, but also more difficult to interpret factors, such as spatial heterogeneity, community composition and environmental gradients, that can become disrupted when landscapes are disturbed at a high level. Disturbance can alter the pattern of variation in the structure or function of ecosystems. Fragmentation is the breaking up of a habitat, ecosystem, or land-use type into smaller parcels. An important consequence of repeated, random clearing is that contiguous cover can break down into isolated patches. This happens when the area cleared exceed a critical level and landscapes start to become disconnected. Spatially heterogeneous patterns can be interpreted as individualistic responses to environmental gradients and lead to natural patterns in the landscape. Disrupting gradients and creating disturbance edges across wide areas is very disruptive of natural processes and will lead to fundamental changes in ecosystem function. It is possible that this could be a cumulative consequence of the combined projects, but it is difficult to determine without a detailed assessment of fragmentation of the combination of all the projects.

Cumulative impacts on fauna

Construction activities, loss of habitat, noise, dust and general activity associated with the construction phase of the project are likely to cause all mobile species to move away from the area. This effect will be increased if there are a number of projects being constructed at the same time or in quick succession, so the effect is likely to be cumulative. However, the geographical ranges of the species of concern is wide and it is considered that the significance of the effect will be low in the long-term, although probably significant during the combined construction phase of the projects. It is possible that some species will be more significantly negatively affected than others, especially shy species, territorial species that get displaced, or those with large territories that get shrunk. It is also possible that some species will benefit from the increased presence of humans and will migrate into the area. This will possibly cause additional shifts in other species that are affected by the increase in numbers or new species.

Cumulative impacts due to spread of declared weeds and alien invader plants

There is a moderate to high possibility that alien plants could be introduced to areas within the footprint of the proposed infrastructure from surrounding areas in the absence of control measures. The greater the number of projects, the more likely this effect will happen; therefore, the effect is cumulative. For the current site, the impact is predicted to be a moderate to high risk due to the current presence of various invasive species on site and in surrounding areas. The significance will probably be low if control measures are implemented. However, the increased overall disturbance of the landscape will create invasion opportunities and, if new invasions are not controlled, can create nodes that spread to new locations due to the heightened disturbance levels.

Cumulative impacts due to loss of protected animals

There are various animal species protected according to National legislation that occur in the geographical area covered by the combined projects. Some of these animals may be vulnerable to secondary impacts, such as hunting, road kill and illegal collecting. The greater the number of projects, the more likely this effect will happen; therefore, the effect is cumulative. However, in all cases, the geographical distribution of each species is much wider than the combined project areas. The significance will therefore be low, especially if control measures are implemented.

Cumulative impacts on CBAs and conservation planning

Significant proportions of the site and surrounding sites are included in Critical Biodiversity Areas for the Northern Cape. Disruption of these areas means that conservation planners have to find alternative sites to include in future CBAs according to an algorithm that seeks a least-cost outcome for preserving biodiversity, i.e. the least amount of land space for preserving the greatest amount of area of biodiversity importance, as well as meeting specific conservation targets. At some point, the loss of suitable sites leads to a situation where it is no longer possible to plan effective conservation networks or the cost of doing so increases due to a lack of choice. The higher the density of similar projects in a uniform area, the less chance there is of finding sites suitable for conservation that contain all the attributes that are desired to be conserved, including both ecological processes and ecological patterns.

Cumulative impact on climate change

One of the primary reasons for promoting renewable energy projects is the desire to make South Africa compliant with international treaties regarding climate-change effects. The combined generation capacity of all the renewable energy projects considered here is just less than 1 600 MW, which is more than half of the average size of one of the 14 coal power stations in South Africa (Eskom's Generation Division has 14 coal-fired power stations with an installed capacity of 38 548 MW, www.eskom.co.za). A reduction in reliance on coal power would improve the air quality of the Mpumalanga Highveld (where many of these power stations are located), reduce the amount of coal-mining that would take place (which has a devastating effect on biodiversity resources and water quality) and would reduce the per capita carbon footprint of our country. Greater uptake of renewable energy would furthermore reduce the global risk of climate change, one of the factors taken into account in designing the conservation network in South Africa. The construction of renewable energy projects can be viewed as an offset for other carbon-generating technology.

6.3.1.2 Assessment of Cumulative Impacts

Based on the assessment undertaken (refer to **Table 23** on **page 188**), all cumulative impacts can be reduced to a LOW significance with mitigation measures, with the exception of "*Reduction in the opportunity to undertake or plan conservation, including effects on CBAs and ESAs, as well as on the opportunity to conserve any part of the landscape*", which has a residual significance of MEDIUM. Based on this assessment, it is considered that the cumulative impacts are acceptable.

6.3.2 Avifauna

Cumulative effects are commonly understood to be impacts from different projects that combine to result in significant change, which could be larger than the sum of all the individual impacts. The assessment of cumulative effects therefore needs to consider all renewable energy developments (wind and solar) within at least a 35km radius of the proposed site. The 17 renewable energy developments which are planned or authorised are listed in **Table 24** and displayed in **Figure 50**. Appendix 4 of the Avifaunal Scoping Assessment Report lists the renewable energy developments together with the relevant recommended mitigation measures pertaining to birds.

6.3.2.1 PV Sites

In the case of solar projects, the potentially most significant impact from an avifaunal perspective is the transformation of the natural habitat. The total land parcel area taken up by existing and proposed solar energy projects are approximately 13 000ha, and the wind energy projects come to approximately 47 000ha. The Umsobomvu SEF's will add another approximately 13 500ha of land parcel to these. The total area of the 35km radius around the proposed developments equates to about 400 000ha. The total combined size of the land parcels taken up by SEF's and WEF's, including the Umsobomvu developments, equates to about 60 500ha, which is just over 15% of the available land in the 35km radius. However, the actual footprint of the solar facilities will be much smaller than the land parcel area, between 20 - 40% of the land parcel area. In the case of the WEF's the situation is much the same. The total area to be taken up by renewable energy developments will therefore comprise less than 10% of the land surface within the 35km radius around the proposed Paarde Valley development. The cumulative impact of the habitat transformation which will come about as a result of the proposed Paarde Valley development should therefore be **low**.

6.3.3 Surface Water

Cumulative impacts are hard to predict even with knowledge of other sites in the general area that are also going to be developed. A single solar energy facility has little impact beyond the borders of the site, however, when several solar energy facilities are developed in an area, there is potentially a large cumulative impact. Negative impacts of roads are frequently cited as one (1) of the major effects of renewable energy developments on watercourses and water resources. These impacts include increased hardened surfaces, erosion, and direct loss of watercourse habitat. However, given the semi-arid to arid system that the proposed development will impact upon it is unlikely that large-scale impacts will be impacted by the construction of the solar energy facility on the site, and the cumulative impact of the other developments in the area on water resources is likely to still pose a low risk to these systems if correct mitigation measures are implemented. Most of the drainage of the site does not join that found on the sites to the south of the study area, and thus the effects of the neighbouring land parcels being developed will have little impact on the study area drainage. There are however a few developments to the east and north of the site that also drain towards the Klein-Seekoei River but correct use of mitigation measures within the Paarde Valley site will ensure that the cumulative impact will have minimal impact on the other sites in the area. Thus, no immediate cumulative impact to the drainage patterns of the site are predicted.

On a larger scale, all the drainage of the sites enters the Klein-Seekoei River which flows into the Orange River away from site. Thus, if the sites to the north cause a hydrological impact, and the Paarde Valley site causes a hydrological impact, these impacts (increased run-off as well as associated erosion and sedimentation impacts) will eventually meet in the Seekoei River and exacerbate each other. However, the risk of either site causing a significant impact is small if all appropriate mitigation (as contained in **Table 23** above) that has been proposed is implemented.

SiVEST undertook every effort to obtain the information (including specialist studies, BA / EIA / Scoping and EMPr Reports) for the surrounding developments. However, many of the documents are not currently publicly available to download. The information that could be obtained for the surrounding planned renewable energy developments were considered as part of the cumulative impact assessment.

6.3.4 Agriculture and Soils

The cumulative impact of a development is the impact that development will have when its impact is added to the incremental impacts of other past, present or reasonably foreseeable future activities that will affect the same environment. The most important concept related to a cumulative impact is that of an acceptable level of change to an environment. A cumulative impact only becomes relevant when the impact of the proposed development will lead directly to the sum of impacts of all developments causing an acceptable level of change to be exceeded in the surrounding area. If the impact of the development being assessed does not cause that level to be exceeded, then the cumulative impact associated with that development is not significant.

The potential cumulative agricultural impact of importance is a regional loss or degradation of agricultural land. The defining question for assessing the cumulative agricultural impact is this:

'What level of loss of agricultural land use is acceptable in the area, and will the loss associated with the Umsobomvu PV development, cause that level in the area to be exceeded?'

The DEA requires compliance with a specified methodology for the assessment of cumulative impacts. This is positive in that it ensures engagement with the important issue of cumulative impacts. However, the required compliance has some limitations and can, in the specialist's opinion, result in an over-focus on methodological compliance, while missing the more important task of answering the above-defining question more broadly.

The first limitation with the DEA's required methodology is that it restricts the cumulative impacts to similar developments, so in this case to renewable energy developments. In order to accurately answer the defining question above, all developments, regardless of their type and similarity, should be taken into account, because all will contribute to exceeding the acceptable level of change.

The second problem with the requirement, is that it restricts surrounding developments to those within an absolutely defined distance, in this case 35km. Again, this does not allow for accurately answering the defining question. To achieve this, the distance used for cumulative impact assessment should be discipline dependent. A different distance is likely to apply for agricultural impact than for economic impact or botanical impact. And a different distance should be used in different environments, for example in high potential agricultural environments versus very low potential agricultural environments.

Given the above, this assessment focuses less on methodological compliance and more on effectively addressing the defining question above by considering the cumulative impacts more broadly than is required by DEA compliance. This includes considering a wider area than the 35km radius and considering the likelihood of pressure from other types of developments as well.

There are 17 renewable energy developments, with their associated transmission lines, within 35km of the proposed site (that need to be considered in terms of the DEA requirements). These are listed in **Table 24** and mapped in **Figure 50**.

All of these projects have the same agricultural impacts in a very similar agricultural environment, and in all cases the agricultural impact is assessed as low.

Of all the mitigation measures proposed for all of these developments, the following have not been included in this report for the reasons given. All others have been included.

- Keeping disturbed soil covered by straw, mulch, or erosion control mats. This is not considered viable in the arid environment. Straw would blow away, and there is unlikely to be any viable source of mulch. Vegetation establishment, taking into account any recommendations by the vegetation study, would be the most viable form of soil stabilisation.

In quantifying the cumulative impact, the area of land taken out of agricultural grazing as a result of all of the developments above will amount to a total of approximately 1,700ha. This is calculated using the industry standards of 2.5 and 0.3ha per MW for solar and wind energy generation respectively, as per the DEA (2015). As a proportion of the area within a 35km radius (approximately 385,000ha), this amounts to only 0.44% of the surface area. That is well within an acceptable limit in terms of loss of low potential agricultural land, of which there is no scarcity in the country. This is particularly so when considered within the context of the following point:

- For South Africa to achieve its renewable energy generation goals, agriculturally zoned land will need to be used for renewable energy generation. It is far more preferable to incur a cumulative loss of agricultural land in a region such as the one being assessed, which has no cultivation potential, and low grazing capacity, than to lose agricultural land that has a higher potential, and that is much scarcer, to renewable energy development elsewhere in the country. The limits of acceptable agricultural land loss are therefore far higher in this region than in regions with higher agricultural potential.

It should also be noted that there are few land uses, other than renewable energy, that are competing for agricultural land use in this area. The cumulative impact from developments, other than renewable energy, is therefore low.

Due to all of the considerations discussed above, the cumulative impact of loss of agricultural land use is assessed as having low significance. In terms of cumulative impact, therefore, the development can be authorised.

6.3.5 Visual

Although it is important to assess the visual impacts of the proposed solar PV facility specifically, it is equally important to assess the cumulative visual impact that could materialise if other renewable energy facility (both wind and solar facilities) and associated infrastructure developments are developed in the broader area. Cumulative impacts occur where existing or planned developments, in conjunction with the proposed development, result in significant incremental changes in the broader study area. In this instance, such developments would include renewable energy facilities and associated infrastructure development.

Renewable energy facilities have the potential to cause large-scale visual impacts and the location of several such developments in close proximity to each other could significantly alter the sense of place and visual character in the broader region. Although power lines and substations are relatively small developments when compared to renewable energy facilities, they may still introduce a more industrial character into the landscape, thus altering the sense of place.

Seventeen renewable energy projects were identified within a 35km radius of the proposed solar PV facility (**Figure 50**). These projects, as listed in **Table 24**, were identified using the DEA's Renewable Energy EIA Application Database for SA in conjunction with information provided by IPPs operating in the broader region. It is assumed that all of these renewable energy developments include grid connection infrastructure, although few details of this infrastructure were available at the time of writing this report.

The relatively large number of renewable energy facilities within the surrounding area and their potential for large-scale visual impacts could significantly alter the sense of place and visual character in the broader region, as well as exacerbate the visual impacts on surrounding visual receptors, once constructed.

As can be seen from **Table 24**, thirteen (13) of these projects are Solar Energy facilities (SEFs), most of which are located more than 10km from the application site, clustered on the western edge of Noupoort and also to the north of Main Road 389 and along an existing rail route. Given the distance from the study area and the concentration of these facilities in close proximity to existing built infrastructure, it is not anticipated that these developments will result in any significant cumulative impacts affecting the landscape or the visual receptors within the combined assessment zone. It should be noted that although all of these SEF applications were approved at least five (5) years ago, to date only one (1) has been constructed.

The remaining four (4) developments are wind energy facilities (WEFs), all of which are located on the hillier terrain to the east of the solar PV application site. Although WEFs are expected to have different impacts when compared to solar PV developments, these renewable energy developments are however relevant as they influence the cumulative visual impact of the proposed development.

The proposed San Kraal WEF is located well outside the combined zone, just east of the N9 national route, while only a small portion of the Phezukomoya WEF, which is located immediately west of the N9, is located within 5km of the proposed solar PV facility. As such, these WEFs are not expected to give rise to any significant cumulative impacts on the landscape or visual receptors within the study area.

The remaining WEF, namely Umsobomvu WEF, is however almost entirely within 5km of the proposed solar PV facility, and is in fact adjacent to sections of the application site. It is understood that most of the proposed turbines on the WEF development site will be located on high-lying plateaus and ridges and as such they will be visible to many of the visual receptors in the combined assessment area.

This proposed WEF, in conjunction with the proposed solar PV facility and associated grid connection infrastructure, will inevitably introduce an increasingly industrial character into a largely natural, paroral landscape, thus giving rise to significant cumulative impacts.

It should be noted however that PV panels, at an approximate height of 4m, are considerably less visible than wind turbines and as such the proposed solar PV facility would be outside the viewshed of many of the potentially sensitive receptor locations identified in the study area. Cumulative impacts affecting these receptors would therefore be reduced and the severity of these impacts would depend on the perceptions of the receptors.

A cursory examination of the literature available for the environmental assessments undertaken for many of these renewable energy applications showed that the visual impacts identified, and the recommendations and mitigation measures provided are largely consistent with those identified in the scoping phase VIA Report. Where additional mitigation measures were provided in respect of the other renewable energy applications, these have been incorporated into this report where relevant.

From a visual perspective, the further concentration of renewable energy facilities as proposed will inevitably change the visual character of the area and alter the inherent sense of place, introducing an increasingly industrial character into the broader area, and resulting in significant cumulative impacts. It is however anticipated that these impacts could be mitigated to acceptable levels with the implementation of the recommendations and mitigation measures put forward by the visual specialists in their respective reports.

6.3.6 Heritage

The cumulative impacts on heritage resources evaluated a 35km radius (**Figure 50**). It must further be noted that the evaluation is based on available heritage studies (**Table 26**) and cannot take the findings of outstanding studies on current on-going EIA's in consideration.

The following must be considered in the analysis of the cumulative effect of development on heritage resources:

- **Fixed datum or dataset:** There is no comprehensive heritage data set for the Sutherland region and thus we cannot quantify how much of a specific cultural heritage element is present in the region. The region has never been covered by a heritage resources study that can account for all heritage resources. Further to this none of the heritage studies conducted can with certainty state that all heritage resources within the study area has been identified and evaluated;
- **Defined thresholds:** The value judgement on the significance of a heritage site will vary from individual to individual and between interest groups. Thus, implicating that heritage resources' significance can and does change over time. And so, will the tipping threshold for impacts on a certain type of heritage resource; and
- **Threshold crossing:** In the absence of a comprehensive dataset or heritage inventory of the entire region we will never be able to quantify or set a threshold to determine at what stage the impact from developments on heritage resources has reached or is reaching the danger level or excludes the new development on this basis. (Godwin, 2011).

Keeping the above shortcomings in mind, the methodology in evaluating cumulative impacts on heritage resources has been as follows.

The analysis of the completed studies as listed in **Table 26**, took in to account the findings and recommendation of each of the 17 evaluated HIA's. The cumulative impact on the cultural landscape was discounted as the HIA's, in most cases, did not address this and the Visual Impact Assessment covers such analysis in detail.

The overall findings of the 17 studies all concur that the area is characterised by numerous Stone Age findspots and archaeological resources. Many these concentrated around outcrops in a landscape where water, food and shelter came at a premium. The sites around the outcrops where in most cases given a medium to high heritage significance on a local scale and in the majority of the cases were recommended as being 'no-go' areas or extensive mitigation is required.

This cumulative assessment has also not addressed the possible cumulative impacts on the heritage landscape. The evaluated studies have in most cases not addressed or quantified the possible impact on the cultural landscape.

Table 26 below provide an analysis of the projected cumulative impact this proposed development will add to impact on heritage resources.

The significance of the cumulative impacts is assessed in **Table 23** on **page 188**. At this stage, the projected additional load on heritage resources will be MEDIUM and implementing mitigation measures will reduce to the cumulative impact to LOW. With a detailed and comprehensive regional dataset this rating could possibly be adjusted and more accurate.

Table 26: Heritage Impact Assessments conducted within 35km from the Paarde Valley PV Project

Project	DEA Reference No	Findings	Recommendations
Allemans Fontein SEF	14/12/16/3/3/1/730	Surface scatters of middle stone age artefacts occurred over the extent of the area. Most were however disturbed and of low heritage value. No although the area was underlain by fossiliferous mudstone and sandstone no palaeontological significant finds were made.	General management measures such as informing SAHRA and chance finds procedure to be put in place.
Carolus Poort SEF	14/12/16/3/3/1/729	Surface scatters of middle stone age and later stone age artefacts occurred over the extent of the area. Most were however disturbed and of low heritage value Although the area was underlain by fossiliferous mudstone and sandstone no palaeontological significant finds were made.	General management measures such as informing SAHRA and chance finds procedure to be put in place.
Damfontein SEF	14/12/16/3/3/1/728	Surface scatters of middle stone age and later stone age artefacts occurred over the extent of the area. Most were however disturbed and of low heritage value.	General management measures such as informing SAHRA and chance finds procedure to be put in place.
Gillmer SEF	14/12/16/3/3/1/735	Surface scatters of middle stone age and later stone age artefacts occurred over the extent of the area. One single collapsed stone structure was discovered. Most were however disturbed and of low heritage value. Although the area was underlain by fossiliferous mudstone and sandstone no palaeontological significant finds were made.	General management measures such as informing SAHRA and chance finds procedure to be put in place.
Inkululeko SEF	14/12/16/3/3/1/553	Surface scatters of middle stone age and later stone age artefacts occurred over the extent of the area.	General management measures such as informing SAHRA and chance finds procedure to be put in place.
Kleinfontein SEF	12/12/20/2654	Surface scatters of middle stone age artefacts occurred over the extent of the area.	General management measures such as informing SAHRA and chance finds procedure to be put in place.
Klip Gat SEF	14/12/16/3/3/2/354	Surface scatters of middle stone age and later stone age artefacts occurred over the extent of the area. One single collapsed stone structure was discovered. One area of high significance was demarcated. Although the	General management measures such as informing SAHRA and chance finds procedure to be put in

Project	DEA Reference No	Findings	Recommendations
		area was underlain by fossiliferous mudstone and sandstone no palaeontological significant finds were made.	place. A detailed survey of the demarcated area was recommended.
Linde SEF	12/12/20/2258	One site was identified with a cultural heritage resource, a stone redoubt emanating from the Second Boer War together with a portion of low gauge railway line. The resource has been excluded from the development footprint on site H, Taaibos.	General management measures such as informing SAHRA and chance finds procedure to be put in place. A detailed survey of the demarcated area was recommended. Buffering of the site was recommended.
Linde SEF (Expansion)	14/12/16/3/3/1/1122	One site was identified with a cultural heritage resource, a stone redoubt emanating from the Second Boer War together with a portion of low gauge railway line. The resource has been excluded from the development footprint on site H, Taaibos.	General management measures such as informing SAHRA and chance finds procedure to be put in place. A detailed survey of the demarcated area was recommended. Buffering of the site was recommended.
Middelburg Solar Park 1	12/12/20/2465/2	Surface scatters of middle stone age and later stone age artefacts occurred over the extent of the area. A few stone outcrops showed higher concentrations of lithics and required buffering.	General management measures such as informing SAHRA and chance finds procedure to be put in place. A detailed survey of the demarcated area was recommended. Buffering some sites were recommended.
Middelburg Solar Park 2	12/12/20/2465/1	Surface scatters of middle stone age and later stone age artefacts occurred over the extent of the area. A few stone outcrops showed higher concentrations of lithics and required buffering.	General management measures such as informing SAHRA and chance finds procedure to be put in place. A detailed survey of the demarcated area was

Project	DEA Reference No	Findings	Recommendations
			recommended. Buffering some sites were recommended.
Naauw Poort SEF	14/12/16/3/3/2/355	Surface scatters of middle stone age and later stone age artefacts occurred over the extent of the area. A few dry pack stone walls were identified as having a medium heritage significance. One area of high significance was demarcated. Various fossil finds were made in the Katberg formation during fieldwork.	General management measures such as informing SAHRA and chance finds procedure to be put in place. A detailed survey of the demarcated area was recommended. Further ground truthing of footprint areas were recommended.
Toitdale SEF	12/12/20/2653	Surface scatters of middle stone age artefacts occurred over the extent of the area.	General management measures such as informing SAHRA and chance finds procedure to be put in place.
Noupoort Wind Farm	12/12/20/2319	A rock shelter with rock art was identified. Numerous dry-stone walled enclosures were identified. A farmstead and cemetery were also identified during the fieldwork. Various fossil finds were made in the Katberg formation during fieldwork.	General management measures such as informing SAHRA and chance finds procedure to be put in place. A detailed survey of the demarcated area was recommended. Further ground truthing of footprint areas were recommended
Phezukomoya WEF	14/12/16/3/3/1/1028	Stone Age archaeological sites are sparse in the high suurveld areas and that not very many sites will be physically impacted. Two archaeological sites will require mitigation through avoidance or alternatively systematic collection. Only a few fossil remains were recorded during a four-day field assessment	General management measures such as informing SAHRA and chance finds procedure to be put in place. A detailed survey of the demarcated area was recommended. Buffering some sites were recommended.

Project	DEA Reference No	Findings	Recommendations
San Kraal WEF	14/12/16/3/3/1/1069	The comprehensive survey of the project area, associated infrastructure and power lines has revealed that Stone Age archaeological sites are sparse in the high suurveld areas and that not very many sites will be physically impacted. Fossil finds on site are confined to mostly fragmented river-washed bone fragments. The presence of a number of fossilised vertebrate burrows in a riverbed was also noted	General management measures such as informing SAHRA and chance finds procedure to be put in place. A detailed survey of the demarcated area was recommended. Buffering some sites were recommended.
Umsobomvu WEF	14/12/16/3/3/2/730	A total of 41 heritage sites were noted in the study area from in the desktop and field survey. These sites varied from open stone tool scatters, rock art sites in small overhangs, and built structures such as farm buildings and kraals. The historical buildings were the most frequently occurring heritage sites. Three (3) of these early farmsteads have associated cemeteries. There are no fatal flaws in the Umsobomvu WEF development proposal as far as fossil heritage is concerned.	General management measures such as informing SAHRA and chance finds procedure to be put in place. A detailed survey of the demarcated area was recommended. Buffering some sites were recommended.

6.3.7 Palaeontology

A total of 17 Renewable Energy Facilities (13 Solar Energy Facilities and 3 Wind Energy Facilities) are present in a 35km radius of the proposed solar PV energy facility. 13 of these facilities have been approved while two (2) facilities are operational and two (2) are in and EIA Process (**Table 24**).

It was difficult to obtain all the relevant Palaeontological Impact Assessments from the internet except the following:

- ALMOND, J. E., 2017. Palaeontological Impact Assessment of the proposed Phezukomoya wind farm near Noupoort, Northern and Eastern Cape.
- BUTLER, E. 2016. Palaeontological Impact Assessment of the proposed construction of the 150 MW Noupoort concentrated solar power facility and associated infrastructure on portion 1 and 4 of the farm Carolus Poort 167 and the remainder of Farm 207, near Noupoort, Northern Cape.
- GESS, R. 2012**.** Proposed construction of a Photovoltaic Power station and associated infrastructure at Collett substation near Middelburg in the Eastern Cape. Palaeontological Impact Assessment Report.

Table 27 below provides the findings and recommendations from the other specialist studies / assessments which were reviewed.

Table 27: Findings and Recommendations from other Specialist Studies / Assessments

Project	Findings	Recommendations
Allemans Fontein SEF	Mudstones and sandstones and dolerite	No fossils observed, No special recommendations Proceed with Project
Carolus Poort SEF	Katberg and Balfour Formations present, dolerite	No fossils observed, No special recommendations Proceed with Project
Damfontein SEF	Mudstones and sandstones and dolerite	Pre-construction site visit
Gillmer SEF	Mudstones and sandstones and dolerite	No fossils observed, No special recommendations Proceed with Project
Inkululeko SEF	-	-
Kleinfontein SEF	-	-
Klip Gat SEF	Adelaide Subgroup and dolerite	Pre-construction site visit
Linde SEF	-	-
Linde SEF (Expansion)	-	-
Middelburg Solar Park 1	Katberg and Balfour Formations, dolerite and Quaternary	Pre-construction site visit
Middelburg Solar Park 2	Katberg and Balfour Formations, dolerite and Quaternary	Pre-construction site visit
Naauw Poort SEF	Katberg Formation	Pre-construction site visit
Toitdale SEF	-	-
Noupoort Wind Farm	Katberg Formation, dolerite and Quaternary	No site visits pending discovery of fossils
Phezukomoya WEF	Katberg and Balfour Formations present; fragmentary bones vertebrate burrows,	Buffer, mitigation
San Kraal WEF	Katberg and Balfour Formations present;	Buffer, mitigation
Umsobomvu WEF	-	-

6.3.8 Social

Renewable energy facilities require specific climatic conditions that provide high levels of solar radiation and wind energy. This has resulted in a tendency for these facilities to be clustered in specific areas, such as the Karoo, that provide these ideal conditions. Consequently, this grouping of facilities in specific areas has in turn led to cumulative impacts. In this regard the following developments, illustrated in the map in **Figure 50,** have been identified within a 35km radius of the proposed Paarde Valley Solar PV Energy Facility:

- Allemans Fontein SEF;
- Carolus Poort SEF;
- Damfontein SEF;
- Gillmer SEF;
- Inkululeko SEF
- Kleinfontein SEF;
- Klip Gat SEF;
- Linde SEF;
- Middelburg Solar Park 1;
- Middelburg Solar Park 2;
- Naauw Poort SEF;
- Toitdale SEF;
- Noupoort Wind Farm;
- Phezukomoya WEF;
- San Kraal WEF;
- Umsobomvu WEF; and
- Linde SEF (Expansion).

6.3.8.1 Review of Specialist Reports for Renewable Energy Facilities in the Area

The following more specific social issues have been raised in the specialist reports pertaining to the various renewable energy initiatives identified above.

- **<u>Positive impacts</u>**
  - Job creation; Impacts associated with the construction phase are generally short-term
  - Establishment of local community trust
  - Establishment of renewable energy infrastructure

- **<u>Negative impacts</u>**
  - Sense of place
  - Influx of construction workers
  - Impact on family and community relations – STDs and HIV
  - Risk of stock theft, poaching and damage to farm infrastructure
  - Risk of veld fires
  - Impact of heavy vehicles, damage to roads, safety, noise and dust
  - Loss of agricultural land

- Impact on tourism

- **Indirect Impacts**
  - After construction locals may not find future employment
  - Skills and development – increased employability

- **Cumulative Impacts**
  - Development of additional renewable energy facilities – increased potential for job creation
  - Impact on family and community relations – STDs and HIV
  - Sense of place
  - Pressure on municipal and social services

- **No-Go option**
  - Loss of renewable energy infrastructure
  - High carbon emissions
  - Unsustainable way to produce electricity
  - Overall social impact
  - Predominantly low significance (positive impact)
  - In respect of climate change – a positive social benefit for society as a whole.

The details of the reports from which these impacts have been sourced are provided in **Table 28** below.

Table 28: List of EIA reports for developments within a 35km radius

Date	Title of report	DEA Ref number	Consultant responsible for report	Page numbers
July 2011	Establishment of Photovoltaic (Solar Power) Farms in the Northern Cape	12/12/20/2258	Sustainable Development Projects cc	4-5, 37-39, 51
February 2012	Environmental Basic Impact Assessment Process Draft Basic Assessment Report, Proposed Toitdale Solar Energy Facility Northern Cape Province	12/12/20/2653	Savannah Environmental (Pty) Ltd	47, 58, 61-62
March 2012	Social Impact Assessment Aced Middleburg Photovoltaic Solar Energy Facility Eastern Cape Province	Specialist report	Tony Barbour Environmental Consulting and Research	Entire report
March 2012	Environmental Basic Impact Assessment Process Draft Basic Assessment Report, Proposed Middelburg Solar Park 1 Eastern Cape Province	12/12/20/2465/2	Savannah Environmental (Pty) Ltd	54-63, 71-73
13 April 2012	Mainstream Renewable Power South Africa Noupoort (Pty) Ltd. Proposed Construction of a Wind Farm near Noupoort, Northern Cape Province, South Africa. Final Environmental Impact Report	12/12/20/2319	SiVEST Environmental Division	156-177, 221-228, 232-234
May 2012	Environmental Basic Impact Assessment Process Draft Basic Assessment Report, Proposed Tollie Solar Energy Installation on a site near Noupoort, Northern Cape Province	14/12/16/3/3/1/528	Savannah Environmental (Pty) Ltd	54-59, 65-68
September 2012	Environmental Impact Assessment Process Final Basic Assessment Report, Proposed Klip Gat Solar Energy Facility (75MW) near Noupoort, Northern Cape Province	14/12/16/3/3/2/354	Savannah Environmental (Pty) Ltd	61-62, 71-72, 79
September 2012	Environmental Impact Assessment Process Final Basic Assessment Report, Proposed Naauw Poort Solar Energy Facility (75MW) near Noupoort, Northern Cape Province	14/12/16/3/3/2/355	Savannah Environmental (Pty) Ltd	84-86, 95-96, 101, 101-111
November 2012	Social Impact Assessment Klipgat Solar Energy Facility Northern Cape Province (Draft Report)	Specialist report	Tony Barbour Environmental Consulting and Research	Entire report
December 2012	Environmental Impact Assessment Process Final Basic Assessment Report, Proposed Damfontein Solar Energy Facility near Noupoort, Northern Cape Province	14/12/16/3/3/1/728	Savannah Environmental (Pty) Ltd	70-72 & 79-81
January 2013	Environmental Impact Assessment Process Final Basic assessment Report, Allemans Fontein Solar Energy Facility near Noupoort, Northern Cape Province	14/12/16/3/3/1/730	Savannah Environmental (Pty) Ltd	66-67 & 80-81

January 2013	Environmental Impact Assessment Process Final Basic Assessment Report, Proposed Carolus Poort Solar Energy Facility near Noupoort, Northern Cape Province	14/12/16/3/3/1/729	Savannah Environmental (Pty) Ltd	73-74
January 2013	Environmental Impact Assessment Process Final Basic Assessment Report, Proposed Gillmer Solar Energy Facility near Noupoort, Northern Cape Province	14/12/16/3/3/1/735	Savannah Environmental (Pty) Ltd	74-75 & 78-79, 82-83
January 2013	Environmental Impact Assessment Process Final Basic Assessment Report, Proposed Inkululeko Solar Energy Facility near Noupoort, Northern Cape Province	14/12/16/3/3/1/553	Savannah Environmental (Pty) Ltd	63, 66 & 68
January 2013	Environmental Impact Assessment Process Final Basic Assessment Report, Proposed Kleinfontein Solar Energy Facility near Noupoort, Northern Cape Province	12/12/20/3//2654	Savannah Environmental (Pty) Ltd	45-46, 59, 61
April 2016	Proposed Umsobomvu Wind Energy Facility, Northern Cape & Eastern Cape Provinces	14/12/16/3/3/2/730	Savannah Environmental (Pty) Ltd	117-121, 127, 147
December 2017	Social Impact Assessment Phezukomoya Wind Energy Facility Northern Cape and Eastern Cape Province	Specialist report	Tony Barbour Environmental Consultant and Researcher	Entire report
December 2017	Social Impact Assessment San Kraal Wind Energy Facility Northern and Eastern Cape Province	Specialist report	Tony Barbour Environmental Consultant and Researcher	Entire report
March 2018	Environmental Impact Assessment Report for the Proposed 315 MW Phezukomoya Wind Energy Facility and Grid Connection, Northern and Eastern Cape Provinces	14/12/16/3/3/2/1028	Arcus Consultancy Services South Africa (Pty) Limited	ix, 329-338, 350
March 2018	Environmental Impact Assessment Report for the Proposed 390 MW San Kraal Wind Energy Facility and Grid Connection, Northern and Eastern Cape Provinces	14/12/16/3/3/2/1029	Arcus Consultancy Services South Africa (Pty) Limited	vii-viii, 328-337, 350

Recommendation

Recommendations of the reports reviewed indicate that, on an overall basis, the social benefits of renewable energy developments in the area outweigh the negative benefits and that the negative social impacts can be mitigated.

In this regard the following cumulative impacts are addressed below:

- Risk of HIV;
- Sense of place;
- Service supplies and infrastructure; and
- The economic benefit.

6.3.8.2 Risk of HIV Infections[12]

With an HIV prevalence rate of 17.5%, the Northern Cape Province has the lowest HIV prevalence rate of all provinces across South African with the Eastern Cape having the third highest rate at 31.4%. At a district level the Pixley ka Seme District Municipality has the 5th lowest HIV prevalence rate across all district municipalities in South Africa at 15.1%. In comparison, the Chris Hani district has the 14th highest HIV prevalence rate across all district municipalities with a rate of 34.5%. It is most likely that this higher prevalence rates in the Chris Hani district will be associated with more densely populated urban areas and along transport routes, considering that the Chris Hani district serves as a linking node to all regions in the Eastern Cape.

With most developments falling within what is a sparsely populated region of the Northern Cape and along the sparsely populated Northern and Eastern Cape border, HIV prevalence rates will likely be low within the immediate vicinity of these developments. Consequently, it is important to consider the risk of the spread of HIV associated with these developments, particularly where the workforce is recruited from areas that are likely to have relatively high levels of HIV such as Middelburg and other urban areas further afield. This is important as it is well documented on both an international and local basis that the construction industry carries with it a high risk of HIV (Meintjes, Bowen, & Root, 2007; Bowen, Dorrington, Distiller, Lake, & Besesar, 2008; Wasie, et al., 2015; Bowen P. , Govender, Edwards, & Cattell, 2016; Kikwasi & Lukwale, 2017; Bowen P. , Govender, Edwards, & Lake, 2018) which can be spread amongst the local communities, particularly through an increase in prostitution that follows the availability of disposable income. It is also well documented, on both an international and local level, that HIV is also spread by truck drivers (Singh & Malaviya, 1994; Ramjee & Gouws, 2002; Strauss, *et al*., 2018) and there is likely to be an increase in truck drivers in the area as equipment and material is delivered to the various construction sites.

These issues, associated with the area being extremely poor and the associated disposable income that will follow the construction workers and truck drivers to the area, will heighten the risk of the spread of HIV infections across what is a rather remote region. In this regard, The World Bank (2009, pp. 367-368) had indicated a strong link between infrastructure projects and health as:

[12] HIV prevalence rates are at 2013 figures based on The 2013 National Antenatal Sentinel HIV Prevalence Survey, South Africa.

'*Transport, mobility, and gender inequality increase the spread of HIV and AIDS, which along with other infectious diseases, follow transport and construction workers on transport networks and other infrastructure into rural areas, causing serious economic impacts.*'

6.3.8.3 Transformation of Sense of Place

There is also a concern amongst various interest groups that the proliferation of renewable energy facilities in the Karoo will have a significant and negative cumulative social impact on the area's isolated, tranquil and pristine environment[13]. In this regard issues such as the aesthetic appearance associated with highly visible solar parks and wind farms; the noise from turbine blades; the loss of bird and bat life and its effect on tourism; as well as the disruption of social networks have all been cited amongst these concerns.

This is, however, a complex issue as there are varying opinions in respect of the aesthetic appearance of renewable energy facilities with some regarding them in a far more positive light than others (Firestone, Bidwell, Gardner, & Knapp, 2018; Schneider, Mudra, & Kozumplíková, 2018). In a study of public attitudes towards onshore wind farms in south-west Scotland, it was found that many regarded the visual impact of these developments in a positive light. It must, however, be noted that this was linked with community ownership having a positive impact on public attitudes towards windfarm developments in Scotland (Warren & McFadyen, 2010). A further and important consideration in this regard is of an ethical nature associated with community acceptance and energy justice and raises the question of the incorporation of public acceptance, particularly that of the underrepresented, into energy policy (Roddisa, Carvera, Dallimerb, Normana, & Ziva, 2018, pp. 362-363).

6.3.8.4 Services, Supplies and Infrastructure

With the increase in renewable energy facilities in the area it is quite likely that the local authorities, currently hard pressed to deliver services, will find it difficult to keep up with these developments. The influx of construction workers is likely to place pressure on accommodation and the need for both services and supplies. Noupoort, Hanover and Middelburg, being within a 35km radius of these developments, are likely to bear the brunt of the demand for accommodation, services and supplies. On this basis market demands could inflate costs which may have a negative effect on local communities, particularly the poor, who may be forced to pay higher prices for essential supplies resulting in an escalation in the cost of living in the area.

Social services such as medical and educational facilities could also be placed under pressure due to increased demand. Although this may reach its peak during the construction phase it should be

[13] Amongst others see for instance:
1. Heritage South Africa's Karoo News Group http://heritagesa.org/wp/2222-2/
2. Alternative sources of energy for South Africa in various shades of green (Smit, 2011)
3. Social media sites such as the Facebook Karoo Energy Debate https://www.facebook.com/TheKarooEnergyDebate/
4. Why the Karoo (Research Chair in the Sociology of Land, Environment and Sustainable Development. Department of Sociology and Social Anthropology, Stellenbosch University, 2016).

mitigated somewhat by the fact that the construction of the various developments will be spread across different timelines, with some developments commencing while others reach completion. Employing local people across the various developments and development phases will help in reducing the stress placed on services, supplies and infrastructure in the area.

During the operational phases it is likely that these demands will continue as operational staff take up more long-term residency in the area and are supported by service and maintenance personnel who may spend some time on site on a contractual basis. An influx of temporary maintenance and service workers is likely to last over the operational phase of the developments but is likely to settle within the medium term as the economy adjusts and the municipal authorities are able to respond to this growth.

6.3.8.5 Economic Benefit

The cumulative economic impact of the proposed development will be both positive and negative. The negative economic impacts, associated with a possible rise in living costs driven by market demand, are considered under the section above. Under this section, the positive economic impacts will be addressed.

From a positive perspective, the proliferation of renewable energy facilities within the region is likely to result in significant and positive cumulative impacts in the area associated with both direct and indirect job creation, skills development, training opportunities, and the creation of business opportunities for local businesses. The district and local municipalities within the area have identified renewable energy as a strategic economic opportunity in a region that previously had few such opportunities. This is indicated in the various IDPs and LEDs pertaining to the affected municipalities.

6.3.8.6 Assessment of Cumulative Impacts

The cumulative impacts discussed above are assessed in **Table 23** on **page 188**. It must, however, be noted that this assessment is at a superficial level as any in-depth investigation of the cumulative effects of the various developments being planned for the region are beyond the scope of this study as they would require a broad-based investigation on a far larger scale.

The assessment of the cumulative impacts takes into consideration the impacts associated with all renewable energy facilities within a 35km circumference of the Paarde Valley Solar PV Energy Facility. On this basis no fatal flaws associated with the cumulative impacts are evident at a social level. The findings support the recommendations of the reports listed in **Table 28** that, on an overall basis, the social benefits of renewable energy developments in the area outweigh the negative benefits and that the negative social impacts can be mitigated.

6.3.9 Transportation

SiVEST undertook every effort to obtain the information (including specialist studies, BA / EIA / Scoping and EMPr Reports) for the surrounding developments, however many of the documents are not currently publically available. To this extent, the information that could be obtained for the surrounding planned renewable energy developments was taken into account as part of the cumulative impact assessment.

The information obtained for other planned renewable energy developments in the surrounds is indicated in **Figure 50**. A number of the proposed renewable energy developments are located within a 35km radius of the solar PV energy facility development. However, for the purpose of this assessment, the specialist only assumed the two (2) developments which are in close proximity to the Paarde Valley Solar PV Energy Facility development as it is believed they will have the greatest impact from a transportation perspective. The two (2) development are therefore as follows:

UMSOBOMVU - Wind Energy Facility (WEF)	
Developer	Umsobomvu Wind Power (Pty) Ltd
Renewable Energy Type	Wind Turbine Generators
Total Development Area	18 263ha
Wind Turbine Generators	84 Turbines
Infrastructure Area	108.8ha
PHEZUKOMOYA - Wind Energy Facility (WEF)	
Developer	Phezukomoya Wind Power (Pty) Ltd
Renewable Energy Type	Wind Turbine Generators
Total Development Area	15 271ha
Wind Turbine Generators	63 Turbines
Infrastructure Area	74.25ha

Based on the information available, both developments have indicated that they will NOT use the Leeupoort / Noupoort intersection located on the N10 freeway at Km 19.92 on section N10-5. Therefore, the cumulative impact on the proposed access point on the N10 freeway will only be applicable to the Paarde Valley Solar PV Energy Facility.

There will however be a cumulative impact on the background traffic between the Paarde Valley Solar PV Energy Facility and Noupoort / Middleburg. This impact will however be difficult to simulate as the intended start dates and construction programs for each development will need to be clarified. It is therefore recommended that this study be completed prior to the construction process with all Renewable Energy parties involved in the immediate area.

The cumulative impacts discussed above are assessed in **Table 23** on **page 188**.

7 LAYOUT ALTERNATIVES

One (1) of the aims of the Scoping Report is to identify alternatives to carry through to the EIA phase of the investigation for detailed assessment (as was discussed in **section 2.3**). The selection of alternatives during the scoping phase of the proposed development usually helps to focus future investigations, both in terms of the environmental investigations required and the scope of the public participation process. As previously mentioned, no layout alternatives for the laydown areas and O&M buildings have been identified or comparatively assessed at this stage. These will be informed by the identified environmental sensitive areas and will be presented and assessed in the EIA phase. Two (2) grid connection infrastructure alternatives (which include on-site and collector substation sites and 132kV power line corridors) have however been comparatively assessed by the respective specialists. These alternatives essentially provide for two (2) different route alignments with associated substations (on-site and collector) contained within an assessment corridor of approximately 400m wide. It should be noted that the substation sites included as part of this application are intrinsically linked to the associated electrical infrastructure development (part of a separate BA process which will be initiated at a later stage). Although the specialists assessed the grid connection infrastructure alternatives as part of their respective assessments, these will be comparatively assessed as part of the associated electrical infrastructure BA and will inform the location of the on-site and collector substation sites (to be presented in EIA phase).

Various environmental specialists assessed the site during the scoping phase. Their assessments focussed on the entire application site as the layout of the proposed solar PV energy facility (number of panels, generation capacity and layout of arrays) will be dependent on the outcome of the specialist studies, as well as the area available for the erection of PV panels. These specialist assessments also included the identification of sensitive areas. These sensitive areas were subsequently used during the scoping phase to inform the area for the potential erection of PV panels within the application site (referred to as the PV development area)[14]. The proposed PV development area in relation to the environmental sensitive areas is shown in **Figure 52**. The above-mentioned proposed PV development area will be used to inform the layout alternatives which will be presented and assessed in the EIA phase of the proposed development (see the plan of study for the EIA phase in **Chapter 11**).

It should be noted that the alternatives which will be presented and assessed in the EIA phase will be based on both environmental constraints and design factors. The findings of the specialist studies and sensitivity mapping will be used to inform the layout of the proposed facility within the preferred site during the EIA phase.

[14] PV panels will not necessarily be erected in the entire proposed PV development area, particularly where PV panels cannot be placed (e.g. under the existing 400kV transmission lines).

As part of the EIA, the layout for the proposed solar PV energy facility and associated infrastructure will aim to avoid the sensitive features identified by the specialists.

As mentioned above, various specialists identified site-specific sensitive areas during the scoping phase of the EIA. These sensitive areas were subsequently used to inform the proposed PV development area. The identified sensitive areas were precluded from the proposed PV development area. These include the Terrestrial Ecologist, Palaeontologist, Surface Water and Agricultural Specialists. The sensitive areas will be refined in the EIA phase, if required. In addition, site-specific sensitive areas will be precluded from the proposed PV development area, where required. The sensitive areas as identified during the scoping phase by the various specialists overlaid on the proposed PV development area are shown in **Figure 52**.

7.1 Assessment of PV Development Areas

It should be noted that prior to the submission of the DSR, a preliminary PV development area was considered by the applicant. However, in order to ensure that the proposed development avoids the sensitive areas identified by the specialists, the preliminary PV development area was subsequently amended (presented in **Figure 52**). During the scoping phase the preliminary PV development area was comparatively assessed with the proposed PV development area which was informed by the identified sensitive areas (namely the 'proposed PV development area') in order to assess and confirm if this would be 'preferred' from an environmental perspective. A comparative assessment of the preliminary PV development area with the proposed PV development area is thus provided in this section.

A map showing the preliminary PV development area in relation to the identified environmental sensitive areas is provided in **Figure 51** below.

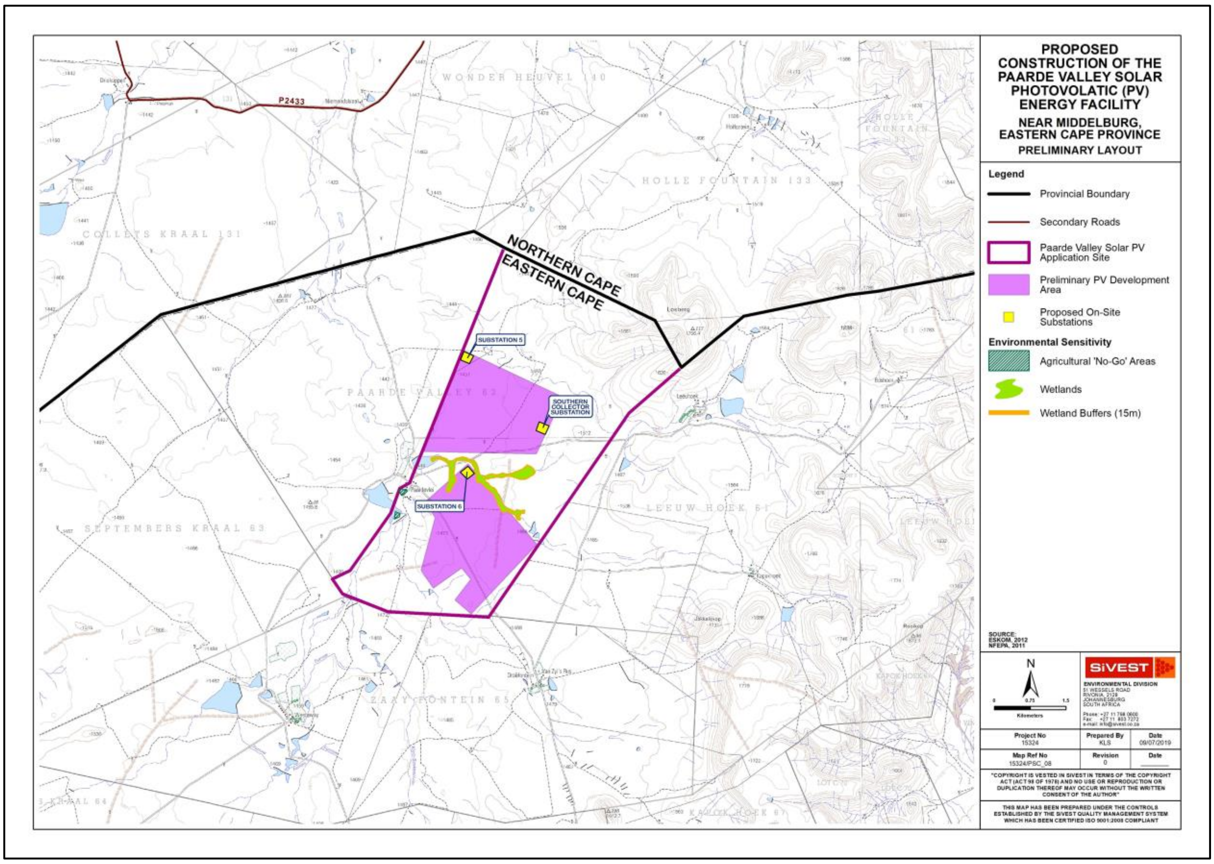

Figure 51: Preliminary PV development area in relation to identified environmental sensitive areas

A map showing the proposed PV development area in relation to the identified environmental sensitive areas is shown in **Figure 52** below.

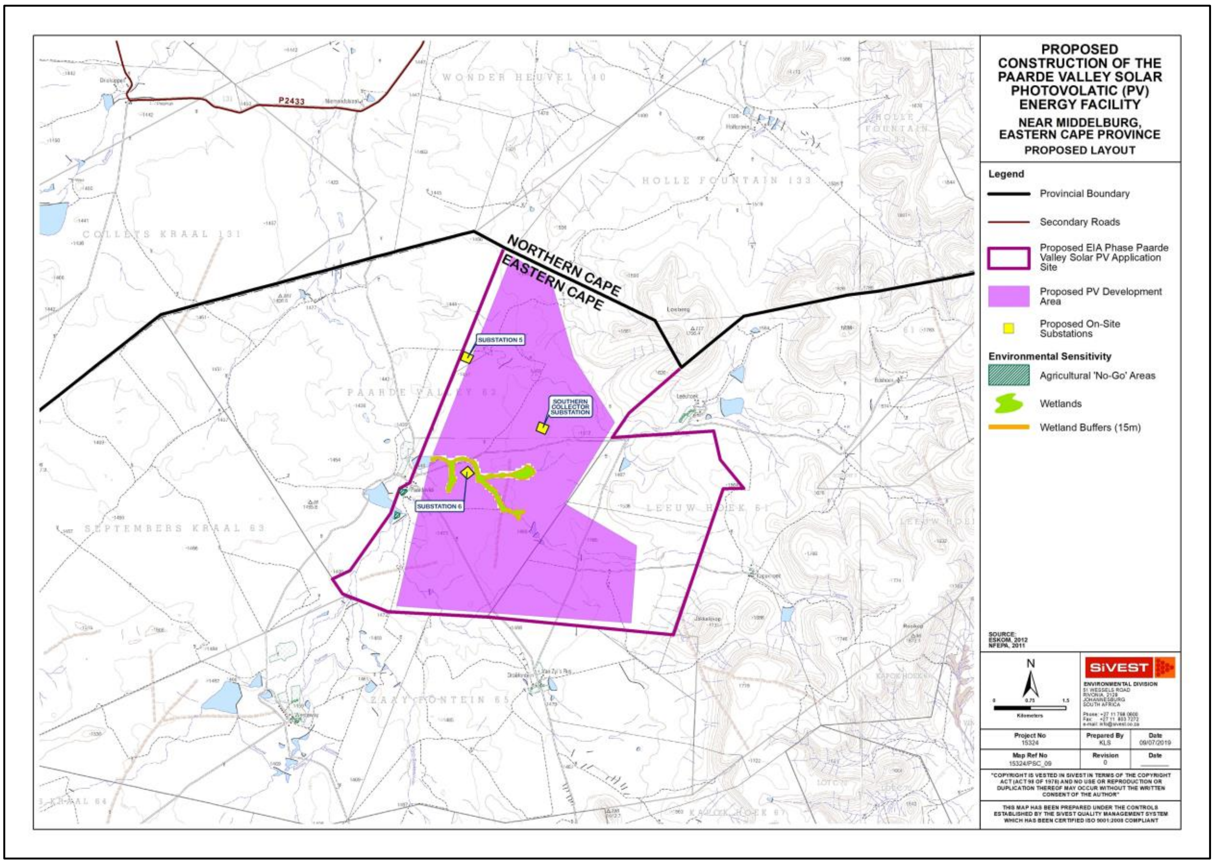

Figure 52: Proposed PV development area in relation to environmental sensitive areas

Based on a comparative assessment of the respective PV development areas in **Figure 51** and **Figure 52** above, it can be concluded that the proposed PV development area is preferred from an environmental perspective. This is due to the following reasons:

- Parts of a wetland and its associated recommended buffer (15m) located within the application site encroach into one (1) of the preliminary PV development areas. A 15m buffer has been applied to this buffer and this has been identified as a "No-Go' area; and
- The proposed PV development area has avoided all of the 'No-Go' areas which were identified by the respective specialists.

As mentioned, the proposed PV development area (which was 'preferred' from an environmental perspective) in relation to the environmental sensitive areas will be used to inform the layout alternatives which will be presented and assessed in the EIA phase of the proposed development. As such, all alternatives will be presented and extensively investigated and assessed in the EIA phase of the proposed development. The alternatives will include alternative locations for the laydown area and O&M buildings[15].

[15]The on-site and collector substation site alternatives will not be comparatively assessed as part of this EIA as the substation locations are intrinsically linked to the grid connection infrastructure alternatives (which include on-site and collector substation sites and 132kV power line corridors). The preferred alternatives will be informed by the BA process (part of a separate BA process) and will be put forward in the EIA phase.

It should be noted that, as previously mentioned, PV panels will not necessarily be erected in the entire proposed PV development area, particularly where PV panels cannot be placed (e.g. under the existing 400kV transmission lines). In addition, the proposed PV development area will be refined in the EIA phase, if required.

8 PUBLIC PARTICIPATION PROCESS

Public participation is the cornerstone of any EIA process. The principles of NEMA as well as the EIA Regulations, 2014 (as amended), govern the EIA process, including public participation. These include provision of sufficient and transparent information on an on-going basis to Interested and/or Affected Parties (I&APs) and key stakeholders, such as Organs of State (OoS) / authorities, to allow them to comment, and ensuring the participation of previously disadvantaged people, women and the youth.

The public participation process is primarily based on two (2) factors.

1. Firstly, on-going interaction with the environmental specialists and the technical teams in order to achieve integration of technical assessment and public participation throughout; and
2. Secondly, to obtain the bulk of the issues to be addressed early on in the process, with the latter half of the process designed to provide environmental and technical evaluation of these issues. These findings are presented to stakeholders for verification that their issues have been captured and for further comment.

Input into the public participation process by members of the public, I&APs and key stakeholders can be given at various stages of the EIA process. Registration on the project database can take place at any time during the EIA process up until the final EIA report is submitted to the DEA for decision-making. There are however established periods in which comments are required from I&APs and key stakeholders in order to ensure that these are captured in time for the submission of the various reports. The comment periods during the scoping phase will be implemented according to the EIA Regulations, 2014 (as amended). The comment periods which have been implemented at this stage of the scoping phase (as set out by the EIA Regulations, 2014) were as follows:

- Comment and review period for the Draft Scoping Report (DSR): 30 days.

As stipulated in the EIA Regulations, 2014 (as amended), the DSR will undergo a 30-day comment and review period that will run from Friday 26 July 2019 until Monday 26 August 2019 (excluding public holidays). Any I&APs and key stakeholders that wish to register on the project's database or comment on this report are encouraged to contact SiVEST environmental division. The contact details are as follows:

Contact: Hlengiwe Ntuli or Stephan Jacobs
PO Box 2921, RIVONIA, 2128
☎ Phone:(011) 798 0600
E-mail:hlengiwen@sivest.co.za / stephanj@sivest.co.za / sivest_ppp@sivest.co.za
Fax:(011) 803 7272
Websites:www.sivest.co.za

The EIA Regulations, 2014 (as amended), emphasise the importance of public participation. In terms of these regulations, registered I&APs and key stakeholders –

- may participate in the application process;

- must comment within the timeframes as stipulated by the EIA Regulations, 2014 (as amended);
- must send a copy of any comments to the applicant or EAP if the comments were submitted directly to the competent authority; and
- must disclose any direct business, financial, personal or other interests that the person has in the application being granted or refused.

Further, in terms of the EIA Regulations, 2014 (as amended), the EAP:

- manages the application process;
- must be independent;
- must undertake the work objectively, even if this results in views and findings that are not favourable to the applicant;
- must disclose material information that may influence the decision; and
- must conduct a public participation process.

It should be noted that the Public Participation Process is being undertaken in line with Chapter 6 of the EIA Regulations, 2014 (as amended). Comments/queries/issues/concerns related to the proposed development which been received to date have been included in **Appendix 7D** of the DSR. The following actions are undertaken upon receiving comments/queries/issues:

- Once a comment/query/issue/concern has been obtained from an I&AP and/or key stakeholder who was not yet been included in the project database, the contact details provided will be included in the project database for use in future notifications;
- Comments will be addressed in an email (if required) or in the Comments & Response Report (C&RR);
- The C&RR has been included in the DSR (**Appendix 7E**);
- The C&RR will be updated throughout the EIA process to address any comments/queries/issues/concerns received; and
- C&RR will be made available to all I&APs and key stakeholders within the FSR.

8.1 Objectives of Public Participation

An understanding of what the public participation is, and is what it is not, needs to be explored and must be clarified.

- Public Participation is:
    - A communication mechanism to inform I&APs and key stakeholders regarding a proposed development; and
    - A communication mechanism to record comments and/or concerns regarding a proposed development raised during the relevant phases of the EIA process by I&APs and key stakeholders.

- Public Participation is not:
    - A marketing exercise;

- A process to address grievances but rather to record comments and/or concerns raised; and
- One-on-one consultation with each I&AP and/or key stakeholder during the EIA process.

The primary aims of the Public Participation Process were:

- To inform I&APs and key stakeholders of the proposed development;
- To initiate meaningful and timeous participation of I&APs and key stakeholders;
- To identify issues and/or concerns of key stakeholders and I&APs with regards to the proposed development;
- To promote transparency and an understanding of the proposed development and its potential environmental impacts;
- To provide information used for decision-making;
- To provide a structure for liaison and communication with I&APs and key stakeholders;
- To assist in identifying potential environmental impacts associated with the proposed development;
- To ensure inclusivity (the views, needs, interests and values of I&APs and key stakeholders must be considered in the decision-making process);
- To focus on issues relevant to the proposed development and issues considered important by I&APs and key stakeholders;
- To provide responses to I&AP and key stakeholder queries/comments/concerns;
- To encourage co-regulation, shared responsibility and a sense of ownership; and
- Meet the requirements for Public Participation as stated in Chapter 6 of the EIA Regulations, 2014 (as amended).

In addition to the guidance of the Public Participation Process in the EIA Regulations, 2014 (as amended), every effort was also made to conform to the requirements of the Promotion of Administrative Justice Act, 2000 (Act No. 3 of 2000).

8.2 Overview of the Public Participation Process to date

As mentioned, the Public Participation Process has been undertaken in line with Chapter 6 of the EIA Regulations, 2014 (as amended).

The public participation process was initiated in July 2019 with initial landowner consultation and included the following activities to date:

- An I&AP database was compiled which includes all affected landowners, adjacent landowners, occupiers of affected and adjacent land, other I&APs, key stakeholders (such as OoS) and other surrounding project developers. The I&AP database is included in **Appendix 7F**.
- Contacting all affected and adjacent landowners to request contact details of the occupiers residing on their land. Proof of this is included in **Appendix 7H**.

- Public notification of the EIA process was advertised (in English and Afrikaans) in a local/regional newspaper (namely the Graaff-Reinet Advertiser), as required under the EIA Regulations, 2014 (as amended), on the 3rd of July 2019. Proof of the advertisements is provided in **Appendix 7C**.
- The affected and adjacent/surrounding landowners were notified about the proposed development via a notification letter. Proof of these notifications is included in **Appendix 7B** and **Appendix 7D**.
- A Background Information Document (BID) (English and Afrikaans) was compiled and distributed to I&APs and key stakeholders registered on the project database on Friday the 26th of July 2019, along with written notification to all I&APs and key stakeholders. Copies of the BID as well as the written notifications to all I&APs and key stakeholders are provided in **Appendix 7B**. Proof of distribution will be included in the FSR.
- English and Afrikaans site notices (as per regulations) were placed within the study area during a site visit undertaken on the 12th of July 2019. Proof of the site notices is shown in **Appendix 7A**. Refer to **section 8.6** for more information regarding the site notices.
- Posters (English and Afrikaans) were erected at a public venue in the town of Middelburg. In addition, hard copies of the BIDs (English and Afrikaans) were also distributed at this venue. Proof of the posters which were erected and the BIDs which were distributed is included in **Appendix 7B**.
- The DSR was released for public review and comment on Friday the 26th of July 2019 and will remain in the public domain for 30 days, until Monday the 26th of August 2019. Refer to **Appendix 7B** and **Appendix 7I**.
- All OoS will be sent electronic copies (on CD) of the DSR, which will be made available for review and comment for a period of 30-days (excluding public holidays). Reminder notifications of the closing period of the DSR will be sent out approximately two (2) days prior to the comment period ending to ensure that comments and/or concerns are received from the OoS. Refer to **Appendix 7I**.
- A hard copy of the DSR will also be available from the Middelburg public library, and an electronic copy will be made available on SiVEST's website: *http://www.sivest.co.za/*, click on *'Downloads'* then browse to the folder *'15324 Paarde Valley Solar PV'.*
- The stages that typically form part of the public participation process during the scoping phase of the EIA process are reflected in **Figure 53** below.

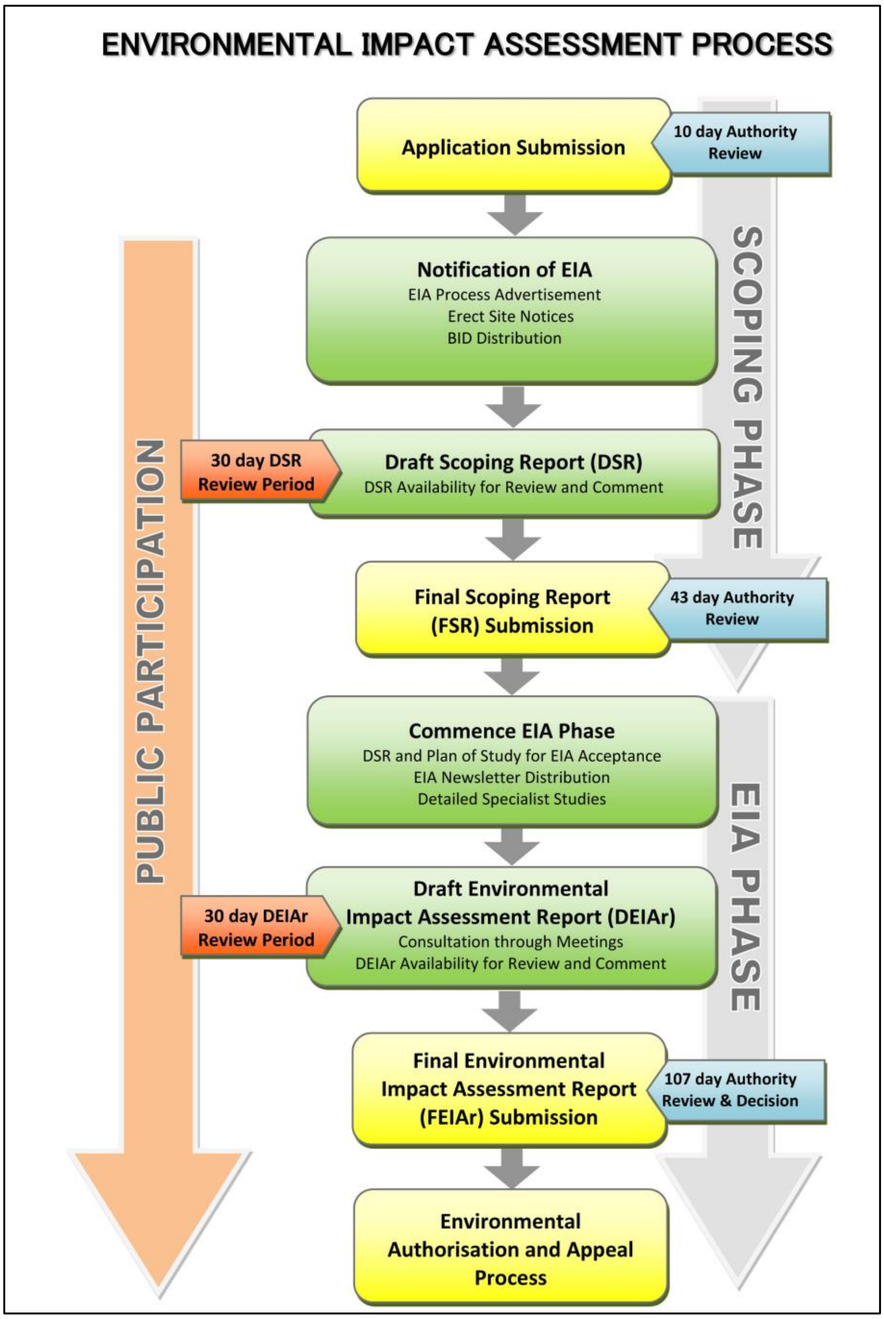

Figure 53: EIA and Public Participation Process

On-going consultation with key stakeholders (e.g. provincial, district and local authorities, relevant government departments, local business etc.) and identified I&APs will ensure that I&APs and key stakeholders are kept informed regarding the EIA process. Networking with I&APs and key stakeholders will effectively continue throughout the EIA process until the final EIA report is submitted to the DEA for decision-making. Where required, key stakeholders and I&APs will be engaged on an individual basis.

During the scoping phase, individuals, businesses, institutions and organisations, and the following sectors of society have been identified and will be afforded the opportunity to comment and/or raise concerns (the full stakeholder / Organ of State database is included in **Appendix 7I**):

- National Authorities;

- Provincial Authorities;
- Inxuba Yethemba Local Municipality;
- Chris Hani District Municipality;
- Government Structures such as SAHRA, Eastern Cape Provincial Heritage Resources Agency (ECPHRA), SANRAL, SENTECH, Eskom Telkom, etc.;
- Agriculture Associations;
- Department of Agriculture Forestry and Fisheries (DAFF);
- Environmental bodies / Non-Government Organisations (NGOs);
- DEA: Biodiversity Conservation Department;
- Department of Water and Sanitation (DWS);
- Community representatives, CBOs, development bodies;
- Landowners;
- I&APs;
- Civil Aviation Authority (CAA);
- Square Kilometre Array (SKA);
- All telecommunication service providers; and
- Air Traffic and Navigation Services (ATNS).

8.3 Landowner Consent and Notification

Regulation 39 (1) of the EIA Regulations, 2014 (as amended), states that "*if the proponent is not the owner or person in control of the land on which the activity is to be undertaken, the proponent must, before applying for an environmental authorisation in respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on that land*".

Regulation 39 (2) of the 2014 NEMA EIA Regulations, 2014 (as amended), further states that "*sub-regulation (1) does not apply in respect of: (a) linear activities; (b) activities constituting, or activities directly related to prospecting or exploration of a mineral and petroleum resource or extraction and primary processing of a mineral or petroleum resource; and (c) strategic integrated projects as contemplated in the Infrastructure Development Act, 2014*".

The proposed Paarde Valley Solar PV Energy Facility development constitutes a non-linear activity, and landowner consent is therefore required for the following land portions:

Table 29: Land portions where consents for the EIA process to occur was obtained.

FARM DESCRIPTION	21 DIGIT SURVEYOR GENERAL (SG) CODE
Portion 2 of the Farm Paarde Valley No. 62	C04800000000006200002
Portion 7 of the Farm Leuwe Hoek No. 61*	C04800000000006100007

**Property not included as part of the application site which was assessed during scoping phase but was identified for inclusion following identification of sensitive areas. Due to prohibitive size of the PV development area, after the areas identified as no-go from an environmental perspective were excluded, it was decided that this property would also need to be incorporated into the application site. Property will be assessed by specialists in EIA phase.*

The landowners and/or occupants of the above-mentioned farm portions, on which the Paarde Valley Solar PV Energy Facility is proposed have been notified. The notification has been included as **Appendix 7H** and has been submitted to the DEA for consideration together with the DSR for comment.

In terms of the Chapter 6, Section 39 of the EIA Regulations, 2014 (as amended), notification of directly adjacent landowners and occupiers is required. As a result, the affected and adjacent landowners were notified of the proposed development accordingly. Please refer to **Appendix 7H** for proof of this correspondence. With regards to occupiers, all landowners and adjacent landowners were approached in order to confirm whether anyone was occupying their respective properties, as well as to determine the best method to notify the occupiers of each property.

The FSR will provide details regarding the landowners who have been contacted and/or notified with regards to the EIA process. Landowners who the EAP was unable to contact during the scoping phase will be contacted during the EIA phase in an effort to notify the occupiers (if required).

8.4 Notification of Stakeholders and I&APs

In line with Regulation 41 (2) (b) of GN R. 982 (as amended) and prior to the commencement of the scoping and EIA Process (and advertising the EIA Process in the local print media), an initial database of I&APs (including key stakeholders and OoS) was developed for the scoping and EIA Process. This was supplemented with input from the applicant as well as the EAP's experience. **Appendix 7F** contains a detailed copy of the I&AP database. All key stakeholders and I&APs have been added to the project database.

In line with Regulation 41 (2)(b) of the EIA Regulations, 2014 (as amended), the database includes the details of the following:

- Landowners of the affected farm portions;
- Landowners of the neighbouring adjacent farm portions;
- Contact details of known occupiers of the affected farm portions and neighbouring adjacent farm portions (Refer to **Appendix 7H**);
- The municipal councillors of the wards in which the proposed development will be undertaken;
- The municipalities which have jurisdiction in the areas (i.e. the Inxuba Yethemba Local Municipality and the Chris Hani District Municipality);
- Relevant OoS that have jurisdiction in respect of any aspect of the activity; and
- Any other party as required by the DEA.

Communication with I&APs and key stakeholders was conducted by means of telephone and email in order to obtain the necessary background information to compile this report.

An advertisement was placed in the Graaff-Reinet Advertiser local/regional newspaper on 04 July 2019. Proof of the above-mentioned advertisement that was placed is provided in **Appendix 7C**.

In addition, site notices (as per regulations) were erected on one (1) of the boundaries of the application site (Portion 2 of the Farm Paarde Valley No. 62) during a site visit undertaken on the 12th of July 2019. Proof of the site notices which were erected (including GPS coordinates) is provided in **Appendix 7A**.

As I&APs and key stakeholders respond to the above-mentioned advertisements, they will be registered on the project database and sent letters of invitation to participate, as well as the BID.

It should be noted that all key stakeholders and I&APs which were registered on the project database received a copy of the BID. In addition, they were also notified about the availability of the DSR for review and comment. All OoS will be sent electronic copies (on CD) of the DSR for comment and review. Refer to **Appendix 7B** and **Appendix 7I**.

8.5 Proof of Notification

Appendix 7 includes the proof of all notifications to I&APs and key stakeholders. More specifically, the types of proofs are as follows:

- Site notice text (**Appendix 7A**);
- Photographs of site notices (**Appendix 7A**);
- Background Information Document (BID) (**Appendix 7B**);
- Proof of BID Distribution (**Appendix 7B**);
- Notification of commencement of EIA process (**Appendix 7B**);
- Proof of advertisements in a local/regional newspaper (**Appendix 7C**);
- Notification to landowners of affected and neighbouring adjacent farm portions (**Appendix 7H**); and
- Notification to Organs of State (OoS) (**Appendix 7I**).

8.6 Site Notices

As mentioned, site notices were erected on one (1) of the boundaries of the application site (Portion 2 of the Farm Paarde Valley No. 62) (coordinates: 31°25'42.85"S; 24°39'4.51"E). Site notices (in the form of posters) and BID's were also placed at the following location:

- Middelburg Public Library.

8.7 Comment and Review of Draft Scoping Report (DSR)

The Draft Scoping Report (DSR) will be circulated to all I&APs and key stakeholders for comment and review for a period of 30 days after submission to the DEA, from **Friday the 26th of July 2019** to **Monday the 26th of August 2019**, excluding public holidays.

The report will be made available to the public for review and comment for a period of 30 calendar days, excluding public holidays. Hard copies of the DSR can be reviewed at the following public place:

VENUE	STREET ADDRESS	HOURS	CONTACT NO
Middelburg Public Library	47 Van Reenen Street Middelburg 5900	**Monday - Friday** 09:00 - 16:30	049 802 1300 / 073 765 0365

The report can also be downloaded from SiVEST's website during the comment and review period: http://www.sivest.co.za/, click on '*Downloads*' then browse to the folder '*15324 Paarde Valley Solar PV*'.

Written notice will be given to all registered I&APs and key stakeholders on the project database that the DSR is available for comment and review. Electronic copies (CD) of the DSR will also be distributed on written request.

Issues, comments and concerns raised to date have been captured in the Comments and Response Report (C&RR), which is included in **Appendix 7E**. In addition, all comments received following the 30-day comment and review period will be incorporated into the C&RR, which will be attached in the Final Scoping Report (FSR). The C&RR provides a summary of the issues and concerns raised, as well as responses provided to I&APs and key stakeholders.

8.8 Review of the Draft Scoping Report (DSR) by Organs of State (OoS)

In terms of section 40 (2) of the EIA Regulations, 2014 (as amended), public participation must include consultation with all OoS which have jurisdiction in respect of the activity to which the application relates.

Table 30 below includes all the OoS who will be e-mailed the DSR and sent electronic copies (on CD) of the full report, including all appendices. Telephonic follow-up will be done throughout the 30-day DSR comment and review period in order to provide them with ample opportunity to comment.

Table 30: Organs of State (OoS) database

DISTRIBUTION OF THE DRAFT SCOPING REPORT (DSR) TO ORGANS OF STATE FOR COMMENT					
TITLE	**SURNAME**	**NAME**	**POSITION**	**POSTAL ADDRESS**	**EMAIL ADDRESS**
INXUBA YETHEMBA LOCAL MUNICIPALITY					
Mr	Mavisiwe	Ayabonga	Environmental Co-ordinator	PO Box 24 CRADOCK 5880	ayabonga88@gmail.com
Mr	Twalo	N	Director: Community Services	PO Box 24 CRADOCK 5880	ntwalo@iym.gov.za
CHRIS HANI DISTRICT MUNICIPALITY					
Ms	Banisi	Vuyeka	Environmental Co-ordinator	Private Bag X20 SPRINGBOK 8240	vbanisi@chrishanidm.gov.za
Mr	Mpotulo	Q	Environmental Co-ordinator	Private Bag X20 SPRINGBOK 8240	qmpotulo@chrishanidm.gov.za
AGRI SA-EASTERN CAPE					
Ms	Croucamp	Anel		17 Mangold Street, Newton Park, PORT ELIZABETH 6055	anel.croucamp@agriec.co.za
ATNS					

Ms	Morobane	Johanna	Manager: Corporate Sustainability and Environment	Private Bag X15 KEMPTON PARK 1620	JohannaM@atns.co.za
Ms	Masilela	Simphiwe	Obstacle Evaluator	Private Bag X15 KEMPTON PARK 1620	SimphiweM@atns.co.za
BIRDLIFE SOUTH AFRICA					
Mr	Booth	Jonathan	Policy Manager	Private Bag X16 PINEGORRE 2121	advocacy@birdlife.org.za
Ms	Ralston	Samantha		Private Bag X16 PINEGORRE 2121	energy@birdlife.org.za
ENDANGERED WILDLIFE TRUST					
Mr	Leeuwner	Lourens	Renewable Energy Project Manager	Private Bag X11, MODDERFONTEIN 1609	lourensl@ewt.org.za
ESKOM					
Mr	Geeringh	John	Chief Planner	PO Box 1091 JOHANNESBURG 2000	GeerinJH@eskom.co.za
DEPARTMENT OF ENVIRONMENTAL AFFAIRS BIODIVERSITY					
Mr	Lekota	Seoka		Private Bag X447 PRETORIA 0001	slekota@environment.gov.za

Mr	Rabothata	Mmatlala		Private Bag X447 PRETORIA 0001	slekotamrabothata@environment.gov.za
DEPARTMENT OF WATER AND SANITATION					
Ms	Mokhoantle	Lerato	Environmental Officer	28 Central road Beaconsfield Kimberley 8300	Mokhoantlel@dws.gov.za
Ms	Kama	Bolekwa	Director: Institutional Establishment	Private Bag X6041 PORT ELIZABETH 6000	kamab@dws.gov.za
DEPARTMENT OF MINERAL RESOURCES (DMR) - EASTERN CAPE					
Ms	Tyala	Z		Pier 14 Building , 444 Govan Mbeki Avenue, North End PORT ELIZABETH 6000	Zimkita.Tyala@dmr.gov.za
DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES					
National Department					
Ms	Buthelezi	Thoko	AgriLand Liaison Office	Private Bag X120 PRETORIA 0001	ThokoB@daff.gov.za
Ms	Marubini	Mashudu	Delegate of the Minister	Delpen Building Cnr Annie Botha and Union Street Office 270 PRETORIA 0001	MashuduMa@daff.gov.za
Provincial Department - Eastern Cape					

Mr	Malgas	Mxolisi		Private Bag X7485 KING WILLIANSTOWN 5600	MxolisiMa@daff.gov.za
EASTERN CAPE PROVINCIAL DEPARTMENT OF AGRICULTURE, LAND REFORM & RURAL DEVELOPMENT					
Ms	Nqeno	Noluvuyo	Director	Private Bag X0040 BHISHO 5606	Nqeno.noluvuyo@gmail.com
EASTERN CAPE DEPT OF ECONOMIC DEVELOPMENT ENVIRONMENTAL AFFAIRS AND TOURISM					
Ms	Ngetu	Cira	Regional Director	Block E, Komani Office Park QUEENSTOWN 5320	cira.Ngetu@deaet.ecape.gov.za
	Mdekazi	Nondwe		Block E, Komani Office Park QUEENSTOWN 5320	Nondwe.Mdekazi@dedea.gov.za
PROVINICIAL DEPT OF SPORT, ARTS & CULTURE: Heritage Resources Unit					
Mr	Matutu	Mzolisi	Head of Department	Private Bag X0020 BISHO 5605	mzolisi.matutu@ecsrac.gov.za
EASTERN CAPE DEPARTMENT OF ROADS AND PUBLIC WORKS					
Ms	Mbanjwa	Vuyokazi	Communication Services Unit	Private Bag X0022 BISHO 5605	Vuyokazi.Mbanjwa@ecdpw.gov.za
SANRAL - SOUTHERN REGION					
Ms	Songxaba	Nenekazi	Environmental Coordinator	20 Shoreward Drive Bay West Port Elizabeth 6025	Songxaban@nra.co.za

EASTERN CAPE PROVINCIAL HERITAGE RESOURCE AUTHORITY					
Mr	Mokhanya	Sello		16 Commissioner Street East London 5200	smokhanya@ecphra.org.za
Mr	Maxongo	Africa		16 Commissioner Street East London 5200	info@ecphra.org.za
SQUARE KILOMETRE ARRAY (SKA)					
Dr	Tiplady	Adriaan	Manager: Site Categorisation	PO Box 522 SAXONWOLD 2132	atiplady@ska.ac.za
SA CIVIL AVIATION AUTHORITY (SA CAA)					
Ms	Stroh	Lizell	Obstacle Specialist	Private Bag X73 HALFWAY HOUSE 1685	strohl@caa.co.za
SENTECH					
Mr	Koegelenberg	Johan	Broadcast Coverage Planner: RF Networks	Private Bag X06 HONEYDEW 2040	koegelenbergj@sentech.co.za
Mr	Motlhake	Serame	Manager	Private Bag X06 HONEYDEW 2040	motlhakes@sentech.co.za
TRANSNET FREIGHT RAIL					
Mr	Monyamane	Ezekiel	Senior Manager: Freight Rail	15 Girton Road Inyanda House 2 Parktown	ezekiel.monyamane@transnet.net

Mr	Fiff	Sam	Environmental Manager: Freight Rail	PO Box 255 BLOEMFONTEIN 9300	sam.fiff@transnet.net
TELKOM					
Ms	van den Heever	Heleen	Ops Manager Central Region	Private Bag X20700 BLOEMFONTEIN 9300	vdheevhd@telkom.co.za
Ms	Peters	Ihlaam	Wayleave Officer	10 Jan Smuts Drive Pinelands CAPE TOWN 7404	ihlaamp@telkom.co.za IhlaamP@openserve.co.za
WESSA					
Mr	Griffiths	Morgan	Environmental Governance Programme Manager	PO Box 12444, Centrahill PORT ELIZABETH 6006	morgan.griffiths@wessa.co.za

8.9 Meetings

During the EIA phase meetings will be undertaken to present the proposed development to the public and solicit comments and/or concerns. Up to a maximum of four (4) meetings will be undertaken during this time. The number and type of meetings will however be determined at a later stage. Invitations to these meetings will be sent out via post (in the form of invitation letters), e-mail and SMS to all registered I&APs and key stakeholders (including affected and adjacent landowners) on the project database. Additionally, Ward Councillors will be utilised in order to invite members of the affected community to the meeting, should this be required.

Following all meetings, minutes of the meetings will be compiled and forwarded to all attendees for their review and comment. The primary aim of these meetings is to:

- disseminate information regarding the proposed development to I&APs and key stakeholders;
- provide I&APs and key stakeholders with an opportunity to interact with the EIA team and the representatives from the applicant present;
- supply more information regarding the EIA process;
- answer questions regarding the proposed development and the EIA process; and
- receive input regarding the public participation process and the proposed development.

8.10 Comments and Response Report (C&RR)

Issues, comments and concerns raised during the public participation process will be captured in the Comments and Response Report (C&RR). The C&RR provides a summary of the comments received and issues raised by I&APs and key stakeholders, as well as the responses provided. This information will be used to feed into the evaluation of environmental and social impacts and will also be taken into consideration when compiling the FSR. All comments received to date have been included in the C&RR (**Appendix 7E**).

9 ASSESSMENT IN TERMS OF EQUATOR PRINCIPLES

The Equator Principles (EPs) are a financial industry benchmark for determining, assessing and managing social and environmental risk in project financing. Several banks, exchanges and organisations worldwide have adopted the EPs as requirements to be undertaken for project funding on application and approval. Furthermore, certain funding institutions have not formally adopted the EPs, but require clients to be compliant with them in order to qualify for loans. The EPs are summarised below:

Principle 1: Review and Categorisation

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

Principle 2: Environmental and Social Assessment

For each project assessed as being either Category A or Category B, the client / borrower must conduct a Social and Environmental Assessment ("Assessment") process to address the relevant impacts and risks of the proposed project. The Assessment should also propose mitigation and management measures relevant and appropriate to the nature and scale of the proposed project.

Principle 3: Applicable Environmental and Social Standards

The Assessment will refer to the applicable IFC Performance Standards and applicable Industry Specific Environmental, Health, and Safety (EHS) Guidelines.

Principle 4: Environmental and Social Management System and Equator Principles Action Plan

The client / borrower must prepare an Environmental and Social Management System (ESMS). Further, an Environmental and Social Management Plan (ESMP) must be prepared by the client to address issues raised in the Assessment process and incorporate actions required to comply with the applicable standards. Where applicable standards are not met to the EPFI's satisfaction, the client and the EPFI will agree to an Equator Principles Action Plan to outline gaps and commitments.

Principle 5: Stakeholder Engagement

For all Category A and Category B Projects, the EPFI will require the client to demonstrate effective Stakeholder Engagement as an ongoing process in a structured and culturally appropriate manner with Affected Communities and, where relevant, Other Stakeholders. For projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation process. The client will tailor its consultation process to: the risks and impacts of the Project; the Project's phase of development; the language preferences of the Affected Communities; their decision-making processes; and the needs of disadvantaged and vulnerable groups.

Principle 6: Grievance Mechanism

The EPFI will require the client, as part of the ESMS, to establish a grievance mechanism designed to receive and facilitate resolution of concerns and grievances about the project's environmental and social performance. The grievance mechanism is required to be scaled to the risks and impacts of the Project and have Affected Communities as its primary user. It will seek to resolve concerns promptly, using an understandable and transparent consultative process that is culturally appropriate, readily accessible, at no cost, and without retribution to the party that originated the issue or concern. The mechanism should not impede access to judicial or administrative remedies.

Principle 7: Independent Review

For all Category A projects and, as appropriate, for Category B projects, an independent social or environmental expert not directly associated with the borrower must review the Assessment, AP and consultation process documentation in order to assist the EPFIs due diligence and assess EPs compliance.

Principle 8: Covenants

An important strength of the EPs is the incorporation of covenants linked to compliance. For all projects, the client will covenant in the financing documentation to comply with all relevant host country environmental and social laws, regulations and permits in all material respects. For Category A and B projects, the client / borrower will covenant in financing documentation:

- To comply with the ESMPs and EPs AP (where applicable) during the construction and operation of the Project in all material respects;
- To provide periodic reports in a format agreed with the EPFI (with the frequency of these reports proportionate to the severity of impacts, or as required by law, but not less than annually), prepared by in-house staff or third-party experts, that i) document compliance with the ESMPs and EPs AP (where applicable), and ii) provide representation of compliance with relevant local, state and host country environmental and social laws, regulations and permits; and
- To decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan.

<u>Principle 9: Independent Monitoring and Reporting</u>

To ensure ongoing monitoring and reporting over the life of the loan, EPFIs will, for all Category A projects, and as appropriate, for Category B projects, require appointment of an independent environmental and/or social expert, or require that the borrower to retain qualified and experienced external experts to verify its monitoring information, which would be shared with EPFIs.

<u>Principle 10: Reporting and Transparency</u>

For all Category A and, as appropriate, Category B Projects:

- The client will ensure that, at a minimum, a summary of the ESIA is accessible and available online.
- The client will publicly report GHG emission levels (combined Scope 1 and Scope 2 Emissions) during the operational phase for Projects emitting over 100,000 tonnes of CO2 equivalent annually.

Although this report is not written in terms of the EPs, it fully acknowledges that EPs will need to be complied with should funding for the proposed development be required from a development financial institution. In general, the following documentation will need to be considered in that regard:

- The “Equator Principles” 2013
- International Finance Corporations Performance Standards on Social and Environment, IFC, January 2012, namely:
    - Performance Standard 1: Social and Environmental Assessment and Management Systems
    - Performance Standard 2: Labour and Working Conditions
    - Performance Standard 3: Pollution Prevention and Abatement
    - Performance Standard 4: Community Health, Safety and Security
    - Performance Standard 5: Land Acquisition and Involuntary Resettlement
    - Performance Standard 6: Biodiversity Conservation and Sustainable Natural Resource Management
    - Performance Standard 7: Indigenous Peoples
    - Performance Standard 8: Cultural Heritage
- International Finance Corporation – World Bank Guidelines, General EHS Guidelines 2007.

EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice. These EHS Guidelines are applied as required by the World Bank's respective policies and standards. These General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors.

- The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs.

9.1 Assessment Results

This section details the current compliance level with which the proposed development meets with the EPs and the related Performance Standards which are outlined below.

The coding key is as follows:

Compliance Level			
Clear	(red)	(amber)	(green)
Not assessed / determined	Not compliant	Partially compliant	Compliant

Table 31: Compliance level of proposed development in terms of EPs and related performance standards.

Principles	**Compliance Level**	**Reference**
General, Performance Standard 1 Environmental & Social Reporting		
1. Baseline Information	(green)	Refer to **Chapter 2** – Technical Details and **Chapter 5** – Description of the receiving environment
2. Alternatives (Assessment of alternatives)	(green)	Refer to **Chapter 7**
3. Impacts and risks	(green)	Refer to **Chapter 6**
4. Global impacts	N/A	N/A
5. Legal requirements	(green)	Refer to **Chapter 3** for legal requirements and guidelines
6. Transboundary	N/A	N/A
7. Disadvantaged / vulnerable groups	(amber)	Partly addressed in **Appendix 6F** as part of the scoping phase Social Impact Assessment. This will be addressed as part of the EMPr during the EIA phase

Principles	Compliance Level	Reference
8. Third party		Refer to **section 1.1.**
9. Mitigation measures		Partly addressed as part of scoping phase specialist assessments. These will be addressed as part of the EMPr during the EIA phase
10. Documentation process		Refer to **Chapter 1**, **Chapter 3** and **Chapter 8**
11. Action Plans		Partially addressed in **Chapter 11**. To be addressed in the FSR with the EIA Plan of Study and then will be addressed further in the EIA phase
12. Organisational capacity		To be addressed as part of the EMPr during the EIA phase
13. Training		To be addressed as part of the EMPr during the EIA phase
14. Grievance mechanism		To be addressed during the EIA phase
15. Report content		To be addressed as part of the EMPr during the EIA phase
Performance Standard 2, Labour & Working Conditions		
1. Human Resource Policy		To be addressed as part of the EMPr during the EIA phase or prior to the commencement of the construction phase
2. Working relationship		To be addressed as part of the EMPr during the EIA phase or prior to the commencement of the construction phase
3. Working conditions with and terms of employment		To be addressed as part of the EMPr during the EIA phase or prior to the commencement of the construction phase
4. Workers organisation		To be addressed prior to construction
5. Non-discrimination and equal opportunities		Partly addressed as part of the scoping phase Social Impact Assessment (**Appendix 6F**). This issue will also be addressed as part of the EMPr during the EIA phase
6. Grievance mechanism		To be addressed as part of the EMPr during the EIA phase
7. Occupational Health and Safety		To be addressed as part of the EMPr during the EIA phase and prior to commencement of construction
8. Non-employee workers		To be addressed as part of the EMPr during the EIA phase and prior to commencement of construction

Principles	Compliance Level	Reference
9. Supply Chain		To be addressed as part of the EMPr during the EIA phase and prior to and during construction
10. Labour Assessment Component of a Social and Environmental Assessment		To be addressed as part of the EMPr during the EIA phase and prior to the commencement of construction
Performance Standard 3, Pollution		
1. Pollution Prevention, Resource Conservation and Energy Efficiency		To be addressed as part of the EMPr during the EIA phase
2. Wastes		To be addressed as part of the EMPr during the EIA phase
3. Hazardous material		To be addressed as part of the EMPr during the EIA phase
4. Dangerous substances		To be addressed as part of the EMPr during the EIA phase
5. Emergency preparedness and response		To be addressed as part of the EMPr during the EIA phase
6. Technical guidance – ambient considerations		To be addressed as part of the EMPr during the EIA phase
7. Greenhouse gas emissions		N/A
Performance Standard 4, Health & Safety		
1. Hazardous materials safety		To be addressed as part of the EMPr during the EIA phase
2. Environmental and natural resource issues		Refer to **Chapter 6**
3. Emergency preparedness and response		To be addressed in the EMPr during the EIA phase
Performance Standard 5, Land Acquisition		Refer to **Chapter 4**. Project needs and desirability are discussed.
Performance Standard 6, Biodiversity		Refer to **Chapter 5**, **section 5.7** and **Chapter 6**, **section 6.2.2** which summarises the scoping phase Terrestrial Ecology Impact Assessment
Performance Standard 7, Indigenous People		Refer to **Chapter 8** describing public participation.
Performance Standard 8, Cultural Heritage		Refer to **Chapter 5**, **section 5.13** and **Chapter 6**, **section 6.2.7**

It is important to note that most of the issues listed per performance standard in the table above will only be addressed during the EIA phase, and some during the pre-construction and construction phase of the proposed development. Therefore, at this stage (scoping phase), most of the issues are categorised as 'not assessed / to be determined'. Full compliance with the EPs will only be realised following EIA assessment.

10 CONCLUSIONS AND RECOMMENDATIONS

The above report provides a broad introduction to the impacts and benefits that are pertinent to the proposed Paarde Valley Solar PV Energy Facility and highlights important issues to be investigated during the EIA Phase of the proposed development. The EIA Phase will draw on the above information and make use of the recommended specialist studies to reach an objective decision on the overall impact of the proposed development.

The EIA Phase will culminate in the compilation of detailed mitigation measures to reduce impacts, the identification of least impactful locations for the PV panels, the identification of least impactful locations for associated infrastructure and the identification of sensitive areas within the site which may require more specific management measures. The EIA phase will also aim to optimise and improve potential positive impacts that may result from the proposed development. In addition, as previously mentioned, the identified environmental sensitive areas will be used to inform the layout alternatives which will be presented and extensively investigated and assessed in the EIA phase.

None of the specialist studies conducted during the scoping phase for the proposed development have identified any fatal flaws for the proposed Paarde Valley Solar PV Energy Facility. However, a few of potentially significant environmental impacts have been identified and will need to be evaluated and assessed further during the detailed EIA phase of the proposed development. As mentioned, the specialist assessments will be updated/revised (if required) to include a review of the findings in accordance with detailed site layouts; a comparative assessment of the layout alternatives provided and by addressing any comments or concerns arising from the public participation process. The EIA phase will also provide a more detailed comparative analysis of these potential impacts against the “no-go” alternative.

Detailed mitigation and management measures will be developed in the EIA phase and will be put forward in the Environmental Management Programme (EMPr). Should this proposed development receive a positive EA, the EMPr will guide the project proponent and appointed contractor(s) through the final design, construction and operational phases of the proposed development. The possible mitigation measures that could be applied are provided in **Section 10.2** below.

10.1 Summary of Findings

A summary of the findings for each identified environmental impact evaluated in the context of the proposed development (both biophysical and social) is provided in the table below.

Table 32: Summary of environmental issues identified in Specialist Studies

Terrestrial Ecology	There are various Acts that limit development or require permits before development can proceed. The most important of these are permits required in terms of protected species that could potentially occur on site, including the

	National Environmental Management: Biodiversity Act and the National Forests Act. Details of the description of the ecological receiving environment are summarised as follows: 1. The study area is situated in an area that is on the boundary between relatively flat plains and a low mountain range with moderately to steeply sloping topography. Habitat on site is in a largely natural state and is in a rural environment. There is very little transformation or serious degradation on site. 2. There are two (2) regional vegetation types occurring in the project study area, Eastern Upper Karoo (most of the area), and Besemkaree Koppies Shrubland (mountain areas). There are three (3) other national vegetation types in the vicinity, namely Southern Karoo Riviere, Tarkastad Montane Shrubland and Karoo Escarpment Grassland. Floristic components of all five of these units occur in the study area, even though they are not all mapped as occurring within the study area. All these vegetation types are listed in the scientific literature as Least Threatened and none are listed in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011). 3. The Paarde Valley project site is within the Eastern Cape and Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) therefore do not apply to that project for the solar array. 4. Habitats on site were divided into five units, namely “Mountain Vegetation”, “Lowland Plains Vegetation”, “Low Ridges and Koppies”, “Broad Drainage Areas” and “Mountain Stream”. The vegetation on the plains on site was found to be a karroid dwarf shrubland that resembles the description for Eastern Upper Karoo, but the mountain vegetation was a mixed grassy shrubland that appears to be a floristic mix of Besemkaree Koppies Shrubland and Karoo Escarpment Grassland. The mountain vegetation has the highest local diversity and greatest variation in species composition. A map of natural habitats of the study area was produced by mapping from aerial imagery, based on information collected in the field. 5. There are no plant species occurring on-site or likely to occur on-site that are protected according to the National Environmental Management: Biodiversity Act (Act No 10. Of 2004) (NEM:BA). 6. There are no protected tree species that are likely to occur in the study area. 7. A total of 79 mammal species have a geographical distribution that includes the general study area in which the sites are found. Of the species currently listed as threatened or protected (see Appendix 5 of Terrestrial Ecology Impact Assessment Report for list of protected species), the following are considered to have a very high, high or medium probability of occurring on-site, based on habitat suitability and evidence collected in the field: the Black-footed Cat (Vulnerable), the Cape Clawless Otter (Near Threatened), the South African Hedgehog (Near Threatened), Grey Rhebok (Near Threatened), White-tailed Rat (Vulnerable), and the Spectacled Dormouse (Near Threatened). There is strong evidence to suggest that the Black-footed Cat and the Cape Clawless Otter both definitely occur on-site.

	8. The study area contains habitat that is suitable for a small number of frog species. One (1) protected frog species, the Giant Bullfrog, could potentially occur on-site. 9. A total of 55 reptile species have a geographical distribution that includes the general study area in which the sites are found. No reptile species of conservation concern could potentially occur in the study area. 10. A preliminary sensitivity map of the study area was produced that identifies areas of higher sensitivity that should be taken into account during activities on site. This includes drainage areas and associated wetland-related habitat, low ridges and parts of the mountain area. The preliminary assessment of impacts indicates that all impacts are of low significance or can be reduced to low significance with mitigation, with the exception of loss of natural vegetation, for which the impact remains of medium significance after mitigation. Proposed mitigation measures include the following: shifting infrastructure positions to avoid sensitive habitats, select infrastructure options that cause the least amount of damage to natural habitats, cross watercourses at right angles, install appropriate structures at watercourse crossings to minimise impacts on these systems, minimise vegetation clearing and disturbance, formalise a rehabilitation programme, undertaking a pre-construction botanical walk-through survey of the footprint of the selected options, obtaining permits for any protected species that may be affected, undertaking a search and rescue of plants for which it is appropriate to rescue, compile an alien plant management plan and undertaking regular monitoring. The report concludes that there are some sensitivities in the study area related to natural habitat and to individual species, but that these can be minimised or avoided with the application of appropriate mitigation or management measures. There will be residual impacts, primarily on natural habitat, but the amount of habitat that will be lost to the project is insignificant compared to the area in hectares of the regional vegetation type that occurs on site and therefore the residual impacts are considered acceptable, on condition local sensitivities of biodiversity importance are avoided. On this basis it is recommended that the project be authorised.
Avifauna	A total of 185 bird species could potentially occur in the broader area. Of these, 78 species are classified as solar priority solar species. Eighteen (18) solar priority species have a high likelihood of occurring in the study area site itself. The potential impacts of the PV facility on avifauna which were assessed in this report are: ▪ Displacement due to disturbance and habitat transformation associated with the construction of the solar PV plant and associated infrastructure; ▪ Collisions with the solar panels; and ▪ Entrapment in perimeter fences.

	The proposed PV facility will have some pre-mitigation impacts on avifauna at a site and local level which will range from Medium to Low. The impact of displacement due to disturbance during the construction phase is rated as Medium and will remain at a Medium level after mitigation. The impact of displacement of priority species due to habitat transformation associated with the operation of the plant and associated infrastructure is rated as Medium. This impact can be partially reversed through mitigation, but it will remain at a Medium level, after mitigation. The envisaged impacts in the operational phase, i.e. mortalities due to collisions with the solar panels and entrapment in perimeter fences are both rated as Low pre-mitigation and could be further reduced with appropriate mitigation. The impact of displacement due to disturbance during the decommissioning phase is rated as Medium, and it will remain at a Medium level after mitigation. The cumulative impact of the proposed PV facilities within a 35km radius is rated as Low, both pre- and post-mitigation. From an avifaunal impact perspective, there is no objection to the proposed development of the PV facility, provided the proposed mitigation measures are strictly implemented. No further monitoring will be required during the operational phase.
Surface Water	Findings were based on the method for delineating wetlands and riparian habitats as per the **DWAF (2005 & 2008)** guidelines. At a broad level, the study site is located within the Orange Catchment. More specifically, the study area is situated within the quaternary catchments D32B & D32C. In terms of fieldwork findings, it was found that there is one (1) wetland on the Paarde Valley study site. However, a number of watercourses, both perennial and non-perennial, were identified. In terms of the Ecological Condition of the watercourses, Ecological Condition was assessed to be a class C – Moderately Modified systems. The Environmental Importance and Sensitivity Class for the watercourses was determined. The results showed that the EISC for the watercourses and wetland were categorised as a Class B (High). The classification of high EISC was primarily due to the condition of the watercourses assessed, as well as the presence of Endangered species. The buffer zone determination findings for the watercourses took into account the type of the proposed development, potential impacts, condition of the habitat as well as other characteristics of the watercourse. As a result, the following buffer zones were assessed and are to be implemented as far as possible: ▪ Construction Phase Buffer: 15m ▪ Operation Phase Buffer: 15m Foreseen potential negative impacts in terms of the proposed development were identified and assessed. The potential construction-related impacts included

	impacts to watercourses (-20 low pre- and -8 low post-mitigation impact rating), hydrology of the watercourses (-20 low pre- and -9 low post-mitigation impact rating) and water quality impacts (-39 medium pre- and -9 low post-mitigation impact rating). The operational impacts identified included impacts to the hydrology of the watercourse (-36 medium pre- and -18 low post-mitigation impact rating). Overall, all impacts were assessed to be low, post-implementation of mitigation measures. In terms of potentially applicable environmental and water-related legislation, listed activities were identified to be triggered in terms of NEMA (1998) and the EIA Regulations (2014, as amended) from a surface water perspective. With respect to the NWA (1998), water uses (c) and (i) were identified as being potentially applicable. However, the application of the risk assessment matrix protocol as per **Government Notice 509 of 2016 (No. 40229)** was undertaken, the findings show that the risk of potential impacts on the watercourse was assessed to be in the LOW-risk class. Where risks were identified, a number of control measures have been stipulated which will assist in decreasing the level of risk to an even lower level. In accordance with the implementation of control measures, all potential risks are classed as LOW. Therefore, registration for General Authorisation can be undertaken where required and agreed with the DWS. The decision on whether the proposed development is to proceed will rest on environmental and water governmental departments whom will need to make a trade-off between meeting the conservation targets of the province or meeting the energy demands of the country. However, it is the opinion of the specialist that the proposed development may proceed where the relevant control measures and mitigation measures stipulated above are implemented. There are a number of recommendations to be implemented for the proposed development. These include the following: ▪ A stormwater management plan for all phases of the proposed development is required to be compiled and implemented which accounts for control of increased run-off, erosion and sedimentation; and ▪ An Alien Eradication and Removal Programme is to be compiled and implemented for the duration of the proposed development. Based on the findings above, with the implementation of the control and mitigation measures stipulated herein, it is the opinion of the specialist that the proposed development may proceed.
Agricultural and Soils (Desktop)	It should be noted that a field investigation was not considered necessary. The assessment was based on a desktop analysis of existing soil and agricultural potential data and other data for the site, which is considered entirely adequate for a thorough assessment of all the agricultural impacts of the proposed development (see section 4.1 of the scoping phase Agricultural and Soils Impact Assessment Report).

	The key findings of the Agricultural and Soils Impact Assessment are provided below: ▪ The proposed project area is dominated by shallow, loamy sands on underlying rock or less commonly clay. Dominant soil forms are Swartland, Hutton, Mispah, and Valsrivier. ▪ The major limitations to agriculture are the limited climatic moisture availability (low rainfall), the rugged terrain and the shallow, rocky soils. ▪ As a result of these limitations, the agricultural use of the study area is limited to low-intensity grazing only, except for some isolated patches of irrigation land. ▪ The proposed project area is classified with land capability evaluation values between 1 (very low) and 7 (low to moderate), with 6 being most predominant. ▪ The significance of all agricultural impacts is kept low by the limited agricultural potential of the land. ▪ The only parts of the study area that do not have low sensitivity are the small patches of irrigation. These are considered no-go areas for any footprint of development that will exclude cultivation. ▪ Two (2) potential negative impacts of the development on agricultural resources and productivity were identified. These are: o Loss of agricultural land use; and o Soil erosion and degradation. ▪ One (1) potential positive impact of the development on agricultural resources and productivity was identified as: o Increased financial security of farming operations through rental income ▪ Soil erosion and degradation was assessed as having medium significance before and after mitigation. The other two (2) impacts were assessed as having low significance before and after mitigation. ▪ The recommended mitigation measures are for implementation of an effective system of stormwater run-off control; maintenance of vegetation cover; and to strip, stockpile and re-spread topsoil. ▪ Due to the low agricultural potential of the site, and the consequent low to medium, negative agricultural impact, there are no restrictions relating to agriculture which preclude authorisation of the proposed development (including all alternatives) and therefore, from an agricultural impact point of view, the development should be authorised.
Visual	Overall, sparse human habitation and the predominance of natural vegetation cover across much of the study area would give the viewer the general impression of a largely natural setting with some pastoral elements. As such, solar PV development would alter the visual character and contrast significantly with the typical land use and/or pattern and form of human elements present across the broader study area.

	The area is not typically valued for its tourism significance and there is limited human habitation resulting in relatively few potentially sensitive receptors in the area. A total of twenty-six (26) potentially sensitive receptors were identified in the combined study area, three (3) of which are considered to be sensitive receptors as they are linked to leisure/nature-based tourism activities in the area. None of the receptors are however expected to experience high levels of visual impact from the proposed PV facility. An overall impact rating was also conducted as part of the scoping phase in order to allow the visual impact to be assessed alongside other environmental parameters. The assessment revealed that impacts associated with the proposed Paarde Valley solar PV facility will be of low significance during both construction and decommissioning phases. During operation, visual impacts from the solar PV facility would be of medium significance with relatively few mitigation measures available to reduce the visual impact. Although other renewable energy developments and infrastructure projects, either proposed or in operation, were identified within a 35km radius of the Paarde Valley solar PV project, it was determined that only one of these would have any significant impact on the landscape within the visual assessment zone, namely Umsobomvu WEF. This proposed WEF, in conjunction with the proposed solar PV facility, will alter the inherent sense of place and introduce an increasingly industrial character into a largely natural, paroral landscape, thus giving rise to significant cumulative impacts. It is however anticipated that these impacts could be mitigated to acceptable levels with the implementation of the recommendations and mitigation measures stipulated for each of these developments by the visual specialists. In light of this and the relatively low level of human habitation in the study area however, cumulative impacts have been rated as medium.
Heritage (Desktop)	Due to the prohibitive size of the application area during the Scoping phase, it was agreed that fieldwork related to the heritage assessment will only be done in the EIA phase when the footprint area has been determined and significantly reduced, based on environmental sensitive areas determined by the other specialists. Heritage resources are unique and non-renewable and as such any impact on such resources must be seen as significant. The Heritage Scoping Report has shown that the proposed site to be developed as a PV Facility may have heritage resources present on the property. This has been confirmed through archival research and evaluation of aerial photography of the site. The projected impact assessment indicates that unmitigated impacts during construction can be MEDIUM to HIGH but reduced to LOW with the implementation of management measures. Impacts during the operational and

	decommissioning phase is projected to be LOW with the implementation of management measures. These findings provide the basis for the recommendation: ▪ further field truthing through an archaeological walk down. The aim of this will be to compile a comprehensive database of heritage sites within the PV development area, with the aim of developing a heritage management plan for inclusion in the Environmental Management Programme (EMPr). It is the specialist's considered opinion, based on the current data available, that with the consideration of the position of heritage sensitivities during the layout design the project will have an acceptable low impact on heritage resources and can continue.
Palaeontology	The National Heritage Resources Act (No 25 of 1999, section 38) (NHRA), states that a Palaeontological Impact Assessment (PIA) is key to detect the presence of fossil material within the planned development footprint. This PIA is thus necessary to evaluate the effect of the construction on the palaeontological resources. The proposed development is underlain by the continental sediments of the Latest Permian sediments of the Balfour Formation (Upper Beaufort Group, Adelaide Subgroup) and earliest Triassic sediments of the Katberg Formation (Upper Beaufort Group, Tarkastad Subgroup, Karoo Supergroup) as well as Jurassic Karoo Dolerite. These sediments are generally mantled by a thick layer of Quaternary to Recent colluvium and alluvium. The uppermost Balfour and Katberg Formations are of extraordinary interest in that they provide some of the best existing information on ecologically-complex terrestrial ecosystems during the catastrophic end-Permian mass extinction. According to the PalaeoMap of South African Heritage Resources Information System (SAHRIS), the Palaeontological Sensitivity of the Tarkastad and Adelaide Subgroups has a Very High Palaeontological Sensitivity, while that of the Quaternary superficial deposits of the Central interior is high and the Karoo dolerite (igneous rocks) is insignificant and rated as zero. A site-specific field survey of the development footprint was conducted on foot and by motor vehicle from the 24th – 28th January 2019. Elsewhere in the Karoo Basin numerous fossils have been uncovered in these geological sediments but only two sites (2) on koppies with fossiliferous outcrops were identified. These fossiliferous sites have been identified as Highly Sensitive and No-go areas. It is recommended that a 50m buffer will be placed around these areas. If construction is a necessity in these sensitive areas, it is recommended that the fossils will be collected by a professional palaeontologist. Preceding excavation of any fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an accredited collection (museum or university collection), while all fieldwork and reports should meet the minimum standards for palaeontological impact studies suggested by SAHRA.

	With the above mentioned in consideration, the proposed development, as well as all alternatives have a similar geology and therefore there is no preferences on the grounds of palaeontological fossil heritage for any specific layout among the different options under consideration. As impacts on fossil heritage usually only occur during the excavation phase, no further impacts on fossil heritage are expected during the operation and decommissioning phases of the Solar Energy Facility (SEF). The impact of development on fossil heritage are usually negative but it could also have a positive impact due to the discovery of newly uncovered fossil material that would have been unavailable for scientific research. The SEF could also provide a long-term benefit to the country by supplying renewable energy to the electricity grid. If fossil remains are discovered during any phase of construction, either on the surface or exposed by fresh excavations the Chance Find Protocol must be implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected (if possible, in situ) and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that correct mitigation (e.g. recording and collection) can be carried out by a palaeontologist. It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils. From a Palaeontological Heritage view there is no fatal flaws in the proposed SEF development project. However, it is recommended that the mitigation measures are included in the Environmental Management Programme (EMPr) and fully implemented
Social	**APPROACH TO STUDY** Data was gathered by means of the following techniques. **Collection of data** Data was gathered through: • The project description prepared by the project proponent. • Statistics South Africa, Census 2011 and other relevant demographic data generated by Stats SA such as the Quarterly Labour Force Survey and Mid-year population estimates. • Discussions with the project proponents and Environmental Impact Assessment Consultants. • A literature review of various documents such as the relevant Municipal Integrated Development Plans (IDPs) and other specialist reports and documents. • A broader literature scan.

Impact assessment technique

The assessment technique used to evaluate the social impacts was provided by SiVEST Environmental Division and is attached in Appendix 1 of the Social assessment report (**Appendix 6F**).

IMPACTS IDENTIFIED

The impacts are assessed in respect of the following phases of the project:

- Planning and design;
- Construction;
- Operational;
- Decommissioning; and
- The 'no go" option.

Construction phase

Most of the impacts discussed above apply over the short-term to the construction phase of the project and include:

- Annoyance, dust and noise;
- Increase in crime;
- Increased risk of HIV infections;
- Influx of construction workers and job seekers;
- Hazard exposure;
- Disruption of daily living patterns;
- Disruptions to social and community infrastructure;
- Job creation and skills development; and
- Socio-economic stimulation.

Operational phase

The social impacts that apply to the operational phase of the project are:

- Transformation of the sense of place; and
- Economic.
  - Job creation and skills development.
  - Socio-economic stimulation.

Decommissioning

If the project were to be completely decommissioned the major social impacts likely to be associated with this would be the loss of jobs and revenue stream that stimulated the local economy and flowed into the municipal coffers.

'No Go' Alternative

The 'no go' option would mean that the social environment is not affected as the status quo would remain. On a negative front it would also mean that all the positive aspects associated with the project would not materialise. Considering that Eskom's coal-fired power stations are a huge contributor to carbon emissions the loss of a chance to supplement the National Grid through renewable energy would be significant at a national, if not at a global level.

	Cumulative Impacts In this regard the following cumulative impacts are addressed below: ▪ Risk of HIV ▪ Sense of place ▪ Service supplies and infrastructure, and ▪ The economic benefit. No fatal flaws associated with the cumulative impacts are evident at a social level. The findings support the recommendations of the various reports undertaken for the different renewable energy projects in the region that, on an overall basis, the social benefits of renewable energy projects outweigh the negative benefits and that the negative social impacts can be mitigated. **CONCLUSION AND RECOMMENDATIONS** In assessing the social impact of the solar PV Facility, it was found that in respect of the energy needs of the country and South Africa's need to reduce its carbon emissions that the project fits with national, provincial and municipal policy. Regarding the social impacts associated with the project it was found that most apply over the short term to the construction phase of the project. Of these impacts all can be mitigated to within acceptable ranges and there are no fatal flaws associated with the construction or operation of the project. On a cumulative basis it is evident that the cumulative impacts associated with changes to the social environment of the region are more significant than those attached to the project in isolation. On a negative front there are two (2) issues associated with developments in the region that are of most concern. The first of these issues is the change to the sense of place of an area that was once considered a pristine region of South Africa. The second is the potential, through an influx of labour and an increase in transportation to constructions sites, of the risk for the prevalence of HIV to rise in an area that has a relatively low HIV prevalence rate. In this regard it is important that the relevant authorities recognise these issues and find ways of mitigating them to ensure that they do not undermine the benefit that renewable energy projects bring, both to the region as well as to the country as a whole. These issues are beyond a project-specific basis and as such will need to be addressed at a higher level.
Geotechnical (Desktop)	The desktop geotechnical assessment did not identify any fatal flaws that, from a geological and geotechnical perspective, would prevent the construction of the proposed Paarde Valley Solar PV Energy Facility. The potential impacts the project may have on the geology, relate to soils that could be impacted by the construction activities. There may be a potential for soil erosion, due to removal of vegetation and exposure of the soils to the elements, during construction. The impacts were found to be of "***negative low impact***".

	From a geological and geotechnical perspective, based on the minimal negative impacts on the geology and soils and the recommendations for mitigation measures, it is recommended that the Paarde Valley Solar PV Energy Facility project receives the go-ahead from the Competent Authority.
Transportation	The following conclusions were made: ▪ During the construction phase an additional ±43 vehicles trips will commute at the peak of the construction phase, transporting staff and labour. Typically, these trips will be in the morning between 6:00 – 7:00 and in the afternoons between 16:00 – 17:00. ▪ The heavy construction vehicles and deliveries will contribute an additional ±25 vehicle trips / day, typically occurring during the 'weekday midday' which will equate to ±4 vehicle trips / hour. These additional vehicles will only contribute a small percentage to the existing road network. ▪ The abnormal loads on this development will be negligible and therefore will have no major impact. ▪ The cumulative impact of the area confirms that no significance rating change will be experienced during the construction period of the PV development. ▪ The existing road network can accommodate the proposed development, however, the recommendations below must be considered to mitigate any possible negative impacts. ▪ We recommend a Traffic Management Plan be completed prior to construction in order to form part of the Final Environmental Management Programme (EMPr). The plan must include inter alia the following; o The review of all intersections and routes prior to the project commencing in order to accommodate construction vehicles and staff commuting. o Further discussions with the SANRAL and the respective transport department on access points and route requirements. o The upgrades of intersections and the installation of road traffic signage as per the SARTSM (South African Road Traffic Sign Manual). o The implementation of pedestrian safety initiatives o The implementation of a road maintenance plan under the auspices of the respective transport department. ▪ We recommended that one (1) access point from the N10 freeway be used for the proposed facility to reduce the impact to the area. This access point is located at Km19.92 on section N10-5 and the appropriate axillary lanes and speed reduction measures are to be implemented subsequent to discussions with SANRAL. This study and a revised study, with the all the renewable parties involved in the area at the time, must be submitted to SANRAL and more specifically Ms. Colene Runkel 021 957 4613 for review and comments.

	▪ Development of access points to the PV facility is as per the recommendations in Section 9 of the specialist Transportation report (**Appendix 6I**). ▪ The appropriate load permits be obtained from the Department of Transport prior to construction (if required). ▪ This assessment is limited to the impacts the development traffic will have on the network and not on the wider impacts known as background traffic. Background traffic includes the cumulative impacts other developments will have on the environment if their programs overlap. Such impacts can only be addressed in a detailed Traffic Impact Study which takes into account actual traffic counts undertaken during the peak periods. We therefore recommend that this study be completed prior to the construction process with all Renewable Energy parties involved in the immediate area.

10.2 Recommendations

Table 33: Outcomes and Recommendations of Specialist Studies

Aspect	Fatal Flaws	Recommendations	Further Investigations required during EIA phase
Terrestrial Ecology	None	There are some sensitivities in the study area related to natural habitat and to individual species, but these can be minimised or avoided with the application of appropriate mitigation or management measures. There will be residual impacts, primarily on natural habitat, but the amount of habitat that will be lost to the proposed development is insignificant compared to the area in hectares of the regional vegetation type that occurs on site and therefore the residual impacts are considered acceptable, on condition local sensitivities of biodiversity importance are avoided. On this basis it is recommended that the proposed development be authorised. Implement mitigation measures as outlined in scoping phase Terrestrial Ecology Impact Assessment Report (**Appendix 6H**) as well as included in **Table 23**.	**Yes**
Avifauna	None	From an avifaunal impact perspective, there is no objection to the proposed development of	**Yes**

Aspect	Fatal Flaws	Recommendations	Further Investigations required during EIA phase
		the PV facility, provided the proposed mitigation measures are strictly implemented. No further monitoring will be required during the operational phase. Mitigation measures included in **Table 23** will need to be incorporated into the EMPr and implemented.	
Surface Water	None	There are a number of recommendations to be implemented for the proposed development. These include the following: ▪ A stormwater management plan for all phases of the proposed development is required to be compiled and implemented which accounts for control of increased run-off, erosion and sedimentation; and ▪ An Alien Eradication and Removal Programme is to be compiled and implemented for the duration of the proposed development. Based on the findings, with the implementation of the control and mitigation measures stipulated herein, it is the opinion of the specialist that the proposed development may proceed. Mitigation measures in **Table 23** will need to be incorporated into the EMPr and implemented.	**Yes**
Agriculture and Soils	None	Due to the low agricultural potential of the site, and the consequent low to medium, negative agricultural impact, there are no restrictions relating to agriculture which preclude authorisation of the proposed development (including all alternatives) and therefore, from an agricultural impact point of view, the development should be authorised. The only parts of the study area that do not have low sensitivity are the small patches of irrigation. These are considered no-go areas for any footprint of development that will exclude	**Yes**

Aspect	Fatal Flaws	Recommendations	Further Investigations required during EIA phase
		cultivation. The relevant buffers have been applied to these areas and they have been precluded from the PV development area. Mitigation measures in **Table 23** will need to be incorporated into the EMPr and implemented.	
Visual	None	The visual impacts associated with the proposed Paarde Valley solar PV facility are of moderate significance. Given the low level of human habitation and the relative absence of sensitive receptors, the proposed development is deemed acceptable from a visual perspective and the EA should be granted. The impacts associated with the construction, operation and decommissioning phases can be mitigated to acceptable levels provided the recommended mitigation measures are implemented. The scoping phase VIA report has adequately assessed the visual impacts of the proposed Paarde Valley solar PV facility and no further field investigation will be required. The focus of the EIA phase assessment will be to update the scoping phase VIA report. This will entail: ▪ a review of the findings of the VIA in accordance with a detailed site layout; ▪ a comparative assessment of the layout alternatives provided; and ▪ addressing any comments or concerns arising from the public participation process. Mitigation measures in **Table 23** will need to be incorporated into the EMPr and implemented.	**Yes**
Heritage	None	Further field truthing through an archaeological walk down study covering the site. The aim of this will be to compile a comprehensive database of heritage sites within the PV development area, with the aim of developing a heritage management plan for inclusion in the EMPr.	**Yes**

Aspect	Fatal Flaws	Recommendations	Further Investigations required during EIA phase
		Based on the current data available, with the consideration of the position of heritage sensitivities during the layout design, the proposed development will have an acceptable low impact on heritage resources and can continue. Mitigation measures in **Table 23** will need to be incorporated into the EMPr and implemented.	
Palaeontology	None	It is recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils. From a Palaeontological Heritage view there are no fatal flaws associated with the proposed development. However, it is recommended that the mitigation measures in **Table 23** are included in the EMPr and fully implemented.	**Yes**
Social	None	The proposed development has a positive element which outweighs the negative in that it will contribute towards the supply of renewable energy into a grid system heavily reliant on coal-powered energy generation. In this sense the project forms part of a national effort to reduce South Africa's carbon emissions and thus carries with it a significant social benefit and is thus supported and should proceed. As the area is sparsely populated and the negative social impacts associated the solar PV facility are of moderate significance it is most unlikely that any further social study will be necessary. This will, however, be dependent on the outcome of the public participation process which may result in a need to update the current report by incorporating the comments recorded and updating the social impacts accordingly. Mitigation measures in **Table 23** will need to be incorporated into the EMPr and implemented.	**Yes**

Aspect	Fatal Flaws	Recommendations	Further Investigations required during EIA phase
Geotechnical	None	The desktop geotechnical assessment did not identify any fatal flaws that, from a geological and geotechnical perspective, would prevent the construction of the proposed Paarde Valley Solar PV Energy Facility. From a geological and geotechnical perspective, based on the minimal negative impacts on the geology and soils and the recommendations for mitigation measures, it is recommended that the Paarde Valley Solar PV Energy Facility project receives the go-ahead from the Competent Authority. Mitigation measures in **Table 23** will need to be incorporated into the EMPr and implemented.	**Yes**
Transportation	None	Recommendations include the following: ▪ Complete a Traffic Management Plan prior to construction in order to form part of the Final EMPr. The plan must include *inter alia* the following; o The review of all intersections and routes prior to the project commencing in order to accommodate construction vehicles and staff commuting. o Further discussions with the SANRAL and the respective transport department on access points and route requirements. o The upgrades of intersections and the installation of road traffic signage as per the SARTSM (South African Road Traffic Sign Manual). o The implementation of pedestrian safety initiatives o The implementation of a road maintenance plan under the auspices of the respective transport department. ▪ It is recommended that one (1) access point from the N10 freeway be used for the proposed facility to reduce the impact to the area. This access point is located at	**Yes**

Aspect	Fatal Flaws	Recommendations	Further Investigations required during EIA phase
		Km19.92 on section N10-5 and the appropriate axillary lanes and speed reduction measures are to be implemented subsequent to discussions with SANRAL. This study and a revised study, with the all the renewable parties involved in the area at the time, must be submitted to SANRAL and more specifically Ms. Colene Runkel 021 957 4613 for review and comments. ▪ Development access points to the PV facility must be as per the recommendations in section 9 of the specialist Transportation report (**Appendix 6I**). ▪ The appropriate load permits be obtained from the Department of Transport prior to construction (if required). ▪ It is recommended that a detailed Traffic Impact Study which takes into account actual traffic counts during peak periods be completed prior to the construction process with all Renewable Energy parties involved in the immediate area. Mitigation measures in **Table 23** will need to be incorporated into the EMPr and implemented.	

As previously mentioned, the specialist assessments will be updated/revised to focus on specific impacts of the proposed PV array / development area and solar PV energy facility infrastructure in detail during the EIA phase, once the layout of the solar PV energy facility has been determined. The updates/revisions will include the following (if required):

- a review of the findings of the specialist assessment in accordance with detailed site layouts, including the PV development areas put forward as a result of the identified sensitive areas;
- a comparative assessment of the layout alternatives provided; and
- addressing any comments or concerns arising from the public participation process.

Following the Desktop Heritage Assessment, it was identified that further field truthing will need to be undertaken through an archaeological walk down study covering the site. This field truthing exercise can however only be undertaken once the layout of the solar PV energy facility and associated infrastructure has been determined, based on the findings of the other specialist studies.

The proposed scope of work and methodology to assess each of the above impacts has been detailed in the plan of study for EIA, as per the EIA Regulations, 2014 (as amended). The Plan of Study is included below.

11 PLAN OF STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT

Issues identified during the scoping phase will be investigated further during the EIA phase of the proposed development. Various specialist studies will be conducted during the EIA phase to assess these issues. Mitigation measures will be formulated, and these will be included in the Environmental Management Programme (EMPr). In addition, all alternatives will be presented and extensively investigated and assessed in the EIA phase.

This information will assist the DEA in making an informed decision with regards to the authorisation of the proposed development.

11.1 Aim of the EIA Phase

The EIA phase aims to:

- Conduct a detailed impact assessment of the issues identified that were not fully assessed in the scoping phase;
- Identify further mitigation measures to reduce impacts;
- Ensure information is disseminated to I&APs and key stakeholder and that there is a constant flow of communication; and
- Adhere to the requirements of Appendix 3 of the EIA Regulations, 2014 (as amended).

The following tasks will form part of the EIA Phase:

- Undertake a comprehensive Public Participation Process (in compliance of section 41 of the EIA Regulations, 2014, as amended);
- Present, extensively assess and complete the assessment of layout alternatives informed by the identified environmental sensitivities and PV development area;
- Compilation of Draft and Final EIA Report (DEIAr and FEIAr);
- Compilation of an Environmental Management Programme (EMPr);
- Submit DEIAr and FEIAr to the DEA; and
- Await the decision on the application

The following specialist studies will form part of the EIAr:

- Terrestrial Ecology Impact Assessment;
- Avifauna Impact Assessment;
- Surface Water Impact Assessment;
- Agricultural and Soils Impact Assessment;

- Visual Impact Assessment;
- Heritage Impact Assessment (including ground-truthing);
- Palaeontology Impact Assessment;
- Social Impact Assessment;
- Geotechnical Impact Assessment; and
- Transportation Impact Assessment.

As mentioned, the above-mentioned specialist assessments will be updated/revised (if required) to include a review of the findings in accordance with detailed site layouts (including the PV development areas put forward as a result of the identified sensitive areas); a comparative assessment of the layout alternatives provided and address any comments or concerns arising from the public participation process. Following the Desktop Heritage Assessment, it was identified that field truthing will need to be undertaken through an archaeological walk down study covering the site. The aim of this will be to compile a comprehensive database of heritage sites within the PV development area, with the aim of developing a heritage management plan for inclusion in the EMPr. This field truthing exercise can however only be undertaken once the layout of the solar PV energy facility and associated infrastructure has been determined, based on the findings of the other specialist studies.

The terms of reference (ToR) for these studies involves assessing and determining mitigation measures to address the potential impacts that have been identified in the scoping phase, in addition to any new issues that may identified (see **section 11.3**). It should be noted that respective specialist reports will be updated/revised by the same specialists who undertook assessments in the scoping phase. The qualifications of these specialists (including their CV's) are included in **Appendix 2**.

11.2 Decision-Making Authority Consultation

The stages at which the competent authority will be consulted are as follows:

- Submission of the DSR for comment;
- Submission of the FSR for comment and acceptance/ rejection;
- Submission of DEIAr for comment;
- Submission of FEIAr for decision-making; and
- Response from competent authority regarding the application.

Additional consultation may occur with the DEA during the EIA process should the need arise.

11.3 Assessing Environmental Issues and Specialist Studies

The EIA Methodology assists in consistent evaluating the overall effect of a proposed activity on the environment. The determination of the effect of an environmental impact on an environmental parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental practitioner through the process of the EIA.

All specialists undertook a detailed evaluation of predicted impacts through an assessment of the significance of the impacts in accordance with the impact rating methodology provided in **Section 11.5** during the scoping phase (refer to **Section 6.2**). These are considered sufficient to inform the EIA Phase. The specialists will however update/revise their assessments during the EIA phase (if required) and thus the evaluation of predicted impacts will be updated/revised if necessary. The updates/revisions to the scoping phase specialist assessment will include the following:

- a review of the findings of the specialist assessment in accordance with detailed site layouts, including the PV development areas put forward as a result of the identified sensitive areas;
- a comparative assessment of the layout alternatives provided; and
- addressing any comments or concerns arising from the public participation process.

It is recommended that the following specialist studies be carried forward into the EIA Phase:

- Terrestrial Ecology Impact Assessment;
- Avifauna Impact Assessment;
- Surface Water Impact Assessment;
- Agricultural and Soils Impact Assessment;
- Visual Impact Assessment;
- Heritage Impact Assessment;
- Palaeontology Impact Assessment;
- Social Impact Assessment;
- Geotechnical Impact Assessment; and
- Transportation Impact Assessment.

Following the Desktop Heritage Assessment, it was identified that further field truthing be undertaken for the HIA. This must be undertaken through an archaeological walk down. The aim of this will be to compile a comprehensive database of heritage sites within the PV development area, with the aim of developing a heritage management plan for inclusion in the EMPr. This field truthing exercise will be undertaken once the layout of the solar PV energy facility and associated infrastructure has been determined.

A brief Terms of Reference (ToR) for the HIA (including the field truthing exercise to be undertaken in the EIA phase) is included below:

11.3.1 Heritage - Methodology for Assessing Heritage Site Significance

Impact Assessment Phase

Step II – Physical Survey: A physical survey will be conducted on foot and by vehicle through the proposed project area by two (2) qualified archaeologists and two (2) field assistants, which will be aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

Step III – The final step will involve the recording and documentation of relevant archaeological resources, the assessment of resources in terms of the HIA criteria and report writing, as well as mapping and constructive recommendations.

The significance of heritage sites is based on four (4) main criteria:

- **site integrity** (i.e. primary vs. secondary context),
- **amount of deposit, range of features** (e.g., stonewalling, stone tools and enclosures),
    - Density of scatter (dispersed scatter)
        - Low - <10/50m^2
        - Medium - 10-50/50m^2
        - High - >50/50m^2
- uniqueness and
- **potential** to answer present research questions.

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be expressed as follows:

A - No further action necessary;
B - Mapping of the site and controlled sampling required;
C - No-go or relocate pylon position
D - Preserve site, or extensive data collection and mapping of the site; and
E - Preserve site

Site Significance

Site significance classification standards prescribed by SAHRA (2006) and approved by the Association for Southern African Professional Archaeologists (ASAPA) for the Southern African Development Community (SADC) region, will be used for the purpose of this report.

Table 34: Site significance classification standards as prescribed by SAHRA

FIELD RATING	GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
National Significance (NS)	Grade 1	-	Conservation; National Site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High Significance	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High Significance	Mitigation (Part of site should be retained)
Generally Protected A (GP. A)		High / Medium Significance	Mitigation before destruction
Generally Protected B (GP. B)		Medium Significance	Recording before destruction
Generally Protected C (GP. A)		Low Significance	Destruction

The guidelines for the impact assessment evaluation provided by SiVEST and as described in **section 11.5** will also be used during the EIA phase.

11.4 Cumulative Impact Assessment

The potential cumulative impact of the proposed solar PV energy facility in combination with other renewable energy facilities within a 35km radius from the application site of the proposed solar PV energy facility has been identified and assessed per environmental aspect in **section 6.3**. In addition, mitigation measures were identified to address the cumulative impacts, where possible. The scoping phase specialist reports included a detailed cumulative impact assessment, including a review of other specialist studies conducted for other renewable energy developments within a 35km radius of the application site of the proposed solar PV energy facility. The recommendations contained in the specialist reports will be reflected in the mitigation measures to be provided in the FSR and EMPr. Cumulative impacts were also rated as part of the impact rating system and used to determine the significance of the impacts. It should be noted that cumulative impacts will be further assessed during the EIA phase of the project, if required.

11.5 Determination of Significance of Impacts

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

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

11.5.1 Impact Rating System

The impact assessment will take account of the nature, scale and duration of effects on the environment and whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact will also be assessed according to the various project stages, as follows:

- Planning;
- Construction;
- Operation; and
- Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact will be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance will also be included.

The significance of impacts will continue to be assessed based on the methodology as described in **section 6.1**.

11.6 Environmental Management Programme (EMPr)

In accordance with Appendix 4 of the EIA Regulations, 2014 (as amended), a draft EMPr will be included within the EIA Report. The EMPr will include the mitigation measures formulated by the various specialists and will include all information as required in **Appendix 4** of the EIA Regulations, 2014 (as amended).

11.7 Alternative Assessment

In accordance with the EIA Regulations, 2014 (as amended), and as discussed in **Chapter 7**, all alternatives will be presented and extensively investigated and assessed in the EIA phase of the proposed development, once the layout has been determined. Two (2) grid connection infrastructure alternatives have been comparatively assessed by the respective specialists. Although the specialists assessed the grid connection infrastructure alternatives as part of their respective assessments, these will be comparatively assessed as part of the associated electrical infrastructure BA and will inform the location of the on-site and collector substation sites (to be presented in EIA phase). As such, all specialists will undertake a comparative assessment of the layout alternatives for the PV facility in the EIA phase, once the layout alternatives have been determined.

During the scoping phase the preliminary PV development area was comparatively assessed with the PV development area which was informed by the identified sensitive areas (namely the ‘refined’ PV development area) in order to show that this would be ‘preferred’ from an environmental perspective. The assessment concluded that the proposed PV development area is preferred from an environmental perspective. The proposed PV development area will therefore be taken forward into the EIA for further assessment.

11.8 Public Participation

The Public Participation during the EIA Phase will involve the following:

Table 35: Public Participation activities still to take place

ACTIVITY	FUNCTION
Written notification to all I&APs and key stakeholders	- Notify registered I&APs and key stakeholders of outcome of the Scoping Phase; and

ACTIVITY	FUNCTION
	- The availability of the DEIAr for comment (including timeframes and when their input is required).
Placement of DEIAr in public domain	- DEIAr will be available from the Middelburg Public Library and on SiVEST's website: http://www.sivest.co.za/, click on '*Downloads*' then browse to the folder '*15324 Paarde Valley Solar PV*'
Meetings	- Up to a maximum of three (3) meetings to be held to provide information regarding the EIA and Public Participation processes, as well as to provide feedback on the findings of the detailed specialist studies. Number and type of meetings to be determined at a later stage.
Public comment period	- Notification to I&APs and key stakeholders of the availability of the DEIAr for public comment and review for a 30-day period.
C&RR	- Compilation of the C&RR
Notification of FEIAr	- Notification of I&APs and key stakeholders of the submission of the FEIAr to the DEA
I&AP database	- Continual updating of the project database as new I&APs and key stakeholders register
Notification of granting or refusal of Environmental Authorisation (EA)	- Informing all registered I&APs and key stakeholders of the EA and their rights to appeal, along with details of the appeal process (DEA's appeals guidelines will be sent to all registered I&APs and key stakeholders)
Environmental Authorisation (EA) appeal period	- Receive any appeals and forward to DEA (if required)

11.9 Proposed Project Schedule going forward

The table below represents the proposed schedule for the EIA phase of the proposed development.

Table 36: Proposed Project Schedule

	July 2019	**August 2019**	**September 2019**	**October 2019**	**November 2019**	**December 2019**	**January 2020**	**February 2020**	**March 2020**	**April 2020**	**May 2020**
Start of DSR Comment period	26th of July 2019 to 26th of August 2019										
Submission of FSR to DEA			September 2019								
DEA Decision on FSR				October 2019							
Distribution of EIA Notifications				October 2019							
DEIAr Comment period					November 2019 – December 2019 (exact dates to be confirmed at later stage)						
Hold Meetings					November 2019						
Submission of FEIAr to DEA							January 2020				
DEA Decision											May 2020

12 WAY FORWARD

The DSR will be circulated for public participation for a period of 30 days (excluding public holidays) from Friday 26 July 2019 until Monday 26 August 2019. Hard copies of the DSR will be made available at a public venue and an electronic copy will also be made available on SiVEST's website (see **section 8.7**). All I&APs and key stakeholders who are registered on the project database will be notified of the submission of the DSR and the above-mentioned 30-day public review and comment period accordingly. In addition, all OoS / authorities will be sent electronic copies (on CD) of the DSR. The 30-day public review and comment period is provided for the general public and for the I&APs and key stakeholders, as required by the EIA Regulations, 2014 (as amended). All comments received will be responded to in a Comments and Response Report (C&RR), which will be included prior to sending the FSR to the decision-making authority, namely the DEA. Comments received on the DSR will be taken into consideration, incorporated into the report (where required) and will be used when compiling the FSR. The DEA must accept or reject the scoping assessment or make further recommendations for the assessment. Should the DEA accept the scoping assessment, the proposed development will proceed to the EIA phase.

All I&APs and key stakeholders will be provided with a second opportunity to participate in the EIA process through the public participation process which will be undertaken during the EIA phase.

To register as an I&AP and/or to obtain additional information, please submit your name; contact details (telephone number, postal address and email address) and the interest which you have in the application to SiVEST Environmental Division, as per the details below:

Contact: Hlengiwe Ntuli or Stephan Jacobs
PO Box 2921, RIVONIA, 2128
☎ Phone:(011) 798 0600
E-mail:hlengiwen@sivest.co.za / stephanj@sivest.co.za / sivest_ppp@sivest.co.za
Fax:(011) 803 7272
Websites:www.sivest.co.za

Please reference "*Paarde Valley Solar PV*" in your correspondence, should your comments be project specific. SiVEST shall keep all registered I&APs informed of the EIA process.

13 REFERENCES

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SiVEST Environmental Division
51 Wessels Road, Rivonia. 2128. South Africa
PO Box 2921, Rivonia. 2128. South Africa

Tel + 27 11 798 0600
Fax +27 11 803 7272
Email info@sivest.co.za
www.sivest.co.za

Contact Person:Andrea Gibb
Cell Number: 011 798 0600
Email: andreag@sivest.co.za