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EIA REPORT

Scoping and **Environmental Impact Assessment**

for the Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province

Prepared for:
Scatec Solar SA 370 (PTY) Ltd

CSIR Report No.: CSIR/CAS/EMS/ER/2015/0009/B

March 2016

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Prepared for:
Scatec Solar SA 370 (PTY) Ltd

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report details

Title:	**Scoping and Environmental Impact Assessment for the Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province: EIA REPORT**
Prepared for:	This Environmental Impact Assessment (EIA) Report forms part of a series of reports and information sources that are being provided during the EIA Process for the proposed Kenhardt PV 3 project. In accordance with the 2014 NEMA EIA Regulations, the purpose of the EIA Report is to: • Present the details of and need for the proposed project; • Describe the affected environment, including the planning context, at a sufficient level of detail to facilitate informed decision making; • Provide an overview of the EIA Process being followed, including public consultation; • Assess the predicted positive and negative impacts of the project on the environment; • Provide recommendations to avoid or mitigate negative impacts and to enhance the positive benefits of the project; • Provide an Environmental Management Programme (EMPr) for the design, construction and operational phases of the project. The EIA Report is being made available to all stakeholders for a 30-day review period. All comments on the EIA Report (submitted within the 30-day review period) will be considered in the preparation of the finalised EIA Report. This finalised EIA Report will then be submitted to the National Department of Environmental Affairs (DEA), in accordance with Regulation 23 (1) of the 2014 NEMA EIA Regulations, for decision-making in terms of Regulation 24 of the 2014 NEMA EIA Regulations.
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Mapping:	Luanita van der Walt and Surina Laurie
CSIR Report Number: CSIR Project Number: CSIR Reference:	CSIR/CAS/EMS/ER/2015/0009/B EMS0102 EMS0102/Scatec/2015
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DEA INFORMATION REQUIREMENTS

General Site Information	**Reference in the EIA Report**
Description of all affected farm portions	Chapters 2, 3 and 5 (as well as Specialist Studies in Chapters 7 to 14).
21 digit Surveyor General codes of all affected farm portions	C03600000000016800000
Copies of title deeds of all affected land portions	Appendix J
Photos of areas that give a visual perspective of all parts of the site	Chapter 8
Photos from sensitive visual receptors (tourism routes, tourism facilities, etc.)	Chapter 8
Solar plant design specifications including: • Type of technology • Structure height • Surface area to be covered (including associated infrastructure such as roads) • Structure orientation • Laydown area dimensions (construction period and thereafter) • Generation capacity	Chapter 2
Generation capacity of the facility as a whole at delivery points	75 MW AC, 100 MW DC
Site Maps and GIS information	**Reference in the EIA Report**
All maps/information layers must also be provided in ESRI Shapefile format	Included on Compact Disk (CD) submitted to the DEA with this EIA Report.
All affected farm portions must be indicated	Included on CD submitted to the DEA with this EIA Report.
The exact site of the application must be indicated (the areas that will be occupied by the application)	Chapter 16 and Appendix J
A status quo map/layer must be provided that includes the following: • Current use of land on site including: o Buildings and other structures o Agricultural Fields o Grazing Areas o Natural Vegetation Areas o Critical endangered and endangered vegetation areas that occur on the site o Bare areas which may be susceptible to soil erosion o Cultural historical sites and elements • Rivers, streams and watercourses • Ridgelines and 20 m continuous contours with height references in the GIS database • Fountains, boreholes, dams (in-stream as well as off-stream) and reservoirs • High potential agricultural areas as defined by the Department of Agriculture, Forestry and Fisheries • Buffer zones • Indicated isolated residential, tourism facilities on or within 1 km of the site	Included on CD submitted to the DEA with this report and discussed in Chapters 2, 3 and 5 and Chapters 7 to 14 of this EIA Report, as applicable.
A slope analysis map/layer	Included on CD submitted to the DEA with this EIA Report
A site development proposal map(s)/layer(s) that indicate: • Foundation footprint • Permanent laydown area footprint • Construction period laydown footprint • Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve • River, steam and water crossing of roads and cables indicating the type of bridging structures that will be used	Chapter 2, Chapter 16 and Appendix J

• Substations and/or transformers sites including their entire footprint • Cable routes and trench dimensions (where they are not along internal roads) • Connection routes to the distribution/transmission network • Cut and fill areas along roads and at substations/transformer sites indicating the expected volume of each cut and fill • Borrow pits • Spoil heaps (temporary for topsoil and subsoil and permanently for excess material) • Buildings including accommodation	
Regional map and GIS information	**Reference in the EIA Report**
All maps/information must also be provided in ESRI Shapefile format	Noted
The map/layer must cover an area of 20 km around the site	Noted
Roads including their types (tarred or gravel) and category (national, provincial, local or private)	Included on CD submitted to the DEA with this report and discussed in Chapter 14 of this EIA Report
Railway lines and stations	Included on CD submitted to the DEA with this report and shown in maps in this EIA Report where applicable.
Industrial areas	N/A
Harbours and airports	N/A
Electricity transmission and distribution lines and substations	Included on CD submitted to the DEA with this EIA Report
Pipelines	Chapter 16 of this EIA Report
Water sources to be utilised during the construction and operational phases	Discussed in Chapter 2 of this EIA Report
A visibility assessment of the areas from where the facility will be visible	Chapter 8 of this EIA Report
Critical Biodiversity Areas and Ecological Support Areas	N/A
Critically Endangered and Endangered Vegetation areas	N/A
Agricultural fields	N/A
Irrigated areas	N/A
An indication of new road or changes and upgrades that must be done to existing roads in order to get equipment onto the site including cut and fill areas and crossings of rivers and streams	Chapter 16 and Appendix J of this EIA Report

executive summary

PROJECT OVERVIEW

Scatec Solar SA 163 (PTY) Ltd is proposing to develop three 75 Megawatt (MW) Solar Photovoltaic (PV) power generation facilities and associated electrical infrastructure (including transmission lines for each 75 MW facility) on the remaining extent of Onder Rugzeer Farm 168 and the connection points to the Eskom Nieuwehoop Substation on the remaining extent of Portion 3 of Gemsbok Bult Farm 120, approximately 80 km south of Upington and 20-30 km north-east of Kenhardt within the !Kheis Local Municipality, Northern Cape Province. Scatec Solar SA 163 (PTY) Ltd consists of various subsidiary companies, one of which is Scatec Solar SA 370 (PTY) Ltd. Scatec Solar SA 370 (PTY) Ltd (hereinafter referred to as Scatec Solar) is the Project Applicant for this proposed 75 MW solar PV project (referred to as Kenhardt PV 3).

In terms of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) and the 2014 NEMA Environmental Impact Assessment (EIA) Regulations promulgated in Government Gazette 38282 and Government Notice (GN) R982, R983, R984 and R985 on 8 December 2014, a full Scoping and EIA Process is required for the construction of the three Solar PV facilities. A separate Basic Assessment Process has been undertaken for the development of the proposed transmission lines, associated electrical infrastructure and connection to the Eskom Nieuwehoop Substation. The Applicant has appointed the Council for Scientific and Industrial Research (CSIR) to undertake the separate EIA and Basic Assessment Processes in order to determine the biophysical, social and economic impacts associated with undertaking the proposed activity.

Since the proposed 75 MW Solar PV facilities are located within the same geographical area and constitute the same type of activity, an integrated Public Participation Process (PPP) will be undertaken for the proposed projects. However, separate Applications for Environmental Authorisation (EA) have been lodged with the Competent Authority (i.e. the National Department of Environmental Affairs (DEA)) for each proposed Scoping and EIA project, as well as for each Basic Assessment project. Furthermore, separate reports (i.e. Basic Assessment, Scoping and EIA Reports) have been compiled for each project.

The abovementioned integrated PPP approach, as well as the general approach to the Scoping and EIA Projects and the Basic Assessment Projects, were discussed with and approved by the DEA at a pre-application meeting, which was held on 17 September 2015. Appendix I.1 of this EIA Report includes a copy of the agenda and notes of the meeting, as well as the presentation given by the CSIR at the pre-application meeting.

The proposed 75 MW Solar PV facility projects (requiring a Scoping and EIA Process) are referred to as (together with the corresponding assigned DEA EIA Reference Numbers):

- Kenhardt PV 1 – DEA EIA Reference: 14/12/16/3/3/2/837;
- Kenhardt PV 2 – DEA EIA Reference: 14/12/16/3/3/2/838; and
- Kenhardt PV 3 – DEA EIA Reference: 14/12/16/3/3/2/836.

The proposed transmission line projects (requiring a Basic Assessment Process) are referred to as Kenhardt PV 1 – Transmission Line; Kenhardt PV 2 – Transmission Line; and Kenhardt PV 3 –

Transmission Line. It should be noted that the DEA Reference Numbers for the Basic Assessment Projects were pending at the time of release of this report.

This EIA Report only discusses the proposed **Kenhardt PV 3** project.

NEED FOR THE PROJECT

The Integrated Resource Plan for South Africa for the period 2010 to 2030 (referred to as "IRP 2010") was released by government in 2010, and proposes to develop and secure 17 800 MW of renewable energy capacity by 2030 (including wind, solar and other energy sources). The IRP was updated in 2013. The IRP 2010 has set up a target of 3 725 MW of renewable energy to be produced by Independent Power Producers (IPPs) by 2016. On 18 August 2015, an additional target of 6 300 MW to be procured and generated from renewable energy sources was added to the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) as noted Government Gazette 39111. The additional target allocated for solar PV energy is 2 200 MW.

In 2011, the Department of Energy (DOE) launched the REIPPPP and invited potential IPPs to submit proposals for the financing, construction, operation and maintenance of the first 3 725 MW of onshore wind, solar thermal, solar PV, biomass, biogas, landfill gas or small hydro projects. The two main evaluation criteria for compliant proposals are price and economic development, with other selection criteria including technical feasibility and grid connectivity, environmental acceptability, black economic empowerment, community development, and local economic and manufacturing propositions. The bidders with the highest rankings (according to the aforementioned criteria) are appointed as "Preferred Bidders" by the DOE. The proposed projects aim to contribute to the above strategic imperative.

PROJECT APPLICANT

Scatec Solar is an integrated IPP that is focused on making solar energy a sustainable and affordable source on a global scale. Scatec Solar was founded in 2001 and holds its headquarters in Norway. The company develops, builds, owns and operates a number of solar power plants internationally and within Africa. The company is growing significantly and is currently planned to provide a combined 207 MW of power in the United States, Honduras and Jordan. In addition, Scatec Solar collectively delivers more than 219 MW of power in the Czech Republic, South Africa and Rwanda. Specifically linked to investment within South Africa, Scatec Solar has been involved in the following major solar energy projects:

- The Linde Solar Plant (40 MW) is located in the Northern Cape and is considered to be the first of the large-scale PV plants in production from the second round of the REIPPPP.
- The Dreunberg Solar Plant (75 MW) is the only REIPPPP Solar PV Project to be located in the Eastern Cape.
- The Kalkbult Solar Plant (75 MW) is located in the Northern Cape and was the first REIPPPP project to be connected to the grid and operational in South Africa.

Scatec Solar was awarded another further 258 MW in the Fourth Round of the REIPPPP.

PROJECT EIA TEAM

As mentioned above, the CSIR has been appointed to undertake the separate EIA and Basic Assessment Processes. The EIA project team, including the relevant specialists are indicated in the table below:

NAME	ORGANISATION	ROLE/STUDY TO BE UNDERTAKEN
Environmental Assessment Practitioners		
Paul Lochner	CSIR	Technical Advisor and Quality Assurance (EAPSA) Certified
Surina Laurie	CSIR	Project Leader (*Pr. Sci. Nat.)*
Rohaida Abed	CSIR	Project Manager (*Pr. Sci. Nat.)*
Specialists		
Simon Bundy	Sustainable Development Projects cc	Ecological Impact Assessment (including Terrestrial Ecology, Aquatic Ecology and Avifauna)
Henry Holland	Private	Visual Impact Assessment
Dr. Jayson Orton	ASHA Consulting (Pty) Ltd	Heritage Impact Assessment (Archaeology and Cultural Landscape)
Dr. John Almond	Natura Viva cc	Desktop Palaeontological Impact Assessment
Julian Conrad	GEOSS	Geohydrological Assessment
Johann Lanz	Private	Soils and Agricultural Potential Assessment
Rudolph du Toit	CSIR	Social Impact Assessment
P. S. van der Merwe and A. J. Otto	MESA Solutions (PTY) Ltd	Electromagnetic Interference and Radio Frequency Interference Surveys

It must be reiterated that the Social Impact Assessment specialist study (included in Chapter 13 of the EIA Report) was subject to a peer review process by an external reviewer (Ms. Liza van der Merwe, a private consultant), as requested by the DEA. This external review report is included as an appendix to the Social Impact Assessment.

A Traffic Impact Statement was also compiled by the Environmental Assessment Practitioner (EAP) and is included in Chapter 14 of the EIA Report, however it serves as a general description of the existing and predicted traffic associated with the proposed project and does not classify as a specialist study in terms of Appendix 6 of the 2014 NEMA EIA Regulations. Furthermore, this statement considered the full development (i.e. the development of the three Solar PV Facilities (i.e. Kenhardt PV 1, 2 and 3) and the associated electrical infrastructure (which are the subjects of separate BA Processes).

PROJECT DESCRIPTION

It is important to point out at the outset that the exact specifications of the proposed project components will be determined during the detailed engineering phase (subsequent to the issuing of an EA, should one be granted for the proposed project).

Linked to enhancing its operations within South Africa, the 75 MW Solar PV facility (i.e. Kenhardt PV 3) proposed by Scatec Solar will cover an approximate area of 250 hectares (ha). The preferred site for the proposed PV facility was assessed in this EIA Phase, which covers an area of approximately 1341 ha. It was reported during the Scoping Phase that the preferred site extended approximately 1000 ha, however this has been increased to 1341 ha, due to progression in the design and the need to ensure that the proposed infrastructure and PV plants are constructed close together. Overall, the portion of land that was removed from the Kenhardt PV 2 area was added to the Kenhardt PV 3 area. The approximate centre point coordinates for this site is 29°12' 59.84" S and 21°18' 1.22"E.

This 1314 ha area was assessed by the specialists and considered in the EIA, even though the proposed project only requires approximately 250 ha of land. This approach was undertaken in order to avoid environmental constraints and sensitivities (highlighted by the specialists), during the siting and final design of the facility. The proposed project site does not fall within a Critical Biodiversity Area (CBA), Ecological Support Area (ESA) or threatened ecosystem.

The proposed project will make use of PV solar technology to generate electricity from the sun's energy. The Applicant is proposing to develop a facility with a possible maximum installed capacity of 100 MW Direct Current (DC) which produces 75 MW Alternating Current (AC) of electricity from PV solar energy.

Once a Power Purchase Agreement (PPA) is awarded, the proposed facility will generate electricity for a minimum period of 20 years. The proposed solar facility will consist of the following components:

- Solar Field:
  - Solar Arrays:
    - PV Modules;
    - Tracking structures;
    - Solar module mounting structures comprised of galvanised steel and aluminium; and
    - Foundations which will likely be drilled and concreted into the ground.

- Building Infrastructure:
  - Offices;
  - Operational and maintenance control centre;
  - Warehouse/workshop;
  - Ablution facilities;
  - Converter/Inverter stations;
  - On-site substation building; and
  - Guard Houses.

- Associated Infrastructure
  - 132 kV overhead transmission line (**this is being assessed as part of a separate Basic Assessment Process, referred to as Kenhardt PV 3 - Transmission Line**);
  - Associated electrical infrastructure at the Eskom Nieuwehoop Substation (including but not limited to feeders, Busbars, transformer bay and extension to the platform at the Eskom Nieuwehoop Substation) **(as mentioned above this is the subject of a separate Basic Assessment Process, referred to as Kenhardt PV 3 - Transmission Line)**;
  - On-site substation;
  - Internal transmission lines/underground cables;
  - Underground low voltage cables or cable trays;
  - Access roads;
  - Internal gravel roads;
  - Fencing;
  - Panel maintenance and cleaning area;
  - Stormwater channels; and
  - Temporary work area during the construction phase (i.e. laydown area).

NEED FOR AN EIA

As noted above, in terms of the EIA Regulations promulgated under Chapter 5 of the NEMA published in GN R982, R983, R984 and R985 on 4 December 2014 and enforced on 8 December 2014, a full Scoping and EIA Process is required for the proposed project. The need for the full Scoping and EIA is triggered by, amongst others, the inclusion of Activity 1 listed in GN R984 (Listing Notice 2):

- *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs within an urban area".*

Given that energy related projects have been elevated to national strategic importance in terms of the EA Process, the proposed project requires authorisation from the National DEA, acting in consultation with other spheres of government.

The purpose of the EIA is to identify, assess and report on any potential impacts the proposed project, if implemented, may have on the receiving environment. The Environmental Assessment therefore needs to show the Competent Authority, the DEA; and the project proponent, Scatec Solar, what the consequences of their choices will be in terms of impacts on the biophysical and socio-economic environment and how such impacts can be, as far as possible, enhanced or mitigated and managed as the case may be.

APPROACH TO THE EIA PROCESS

The Applications for EA for the Scoping and EIA Projects were submitted to the DEA via courier on 30 September 2015, together with the Scoping Reports for comment. Appendix E of this EIA Report includes the proof of submission (i.e. courier waybills) of the Applications for EA and the Scoping Reports to the DEA. The DEA acknowledged receipt of the Scoping Reports and Applications for EA on 26 October 2015 via email (as included in Appendix I.2 of this EIA Report). DEA EIA Reference Numbers were assigned to each Scoping and EIA Project, as noted above.

The Scoping Reports were made available to Interested and Affected Parties (I&APs) and stakeholders for a 30-day comment period extending from 25 September 2015 to 27 October 2015. The Addendum to the Scoping Report was released to I&APs for a further 30-day comment period extending from 6 October 2015 to 5 November 2015. The addendum included additional information that was requested by the DEA relating to an assessment of alternatives in the Scoping Phase.

The comments received from stakeholders during the 30-day review of both the Scoping Report and Addendum were incorporated into the Scoping Report (where required), and the finalised Scoping Report was submitted to the DEA in November 2015, in accordance with Regulation 21 (1) of the 2014 NEMA EIA Regulations, for decision-making in terms of Regulation 22 of the 2014 NEMA EIA Regulations. The DEA accepted the finalised Scoping Report and Plan of Study for EIA on 8 December 2015, which enabled the commencement of the impact assessment phase.

The EIA Report is now being released to stakeholders for a 30-day review period (together with the Basic Assessment Reports). All comments received will be included in the finalised EIA Report, which will be submitted to DEA for decision-making. The EIA Report is available in the Kenhardt and Groblershoop public libraries. An electronic version of this report is also available on the following project website: http://www.csir.co.za/eia/ScatecSolarPV/. Written notifications, hard copies and/or CDs containing the document were sent to key stakeholders, including authorities.

The results of the specialist studies and other relevant project information are summarised and integrated into the EIA Report. Part B of this EIA Report includes an Environmental Management Programme (EMPr). The EMPr is based on the recommendations made by specialists for design, construction, operation and decommissioning of the proposed project.

IMPACT ASSESSMENT AND MANAGEMENT ACTIONS

This section provides a summary of the main impacts identified and assessed by the specialists in the EIA Report. The significant impacts and corresponding impact significance ratings before and after mitigation and the key associated mitigation and management measures are summarised in this section.

Specialist Study	Main Impacts	Main Mitigation Measures	Overall Impact Significance Before Mitigation or Enhancement	Overall Impact Significance After Mitigation or Enhancement
Ecological Impact Assessment (including Terrestrial Ecology, Aquatic Ecology and Avifauna)	**Construction Phase:** ▪ Ousting (and recruitment) of various fauna. **Operational Phase:** ▪ Ousting (and recruitment) of various fauna on account of long term changes in the surrounding habitat/environment. ▪ Changes in water resources and water quality (i.e. impact on water chemistry) as a result of operational activities. **Decommissioning Phase:** ▪ Exotic weed invasion as a consequence of abandonment of site and cessation of weed control measures.	**Pre-Construction and Construction Phases:** ▪ Carry out a second assessment of the site in or around February to March (subsequent to the issuing of an EA and the completion of the detailed engineering) in order to identify any additional plant specimens of significance that may be evident on site. Such specimens may be relocated/removed or avoided (with the relevant permits and approvals in place) prior to the commencement of construction. ▪ An initial pre-construction clearance of all exotic vegetation on site should be undertaken to reduce the possibility of further exotic weed invasion. Continued exotic weed control measures should be implemented during the construction phase and may be incorporated into an exotic weed control plan for the site. **Operational Phase:** ▪ Provision of critter paths within the fencing should be considered in the design. ▪ Conduct regular (daily) inspections of the fence line to address any animals that may be affected by the electric fence (i.e. tortoise). ▪ Adopt “dry” cleaning methods, such as dusting and sweeping the site before washing down. **Decommissioning Phase:** ▪ Conduct monitoring of the land conditions and redress of exotic weeds found present on site.	Negative: Moderate-Very Low	Negative: Very Low-Low
Visual Impact Assessment	**Construction, Operational and Decommissioning Phases:** ▪ Potential visual intrusion of construction, operational and decommissioning activities on existing views of sensitive visual receptors.	**Construction Phase:** ▪ Preparation of the solar field area (i.e. clearance of vegetation, grading, contouring and compacting) and solar field construction should be phased in a way that makes practical sense in order to minimise the area of soil exposed and duration of exposure.	Neutral: Moderate-Very Low	Neutral: Low-Very Low

Specialist Study	Main Impacts	Main Mitigation Measures	Overall Impact Significance Before Mitigation or Enhancement	Overall Impact Significance After Mitigation or Enhancement
	Operational Phase: ▪ Potential visual intrusion of the proposed solar energy facility on the views of sensitive visual receptors; and ▪ Potential impact of night lighting of a large solar energy facility on the nightscape of the region.	**Operational Phase:** ▪ The project developer should maintain re-vegetated surfaces until a self-sustaining stand of vegetation is established and visually adapted to the undisturbed surrounding vegetation. No new disturbance should be created during operations without approval by the Environmental Officer. ▪ A lighting plan that documents the design, layout and technology used for lighting purposes should be prepared, indicating how nightscape impacts will be minimised. **Decommissioning Phase:** ▪ Disturbed and transformed areas should be contoured to approximate naturally occurring slopes to avoid lines and forms that will contrast with the existing landscapes.		
Heritage Impact Assessment (Archaeology and Cultural Landscape)	**Construction Phase** ▪ Damage to or destruction of archaeological resources and graves. **Construction, Operational and Decommissioning Phases** ▪ Impacts to the cultural and natural landscape.	**Construction Phase:** ▪ If they cannot be avoided with a buffer of at least 25 m, the two significant archaeological sites should be excavated; ▪ The potential grave should be avoided with a buffer of at least 5 m or else tested and, if necessary, exhumed prior to construction; ▪ The construction team should be made aware of the potential to locate more graves and instructed to report any suspicious stone features prior to disturbance; ▪ The built elements of the facility should be painted in an earthy colour to minimise visual contrast in the landscape; and ▪ If any archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.	Negative: High-Low	Negative: Low–Very Low
Desktop Palaeontological Impact Assessment	**Construction Phase:** ▪ Potential loss of palaeontological heritage resources through disturbance, damage or destruction of fossils and fossil sites (including associated geological contextual data) through surface clearance and excavation activities during the construction phase.	**Construction Phase:** ▪ All substantial bedrock excavations (into sedimentary rocks) should be monitored for fossil material by the responsible ECO. Should significant fossil remains be exposed during construction, the responsible ECO should safeguard these, preferably *in situ*. The SAHRA should be alerted as soon as possible, so that appropriate action can be taken by a professional palaeontologist. ▪ Appoint a professional palaeontologist to record and sample any	Negative: Very Low	Negative: Very Low

Specialist Study	Main Impacts	Main Mitigation Measures	Overall Impact Significance Before Mitigation or Enhancement	Overall Impact Significance After Mitigation or Enhancement
		chance fossil finds. The palaeontologist concerned with mitigation work will need a valid fossil collection permit from SAHRA.		
Geohydrological Assessment	**<u>Construction and Operational Phases:</u>** ▪ Potential impact of increased storm water outflows. **<u>Construction, Operational and Decommissioning Phases:</u>** ▪ Potential impact on groundwater quality as a result of accidental oil spillages and fuel leakages.	**<u>Construction, Operational and Decommissioning Phases:</u>** ▪ All reasonable measures must be taken to prevent soil, storm water outflows and groundwater contamination. ▪ Emergency measures and plans must be put in place and rehearsed in order to prepare for accidental spillage. ▪ Vehicle and washing areas must also be on paved surfaces and the by-products correctly managed. ▪ If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilled material. Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes.	Neutral: Very Low	Neutral: Very Low
Soils and Agricultural Potential Assessment	**<u>Construction and Decommissioning Phases:</u>** ▪ Degradation of veld vegetation beyond the direct footprint of the proposed PV facility. ▪ Loss of topsoil due to poor topsoil management. ▪ Loss of agricultural land use. ▪ Soil erosion by wind or water due to alteration of the land surface characteristics. **<u>Operational Phase:</u>** ▪ Loss of agricultural land use. ▪ Soil erosion by wind or water due to alteration of the land surface characteristics.	**<u>Construction, Operational and Decommissioning Phases:</u>** ▪ Implement an effective system of stormwater run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.	Negative: Very Low-Low	Negative: Very Low
	<u>Construction, Operational and Decommissioning Phases:</u> ▪ Generation of additional land use income through the rental of the land for the proposed solar energy facility.	None	Positive: Very Low	Positive: Very Low
Social Impact Assessment	**<u>Construction and Operational Phases:</u>** ▪ Negative Impact: Influx of jobseekers ▪ Negative Impact: Increases in social deviance and increases in incidence of HIV/AIDS infections ▪ Negative Impact: Expectations regarding jobs	**<u>Construction and Operational Phases:</u>** ▪ Develop and implement a Workforce Recruitment Plan; ▪ Clearly define and agree upon the Project Affected People (PAP); ▪ Develop a database of PAP and their relevant skills and experience, or use an existing legitimate database of skills and expertise; ▪ Develop and implement a Stakeholder Engagement Plan; and ▪ Delivery on the Economic Development Plan must be contractually binding on the proponent.	Negative: Moderate-Low	Negative: Low-Very Low

Specialist Study	Main Impacts	Main Mitigation Measures	Overall Impact Significance Before Mitigation or Enhancement	Overall Impact Significance After Mitigation or Enhancement
	Construction and Operational Phases: ▪ Positive Impact: Local spending ▪ Positive Impact: Local employment ▪ Positive Impact: Human development resulting from the proposed Economic Development Plan	▪ Develop and implement a Workforce Recruitment Plan; ▪ Procure goods and services, where practical, within the study area; ▪ The proponent should engage with local NGOs, CBOs and local government structures in the Kenhardt community to identify and agree upon relevant skills and competencies required; ▪ Such skills and competencies should then be included in the Economic Development Plan; and ▪ Where possible, align the Economic Development Plan with Local Municipality's IDP.	Positive: Moderate-Low	Positive: Moderate-Low
Traffic Impact Statement	**Construction, Operation and Decommissioning Phases:** ▪ Increase in traffic generation. ▪ Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads. ▪ Impact on air quality due to dust generation, noise and release of air pollutants from vehicles and construction equipment. ▪ Decrease in quality of surface condition of the roads.	**Construction, Operational and Decommissioning Phases:** ▪ Should abnormal loads have to be transported by road to the site, a permit needs to be obtained from the Provincial Government Northern Cape (PGNC) Department of Public Works, Roads and Transport. ▪ A Road Maintenance Plan should be developed for the section of the Transnet Service Road.	Negative: High-Low	Negative: Moderate–Low
Electromagnetic Interference (EMI) and Radio Frequency Interference (RFI) Survey Technical Study	Note from the CSIR this study was commissioned by the Project Applicant to determine the impact of the proposed project on the Square Kilometre Array (SKA), as requested by the SKA Project Office. This report is not a standard specialist study in terms of Appendix 6 of the 2014 NEMA EIA Regulations, as it is a detailed, technical report which provides a cumulative topographical analysis of the proposed PV projects in the Astronomy Geographic Advantage Area and was undertaken to determine appropriate mitigation and management measures to reduce the risk of a detrimental impact on the SKA project.	▪ The inverter units, transformers, communication and control units for an array of panels all be housed in a single shielded environment. ▪ For shielding of such an environment ensure RFI gasketting be placed on all seams and doors and RFI Honeycomb filtering be placed on all ventilation openings. ▪ Cables to be laid directly in soil or properly grounded cable trays (not plastic sleeves). ▪ The use of bare copper directly in soil for earthing is recommended. ▪ Assuming a tracking PV plant design, care will have to be taken to shield the noise associated with the relays, contactors and hydraulic pumps of the tracking units. ▪ All data communications to and from the plant to be via fibre optic.	Refer to Technical Report in Appendix K of the EIA Report	Refer to Technical Report in Appendix K of the EIA Report

OVERALL EVALUATION BY THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

Based on the findings of the specialist studies, which all recommend that the proposed project can proceed and should be authorised by the DEA, the proposed project is considered to have an overall low negative environmental impact and an overall moderate positive socio-economic impact (with the implementation of respective mitigation and enhancement measures).

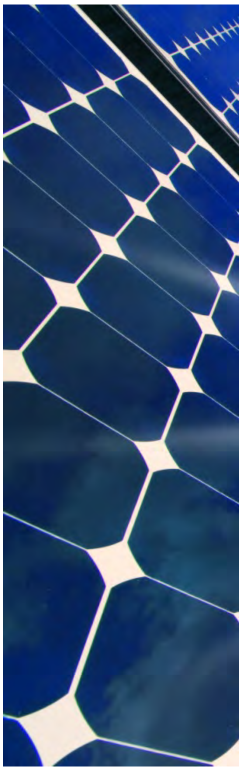
The proposed project will take place within the Development Envelope. The location of the 250 ha PV facility within the assessed Development Envelope will avoid the sensitive ecological and heritage features identified by the respective specialists, where possible. An indicative Site Development Plan within the Development Envelope has been produced and included within this report.

Section 24 of the Constitutional Act 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 prevents pollution and ecological degradation; promotes conservation; and secures ecologically sustainable development and use of natural resources while promoting justifiable economic and social development". Based on this, this EIA was undertaken to ensure that these principles are met through the inclusion of appropriate management and mitigation measures and monitoring requirements. These measures will be undertaken to promote conservation by avoiding the sensitive environmental features present on site (where possible) and through appropriate monitoring and management plans included in the EMPr (Part B of the EIA Report).

The outcomes of this project therefore succeeds in meeting the environmental management objectives of protecting the ecologically sensitive areas and supporting sustainable development and the use of natural resources, whilst promoting justifiable socio-economic development in the towns nearest to the project site. The findings of this EIA show that all natural resources will be used in a sustainable manner (i.e. this project is a renewable energy project and the majority of the negative site specific and cumulative environmental impacts are considered to be of low significance with mitigation measures implemented), while the benefits from the project will promote justifiable economic and social development.

Taking into consideration the findings of the EIA Process and given the national and provincial strategic requirements for infrastructure development, it is the opinion of the EAP that the project benefits outweigh the costs and that the project will make a positive contribution to steering South Africa on a pathway towards sustainable infrastructure development. Provided that the specified mitigation measures are applied effectively, it is recommended that the project receive EA in terms of the 2014 EIA Regulations promulgated under the NEMA.

glossary



AC	Alternating Current
ADT	Average Daily Traffic
AGIS	Agricultural Geo-Referenced Information System
BGIS	Biodiversity Geographic Information System
BID	Background Information Document
CA	Competent Authority
CBA	Critical Biodiversity Area
CPV	Concentrated Photovoltaic
CSP	Concentrated Solar Power
CSIR	Council for Scientific and Industrial Research
DAFF	National Department of Agriculture, Forestry and Fisheries
DEA	National Department of Environmental Affairs
DEA&DP	Western Cape Department of Environmental Affairs and Development Planning
DC	Direct Current
DM	Siyanda District Municipality
DMR	National Department of Minerals Resources
DOE	Department Of Energy
DOT	National Department of Transport
DSR	Draft Scoping Report
DWA	National Department of Water Affairs
EA	Environmental Authorization
EAP	Environmental Assessment Practitioner
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
EMI	Electromagnetic Interference
EMPr	Environmental Management Programme
ESA	Ecological Support Area
FEPA	Freshwater Ecosystem Protection Areas
FSR	Final Scoping Report
GA	General Authorization
GG	Government Gazette
GIS	Geographical Information Systems
GN R	Government Notice Regulation
HPM	Hydraulic Plant Module
I&AP	Interested and Affected Party
IEM	Integrated Environmental Management
ICB	Iron Chromium Battery
IDP	Integrated Development Plan
IPP	Independent Power Producer
IRP	Integrated Resource Plan
kWh	Kilowatt Hours
LSA	Later Stone Age
Mf	Friesdale Charkonite

Mja	Jacomys Pan Formation
Mks	Klip Koppies Granite
MSA	Middle Stone Age
MW	Megawatts
NBA	South African National Parks
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act
NERSA	National Energy Regulator of South Africa
NFEPA	National Freshwater Ecosystems Protected Areas
NHRA	National Heritage Resources Act (Act 25 of 1999)
NPAES	National Protected Expansion Strategy
NWA	National Water Act (Act No. 36 of 1998)
PES	Present Ecological State
PPA	Power Purchasing Agreement
PV	Photovoltaic
REDZs	Renewable Energy Development Zones
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
RFI	Radio Frequency Interference
S&EIR	Scoping and Environmental Impact Reporting
SABAP2	South African Bird Atlas Project
SAHRA	South African Heritage Resources Agency
SANRAL	South African National Roads Agency
SANS	South African National Standards
SANBI	South African National Biodiversity Institute
SARERD	South African Renewable Energy Resource Database
SDF	Spatial Development Framework
SKA	Square Kilometre Array
TDS	Total Dissolved Solids
ToR	Terms of Reference
WASA	Wind Atlas of South Africa
WMA	Water Management Area
WULA	Water Use License Application

Scatec Solar

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EIA REPORT

PART A

EIA Report

Scoping and **Environmental Impact Assessment** for the Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province

EIA REPORT

CHAPTER 1:

Introduction

Scoping and **Environmental Impact Assessment** for the Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province

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1. INTRODUCTION

Scatec Solar SA 163 (PTY) Ltd is proposing to develop three 75 Megawatt (MW) Solar Photovoltaic (PV) power generation facilities and associated electrical infrastructure (including transmission lines for each 75 MW facility) on the remaining extent of Onder Rugzeer Farm 168 and the connection points to the Eskom Nieuwehoop Substation on the remaining extent of Portion 3 of Gemsbok Bult Farm 120, approximately 80 km south of Upington and 20-30 km north-east of Kenhardt within the !Kheis Local Municipality, Northern Cape Province. Scatec Solar SA 163 (PTY) Ltd consists of various subsidiary companies, one of which is Scatec Solar SA 370 (PTY) Ltd. Scatec Solar SA 370 (PTY) Ltd (hereinafter referred to as Scatec Solar) is the Project Applicant for this proposed 75 MW solar PV project (referred to as Kenhardt PV 3).

In terms of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) and the 2014 NEMA Environmental Impact Assessment (EIA) Regulations promulgated in Government Gazette 38282 and Government Notice (GN) R982, R983, R984 and R985 on 8 December 2014, a full Scoping and EIA Process is required for the construction of the three Solar PV facilities. A separate Basic Assessment Process will be undertaken for the development of the proposed transmission lines and connection to the Eskom Nieuwehoop Substation. The Applicant has appointed the Council for Scientific and Industrial Research (CSIR) to undertake the separate EIA and Basic Assessment Processes in order to determine the biophysical, social and economic impacts associated with undertaking the proposed activity.

Since the proposed 75 MW Solar PV facilities are located within the same geographical area and constitute the same type of activity, an integrated Public Participation Process (PPP) will be undertaken for the proposed projects. However, separate Applications for Environmental Authorisation (EA) have been lodged with the Competent Authority (i.e. the National Department of Environmental Affairs (DEA)) for each proposed Scoping and EIA project, as well as for each Basic Assessment project. Furthermore, separate reports (i.e. Basic Assessment and Scoping and EIA Reports) have been compiled for each project.

The Applications for EA for the Scoping and EIA Projects were submitted to the DEA via courier on 30 September 2015, together with the Scoping Reports. Refer to Appendix E of this EIA Report for the proof of submission (i.e. courier waybills), as well as Appendix H for a copy of the Application for EA. The DEA acknowledged receipt of the Scoping Reports and Applications for EA on 26 October 2015 via email (as shown in Appendix I.2 of this EIA Report). DEA Reference Numbers were assigned to each Scoping and EIA Project, as noted below. The Applications for EA for the Basic Assessment projects have been submitted to the DEA together with the Basic Assessment and EIA Reports for comment. The DEA Reference Numbers for the Basic Assessment Projects were pending at the time of compiling this report.

The proposed 75 MW Solar PV facility projects (requiring a Scoping and EIA Process) are referred to as (together with the corresponding assigned DEA Reference Numbers):

- Kenhardt PV 1 – DEA Reference: 14/12/16/3/3/2/837;
- Kenhardt PV 2 – DEA Reference: 14/12/16/3/3/2/838; and
- Kenhardt PV 3 – DEA Reference: 14/12/16/3/3/2/836.

The proposed transmission line projects (requiring a Basic Assessment Process) are referred to as:

- Kenhardt PV 1 – Transmission Line;
- Kenhardt PV 2 – Transmission Line; and
- Kenhardt PV 3 – Transmission Line.

The abovementioned integrated PPP approach, as well as the general approach to the Scoping and EIA Projects and the Basic Assessment Projects, were discussed with and approved by the DEA at a pre-application meeting, which was held on 17 September 2015. Appendix I.1 of this EIA Report includes a copy of the agenda and notes of the meeting, as well as the presentation given by the CSIR at the pre-application meeting.

Figure 1.1 below shows the overall locality of the three proposed 75 MW Solar PV facility projects and the electrical infrastructure corridor (within which the transmission lines will be constructed to support each Solar PV project).

This EIA Report therefore only discusses the proposed **Kenhardt PV 3** project, with this chapter providing an introduction to the proposed project, as well as information on the Project Applicant, the appointed Environmental Assessment Practitioner (EAP), and the specialist team.

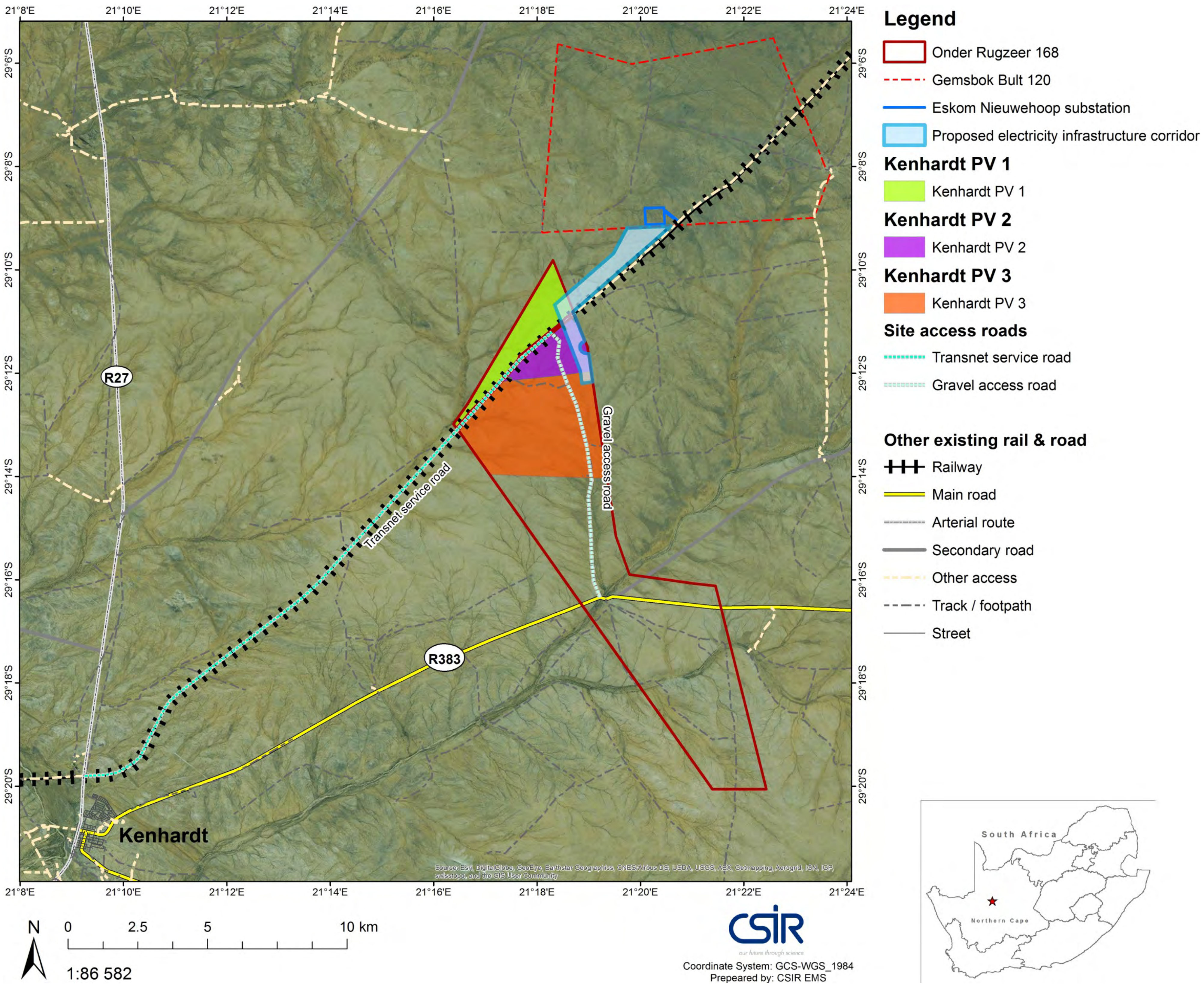

Figure 1.1: Locality of the three proposed 75 MW PV Facilities and Transmission Line Corridor

1.1. Project Applicant and Project Overview

Scatec Solar is an integrated Independent Power Producer (IPP) that is focused on making solar energy a sustainable and affordable source on a global scale. Scatec Solar was founded in 2001 and holds its headquarters in Norway. The company develops, builds, owns and operates a number of solar power plants internationally and within Africa. The company is growing significantly and is currently planned to provide a combined 207 MW of power in the United States, Honduras and Jordan. In addition, Scatec Solar collectively delivers more than 219 MW of power in the Czech Republic, South Africa and Rwanda. Specifically linked to investment within South Africa, Scatec Solar has been involved in the following major solar energy projects:

- The Linde Solar Plant (40 MW) is located in the Northern Cape and is considered to be the first of the large-scale PV plants in production from the second round of the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP).
- The Dreunberg Solar Plant (75 MW) is the only REIPPPP Solar PV Project to be located in the Eastern Cape.
- The Kalkbult Solar Plant (75 MW) is located in the Northern Cape and was the first REIPPPP project to be connected to the grid and operational in South Africa.

Scatec Solar was awarded another further 258 MW in the Fourth Round of the REIPPPP. Dyason's Klip 1, Dyason's Klip 2 and Sirius PV Project One were all anticipated to obtain Financial Closure in Quarter 4 of 2015.

Linked to enhancing its operations within South Africa, the 75 MW Solar PV facility (i.e. Kenhardt PV 3) proposed by Scatec Solar will cover an approximate area of 250 hectares (ha). The proposed project is located in proximity to the Eskom Nieuwehoop Substation, which is currently being constructed on the remaining extent of Portion 3 of Gemsbok Bult Farm 120 (as noted above).

The proposed project will make use of PV solar technology to generate electricity from the sun's energy. The Applicant is proposing to develop a facility with a possible maximum installed capacity of 100 MW Direct Current (DC) which produces 75 MW Alternating Current (AC) of electricity from PV solar energy. Once a Power Purchase Agreement (PPA) is awarded, the proposed facility will generate electricity for a minimum period of 20 years. It is proposed that Scatec Solar will implement the Self-Build Option for the additional electrical infrastructure to be constructed (which will be assessed separately as part of a Basic Assessment Process)). Following the construction phase, the proposed transmission line will either be transferred into the ownership of Eskom or remain in the ownership of Scatec Solar.

The preferred site for the proposed Kenhardt PV 3 project includes approximately 1341 ha of land, however the proposed solar facility and associated infrastructure requires a development area of approximately 250 ha only. It was reported during the Scoping Phase that the preferred site extended approximately 1000 ha, however this has been increased to 1341 ha, due to progression in the design and the need to ensure that the proposed infrastructure and PV plants are constructed close together. Overall, the portion of land that was removed from the Kenhardt PV 2 area was added to the Kenhardt PV 3 area. The larger 1341 ha area was considered and assessed by the specialists in order to ensure that any development constraints or environmental sensitivities can be avoided in the final siting and location of the proposed facility. This is discussed further in Chapter 16 of this EIA Report.

The proposed project will consist of the following main components:

- **<u>Solar Field</u>**
  - Solar Arrays:
    - PV Modules;
    - Single Axis Tracking structures (aligned north-south), Fixed Axis Tracking (aligned east-west), Dual Axis Tracking (aligned east-west and north-south) or Fixed Tilt Mounting Structures;
    - Solar module mounting structures comprised of galvanised steel and aluminium; and
    - Foundations which will likely be drilled and concreted into the ground.
  - Building Infrastructure:
    - Offices;
    - Operational and maintenance control centre;
    - Warehouse/workshop;
    - Ablution facilities;
    - Converter station;
    - On-site substation building; and
    - Guard House.

- **<u>Associated Infrastructure</u>**
  - 132 kV/33 kV/22 kV overhead transmission line (which is the subject of a separate Basic Assessment Process, referred to as Kenhardt PV 3 – Transmission Line);
  - Associated electrical infrastructure at the Eskom Nieuwehoop Substation (including but not limited to an additional feeder bay(s), Busbar(s), transformer bay and extension to the platform at the substation (which is the subject of a separate Basic Assessment Process, referred to as Kenhardt PV 3 – Transmission Line);
  - On-site substation;
  - 33 kV internal transmission lines/underground cables;
  - Underground low voltage cables or cable trays;
  - Access roads;
  - Internal gravel roads;
  - Fencing;
  - Panel maintenance and cleaning area;
  - Stormwater channels; and
  - Temporary work area during the construction phase (i.e. laydown area).

A detailed project description (based on the conceptual design) is provided in Chapter 2 of this EIA Report.

1.2. Project Motivation (Including Need and Desirability)

At a national level, South Africa is facing serious electricity shortages as well as water scarcity. The proposed project aims to supply additional electricity to the national grid, with negligible demand for water. Importantly, the project will reduce the risk of rolling electricity blackouts, which are anticipated in South Africa's Medium Term Risk Mitigation Plan (MTRM) for electricity from 2011 to 2016. The evolution of South Africa's electricity sector is aligned with the global transition towards renewable sources of electricity generation. The urgency behind this evolution can be appreciated considering that South Africa is the largest emitter of greenhouse gases in Africa, accounting for as much as 42% of the continent's total emissions, and is also estimated to rank amongst the top 20 largest emitters of greenhouse gases in the world. These emissions are largely a result of an energy-intensive economy and high dependence on coal-based electricity generation. Furthermore, water demand is high for conventional coal-based electricity generation. Consequently, the South African government is committed to increased use of renewable energy sources for electricity generation. Renewable energy is also a response aimed at advancing economic and social development through the creation of both sector-specific jobs, and jobs in economic sectors that can be sustained by the additional feed-in of electricity to the grid from renewable sources of electricity generation.

In addition to reducing the emission of greenhouse gases, the use of PV technology avoids the high levels of water consumption associated with coal-based electricity generation. This is a benefit that must be considered in the context of Eskom's current consumption of approximately 2% of South Africa's total fresh water resources. Accelerated climate change has the potential to impact on the availability and quantity of water in South Africa, with decreases in summer rainfall predicted in the interior and increasing instances of droughts and floods predicted for the country in general. This creates a risk for the longevity in electricity generation that is water-dependent. By comparison, solar energy projects have no direct water demand during operations, except for periodic washing of solar panels. This reduces the demand on South Africa's water resources, while avoiding the risk of uncertainty in water supply, attributable to climate change effects.

On a provincial level, the Northern Cape Province is currently facing considerable constraints in the availability and stability of electricity supply. This is a consequence of South Africa's electricity generation and supply system being overstretched, and the reliance of the Northern Cape, as many other South African provinces, on the import of power to service its energy needs. The development of solar energy is important for South Africa to reduce its overall environmental footprint from power generation (including externality costs), and thereby to steer the country on a pathway towards sustainability.

The Integrated Resource Plan for South Africa for the period 2010 to 2030 was released by government in 2010, and an updated report was published in 2013, which proposes to secure 17 800 MW of renewable energy capacity by 2030 (including wind, solar and other energy sources). In August 2011, the Department of Energy (DOE) launched the REIPPPP and invited potential IPPs to submit proposals for the financing, construction, operation and maintenance of the first 3 725 MW of onshore wind, solar thermal, solar photovoltaic, biomass, biogas, landfill gas or small hydropower projects. On 18 August 2015, an additional procurement target of 6300 MW to be generated from renewable energy sources was added to the REIPPPP for the years 2021 - 2025, as published in Government Gazette 39111. The additional target allocated for solar PV energy is 2200 MW.

In terms of the REIPPPP, the submitted proposals are then evaluated. Currently, the two main evaluation criteria for compliant proposals are price and economic development with a point allocation of 70/30 (DOE, 2013), with other selection criteria including technical feasibility and grid connectivity, environmental acceptability, black economic empowerment, community development, and local economic and manufacturing propositions. The bidders whose responses rank the highest (according to the aforementioned criteria) will have the greatest potential to be appointed as "Preferred Bidders" by the DOE. The first procurement phase of the DOE's REIPPPP includes five bidding windows. Scatec Solar intends to bid these projects in the 2016 bidding process (i.e. Round 5) to be potentially selected as an IPP. Additional information regarding the project contextualisation is provided in Chapters 2 and 5 of this EIA Report.

1.2.1. Need and Desirability

It is an important requirement in the EIA Process to review the need and desirability of the proposed project. Draft guidelines on Need and Desirability were published in the Government Gazette of 5 October 2012, for comment. These draft 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 project and assists in explaining that need and desirability at the provincial and local context. In addition, the Western Cape Department of Environmental Affairs and Development Planning (DEADP) also published a Guideline on Need and Desirability in 2010. The DEADP Guideline (2010) states that the essential aim of investigating the need and desirability of a proposed project revolves around determining suitability (i.e. is the activity proposed in the right location for the suggested land-use/activity) and timing (i.e. is it the right time to develop a given activity?). DEADP describes need and desirability as components of the "wise use of land", where need refers to time, and desirability to place. In other words, need and desirability answer the question of whether the activity is being proposed at the right time and in the right place. Table 1.1 includes a list of questions based on the DEADP 2010 Guideline to determine the need and desirability of the proposed project.

Table 1.1: DEADP list of 14 questions to determine the "Need and Desirability" of a proposed project – Kenhardt PV 3

NEED
1. Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved Spatial Development Framework (SDF) agreed to by the relevant environmental authority? (i.e. is the proposed development in line with the projects and programmes identified as priorities within the credible IDP). Answer: Yes Justification: The !Kheis Municipality Draft Integrated Development Plan (IDP) (2012 – 2017 and 2015 – 2019) states that an opportunity exists to utilise solar energy more widely and lessen the dependence on wood and fire. This opportunity has been identified because not all people within the municipal area have access to electricity. Even though this solar facility will not provide the municipality directly with electricity, the energy produced by the facility will feed into the national grid. Furthermore, the DEA have commissioned a Strategic Environmental Assessment (SEA) to identify the areas in South Africa that are of strategic importance for Wind and Solar PV development. The SEA aims to identify strategic geographical areas best suited for the roll-out of large scale wind and solar PV energy projects, referred to as Renewable Energy Development Zones (REDZs). The proposed solar facility falls within one of the potential eight REDZ. Therefore, should the REDZ be established and renewable projects operate within these areas, Eskom may be able to unlock funding to proactively construct grid infrastructure to facilitate generation capacity from these areas. This will mean that the municipality will also benefit from these upgrades and potentially alleviate the electrification backlogs present in the area. One of the priority issues identified within the !Kheis Municipality IDP (2012 – 2017 and 2015 – 2019) is the low levels of skilled people, as well as high levels of poverty and unemployment. The IDP (2012 – 2017 and 2015 – 2019) states that the objective to resolve this issue is to create an environment whereby the local community is empowered through capacity building and skills development (particularly for the youth). The proposed project will create job opportunities and economic spin offs during the construction and operational phases (if an EA is granted by the DEA). It is estimated that between 90 and 150 skilled and 400 and 460 unskilled employment opportunities will be created during the construction phase. During the operational phase, approximately 20 skilled and 40 unskilled employment opportunities will be created over the 20 year lifespan of the proposed facility. 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 solar energy facility would help to address the need for increased electricity supply while also providing advanced skills transfer and training to the local communities and creating contractual and permanent employment in the area.
2. Should development, or if applicable, expansion of the town/area concerned in terms of this land use (associated with the activity being applied for) occur here at this point in time? Answer: Yes Justification: As stated above, there is a great need in the area for electricity and grid upgrades. In addition to this, the Northern Cape has a very high solar resource availability which provides the province with an opportunity for the construction and operation of Solar Renewable projects in the area. The need for job opportunities and electricity necessitates that these types of projects be undertaken in the area. The preferred project site is currently being used for agricultural purposes, predominantly grazing. Should the proposed Kenhardt PV 1, PV 2 and PV 3 projects proceed,

approximately 750 ha of the land will be collectively developed on and it is not expected that this will threaten the agricultural activities present on site. As noted in Chapter 12 of this EIA Report (Soils and Agricultural Potential Assessment), due to the climate and soil limitations, the site is not suitable for any agricultural land use other than low intensity grazing.

3. Does the community/area need the activity and the associated land use concerned (is it a societal priority)? This refers to the strategic as well as local level (e.g. development is a national priority, but within a specific local context it could be inappropriate).

Answer: Yes

Justification: South Africa has a high level of Renewable Energy potential and presently has in place a generation target of 10 000 GWh of Renewable Energy. As noted above, at a national level, the DOE has set the target of having 17 800 MW of electricity generated from Renewable Energy sources contributing to the national grid by 2030 to ensure the continued uninterrupted supply of electricity. As noted above, Scatec Solar intends to submit this project for the REIPPPP and this project can therefore contribute to the IPP goals and feed into the national grid, which results in this project having national importance.

At a local level, the !Kheis Municipality Draft IDP (2012 – 2017 and 2015 – 2019) states that an opportunity exists to utilise solar energy more widely (especially in the remote areas of the municipality) and lessen the dependence on wood and fire. This opportunity has been identified because not all people within the municipal area have access to electricity. The IDP (2015 – 2019) also states that due to small communities present in sparsely populated areas, effective distribution of electricity becomes difficult in some areas. Even though this solar facility will not provide electricity to the municipality directly, the energy produced by the facility will feed into the national grid. In addition, on a local level, the project will contribute towards job creation which is needed within the area.

4. Are the necessary services with adequate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?

Answer: Partially

Justification: Some services are currently available to cater for the proposed development, however services to support the proposed facility will need to be designed and constructed as well. As mentioned above, the Eskom Nieuwehoop Substation (which is currently being constructed and is located approximately 3 km from the project site) will be used for the proposed project. An EA for the construction of the 400/50 50 kV Eskom Nieuwehoop Substation was granted to Eskom Holdings SOC Limited on 21 February 2011 by the DEA (Reference Number: 12/12/20/1166). In addition, an EA (DEA Reference Number: 12/12/20/2606; NEAS Reference Number: DEA/EIA/0000785/2011), dated 14 February 2014, was also granted to Eskom Holdings SOC Limited to construct, inter alia, the following within the existing development footprint of the Nieuwehoop Substation:

- 2 x 400 kV transformer feeder bay;
- A 400 / 132 kV transformer;
- 132 kV busbar;
- 400 / 132 kV 500 MVA x 3 transformers; and
- 8 x 132 kV feeder bays and associated lines.

Furthermore, existing roads (such as a private Transnet Service Road or an unnamed farm road) will be used to gain access to the preferred site. The Transnet Service Road can be accessed from the R27 and the farm road can be accessed from the R383 Regional Road also via the R27 National Road. An internal gravel road may also be constructed from either the Transnet Service Road or the unnamed farm road. If the Transnet Service Road cannot be used, the unnamed farm road will need to be widened to approximately 8.5 m.

It terms of additional services, stormwater channels may be constructed as part of the proposed project. However, existing municipal services for the handling of waste, provision of water and sewage handling are expected to be used for the proposed project. Confirmation of the availability of the services will be obtained during the 30-day review of the EIA Report.

5. Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services and opportunity costs)?

Answer: No

Justification: There is no anticipated negative impact on municipal infrastructure planning (no clash of priority, and/or placement) as additional infrastructure required to maintain the proposed facility would be provided and maintained by the Applicant. The activity is furthermore proposed on agricultural land with little or no existing and planned infrastructure. The opportunity cost of constructing the proposed solar energy facility might increase the viability of agricultural productivity due to financial advantage of having a solar facility on agricultural property (i.e. farmers will receive payments for lease of the property per quarter or year). The opportunity cost of not constructing the proposed facility would be the maintenance of the current status quo, which is marginal agriculture and grazing.

6. Is this project part of a national programme to address an issue of national concern or importance?

Answer: Yes

Justification: The National Integrated Resource Plan for Electricity (IRP2) (2011) suggests that 42% of national energy supply must come from renewable energy sources between 2010 and 2030.

DESIRABILITY

7. Is the development the best practicable environmental option for this land/site?

Answer: Yes.

Justification: Based on the findings of this EIA, the proposed project would not have a significant ("high") negative impact on the receiving environment, with the implementation of suitable mitigation measures. No impacts of high significance (with the implementation of mitigation measures) were identified in the EIA. As noted in Chapter 12 of this EIA Report (Soils and Agricultural Potential Assessment), due to the climate and soil limitations, the site is not suitable for any agricultural land use other than low intensity grazing. Currently, the site is used for grazing, which could continue in the surrounding regions, together with the generation of additional income via the leasing of the land to the Applicant. The potential negative impact of loss of agricultural land and the potential positive impact of additional land use income were both rated with a very low significance (without the implementation of mitigation measures) in the Soils and Agricultural Potential Assessment.

However, it is also important to point out that the proposed project will be designed according to relevant national specifications and standards which are regarded as best practice in the renewable energy sector.

Based on the above, the construction of the proposed Solar PV facilities and the associated infrastructure is the best practicable option for the land. In addition, the construction of these facilities would have a positive socio-economic impact on the area.

8. Would the approval of this application compromise the integrity of the existing approved and credible municipal IDP and SDF as agreed to by the relevant authorities?

Answer: No

Justification: The proposed activity does not compromise any of the objectives set within the !Kheis Municipality Draft IDP (2012 – 2017 and 2015 – 2019). The proposed project will also be supportive of the IDP's objective of creating more job opportunities. The proposed solar energy facility will assist in local job creation during the construction and operation phases of the project (if an EA is granted by the DEA). However, as noted above, employment opportunities will be temporary during the construction phase and long-term during the operational phase as the plant is expected to be operational for 20 years.

9. Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g. as defined in EMFs), and if so, can it be justified in terms of sustainability considerations?

Answer: No

Justification: It is not expected that the approval of the proposed project would compromise the integrity of the existing environmental management priorities for the area. Furthermore, mitigation measures have been recommended as part of the EIA Process to manage potential negative environmental impacts that may occur during the construction, operational and potential decommissioning phases. To this end, an Environmental Management Programme (EMPr), which is included as Part B of this EIA Report, has been compiled for the proposed project to ensure that all potential negative impacts identified are suitably managed and mitigated, and potential positive impacts are enhanced.

As noted above, the preferred project site is currently being used for agricultural purposes, predominantly grazing. It should be noted that the existing livestock grazing is expected to continue outside the fenced solar facility.

Section 2.1.4 of the Siyanda District Municipality (now known as ZF Mgcawu District Municipality) Environmental Management Framework states that "in the year 2000, the utilization of groundwater in the area was approximately in balance with a sustainable yield from this source. No significant potential for further development exists. Over-exploitation of the groundwater has not been experienced in the EMF area". As mentioned in the Scoping Report, the Applicant planned to make use of groundwater as a water source for the cleaning of the PV panels during the operational phase. However, the Geohydrological Assessment (including in Chapter 11 of this EIA Report) has concluded that groundwater should not be used as a source of water for the construction and operational phases, as the groundwater on site is limited and of a poor quality. Additional information regarding the possible use of groundwater is included in the Geohydrological Assessment (Chapter 11 of the EIA Report).

10. Do location factors favour this land use (associated with the activity applied for) at this place? (this relates to the contextualisation of the proposed land use on this site within its broader context)

Answer: Yes

Justification: As discussed above and in Chapter 5 of this EIA Report, the solar resource of this area is high, which makes it a very favourable location for the proposed solar facility. In terms of land-use and sense of place, the facility will be located on marginal agricultural land. Although the solar facility proposed on the property is deemed a commercial land-use and not for agricultural purposes, only an estimated 250 ha of the total property area will be developed on for this specific proposed project (i.e. **Kenhardt PV 3**). However, if the proposed Kenhardt PV 1, PV 2 and PV 3 projects proceed, approximately 750 ha of the land on the remaining extent of Onder Rugzeer Farm 168 will be collectively developed on. The remaining extent of Onder Rugzeer Farm 168 extends approximately **5552 ha** in area and if all three solar PV projects proceed, only 13.5 % of the total farm area will be developed on.

Currently, Eskom is constructing a substation which would evacuate electricity produced by the proposed facility, and due to the presence of the substation, the land use is favoured from an electrical landscape perspective. In addition, the landscape of the immediate adjacent area is already impacted by the ore freight railway line and will become even more industrialised by the Eskom Nieuwehoop substation and high voltage transmission lines. As noted in the Visual Impact Assessment (Chapter 8 of this EIA Report), the visual intrusion will be moderate for visual receptors on surrounding farms since the landscape is already transformed by existing structures (as mentioned above), however the Solar PV facility will be clearly noticeable. In addition, motorists will potentially pass within 100 m of the proposed solar field.

As noted in Chapter 12 of this EIA Report (Soils and Agricultural Potential Assessment), due to the climate and soil limitations, the site is not suitable for any agricultural land use other than low intensity grazing. Currently, the site is used for grazing, which could continue in the surrounding regions, together with the generation of additional income via the leasing of the land to the Applicant. The potential negative impact of loss of agricultural land and the potential positive impact of additional land use income were both rated with a very low significance (without the implementation of mitigation measures) in the Soils and Agricultural Potential Assessment.

11. How will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?

Answer: Limited impact in terms of natural sensitivity and potentially negative in terms of cultural areas.

Justification: The impact on sensitive natural areas would be limited. The built environment was considered as part of the Heritage Impact Assessment (Chapter 9 of this EIA Report). The Heritage Impact Assessment concluded that the proposed project will not affect any buildings and it also established that no archaeological material in the form of background scatter was located across much of the site but this is of very low heritage significance. The Heritage Impact Assessment also notes that two archaeological sites of medium heritage significance were found and a single possible grave was located. The single possible grave should be avoided with a buffer of at least 5 m or else tested and, if necessary, exhumed prior to construction. The Heritage Impact Assessment also states that the landscape was identified as a heritage resource but, because of the presence of electrical and other infrastructure in the area, the significance of new impacts in heritage terms is considered to be low. The sensitive features identified in the Heritage Impact Assessment have been mapped and indicated in Chapter 9 and Chapter 16 of this EIA Report).

With regards to the natural environment, the Ecological Impact Assessment (included in Chapter 7 of this EIA Report) identified sensitive environmental features that would need to be avoided by the proposed development.

Chapter 16 includes an environmental sensitivity map that was produced based on the input obtained from the various specialist studies (as discussed in Chapter 16 of this EIA Report). Environmental features that have a high environmental sensitivity have been avoided by the proposed siting of the proposed PV facility (i.e. the development envelope approach); therefore the overall impact of the proposed project on the sensitive features is expected to be low. Please refer to Chapter 16 of this report for detailed discussion on the development envelope of the project.

As noted above, an EMPr has been compiled for the proposed project to ensure that all potential negative impacts identified are suitably managed and mitigated, and potential positive impacts are enhanced. The impact on the sense of place is difficult to predict and would potentially be ambiguous. This is due to the subjective nature of perceptions regarding the relative attraction or disturbance of the solar facility in a rural landscape. The visual impact has been assessed as part of the Visual Impact Assessment (Chapter 8 of this EIA Report).

12. How will the development impact on people's health and wellbeing (e.g. in terms of noise, odours, visual character and sense of place, etc.)?

Answer: No significant negative impacts were identified as part of the EIA.

Justification:

- **Health and Wellbeing**: The impacts on health and wellbeing are expected to be minimal as the project is taking place within a sparsely populated region. Dust may be generated during the construction phase; however it is expected to be of a short-term duration and of low significance. However, where applicable, mitigation measures relating to potential impacts on the health and wellbeing of people (such as construction staff, farm workers, construction staff at the Eskom Nieuwehoop Substation and the operational staff of the ore railway line) have been included in the

EMPr (Part B of the EIA Report).

- **Noise**: During the construction phase, noise may be generated as a result of the operation of equipment, vehicles and machinery, the transportation of construction materials and staff to and from site, the establishment of site construction areas, as well as general construction activities. However, the noise levels and impacts will be short-term and are not expected to be significant during the construction phase. During the operational phase, the proposed solar facility would not generate any noise. Mitigation measures (where applicable) have been included in the EMPr (Part B of the EIA Report) to reduce the negative noise impacts during the construction phase.
- **Odours**: These will be minimal during the construction phase and non-existent during the operational phase.
- **Visual Character and Sense of Place**: In terms of visual character and sense place, the visual landscape and the agricultural landscape has been altered by the ore freight railway line. The site is expected to become even more industrialised by the Eskom Nieuwehoop Substation and high voltage transmission lines. As noted above, this has been assessed in the Visual Impact Assessment (Chapter 8 of this EIA Report).

Notwithstanding the above, the socio-economic benefits likely to result from the proposed project (e.g. creation of jobs and regional economic development) would most likely outweigh the issues mentioned above.

13. Will the proposed activity or the land use associated with the activity applied for, result in unacceptable opportunity costs?

Answer: No

Justification: Solar energy facilities can be dismantled and completely removed from the site leased for the development and do not permanently prevent alternative land-uses on the same land parcel. Based on material and socio-economic terms, and measured to the value of the best alternative that is not chosen, the proposed project will result in positive opportunity costs.

Refer to Chapter 12 of this EIA Report (Soils and Agricultural Potential Assessment), which notes the impact of the proposed project on the potential negative loss of agricultural land and the potential positive impact of additional land use income, which were both rated with a very low significance (without the implementation of mitigation measures).

14. Will the proposed land use result in unacceptable cumulative impacts?

Answer: No

Justification: The potential cumulative impacts resulting from the proposed project are discussed in the respective specialist studies (included in Chapters 7 to 14 of this report). The list of projects that were considered in the assessment of cumulative impacts is included in Chapter 4 of this EIA Report. “Unacceptable’ cumulative impacts are seen as impacts that would have a high negative impact significance. Overall, no cumulative impacts were identified with a high significance with the implementation of mitigation measures.

The findings of the Electromagnetic Interference and Radio Frequency Interference Surveys conducted to comply with the requirements of the SKA South Africa are summarised in Chapter 15 of this EIA Report, with the technical report included in Appendix K of the EIA Report. This assessment also discusses cumulative impacts from a specific Electromagnetic and Radio Frequency Interference perspective.

1.3. Requirements for an EIA

As noted above, in terms of the EIA Regulations promulgated under Chapter 5 of the NEMA published in GN R982, R983, R984 and R985 on 4 December 2014 and enforced on 8 December 2014, a full Scoping and EIA Process is required for the proposed project. The need for the full Scoping and EIA is triggered by, amongst others, the inclusion of Activity 1 listed in GN R984 (Listing Notice 2):

- "*The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs within an urban area*".

Chapter 4 of this EIA Report contains the detailed list of activities contained in R983 and R984 which may be triggered by the various project components and thus form part of this Scoping and EIA Process. Given that energy related projects have been elevated to national strategic importance in terms of the EA Process, the proposed project requires authorisation from the National DEA, acting in consultation with other spheres of government.

The purpose of the EIA is to identify, assess and report on any potential impacts the proposed project, if implemented, may have on the receiving environment. The environmental assessment therefore needs to show the Competent Authority, the DEA; and the project proponent, Scatec Solar, what the consequences of their choices will be in terms of impacts on the biophysical and socio-economic environment and how such impacts can be, as far as possible, enhanced or mitigated and managed as the case may be.

1.4. EIA Team

As previously noted, the CSIR has been appointed by Scatec Solar to undertake the EIA required for the proposed project. Public participation forms an integral part of the Environmental Assessment Process and assists in identifying issues and possible alternatives to be considered during the EIA Process. The CSIR is undertaking the PPP for this EIA. Details on the PPP are included in Chapter 4 of this EIA Report.

The EIA team which is involved in this Scoping and EIA Process is listed in Table 1.2 below. This team includes a number of specialists which have been involved to date, in the EIA Process. Appendix B of this EIA Report includes declaration of interest by the specialists.

Table 1.2: The EIA Management Team

NAME	ORGANISATION	ROLE/STUDY TO BE UNDERTAKEN
Environmental Assessment Practitioners		
Paul Lochner	CSIR	Technical Advisor and Quality Assurance (EAPSA) Certified
Surina Laurie	CSIR	Project Leader (*Pr. Sci. Nat.*)
Rohaida Abed	CSIR	Project Manager (*Pr. Sci. Nat.*)
Specialists		
Simon Bundy	Sustainable Development Projects cc	Ecological Impact Assessment (including Terrestrial Ecology, Aquatic Ecology and Avifauna)
Henry Holland	Private	Visual Impact Assessment
Dr. Jayson Orton	ASHA Consulting (Pty) Ltd	Heritage Impact Assessment (Archaeology and Cultural Landscape)
Dr. John Almond	Natura Viva cc	Desktop Palaeontological Impact Assessment
Julian Conrad	GEOSS	Geohydrological Assessment

NAME	ORGANISATION	ROLE/STUDY TO BE UNDERTAKEN
Johann Lanz	Private	Soils and Agricultural Potential Assessment
Rudolph du Toit	CSIR	Social Impact Assessment
P. S. van der Merwe and A. J. Otto	MESA Solutions (PTY) Ltd	Electromagnetic Interference and Radio Frequency Interference Surveys

It should be noted that the Social Impact Assessment specialist study was subject to a peer review process by an external reviewer (Ms. Liza van der Merwe, a private consultant), as requested by the DEA as part of the acceptance of the Scoping Report (Appendix I.4 of this EIA Report).

1.5. Details and Expertise of the Environmental Assessment Practitioners

Over the past 30 years the CSIR has been involved in a multitude of projects across Africa and South Africa, with experience in 32 sub-Saharan African and Indian Ocean Island countries. The Environmental Management Services (EMS) group within the CSIR has been involved in the management and execution of numerous environmental assessment and management studies in more than 15 countries in Africa, as well as the Middle East, South America and Russia. These studies have included both public and private sector clients. Consequently, the CSIR EMS team offers a wealth of experience and appreciation of the environmental and social priorities and national policies and regulations in South Africa.

The EIA Project Team is being led by Surina Laurie, who will be supported by the Project Manager, Rohaida Abed. Paul Lochner will act as Technical Advisor for the proposed project. Refer to Appendix A of this EIA Report for the Curriculum Vitae of the EAPs. Appendix B of this EIA Report includes a declaration of and affirmation by the EAP as required by the 2014 EIA Regulations.

Paul Lochner - Paul has 22 years of experience in environmental assessment and management studies, primarily in the leadership and integration functions. This has included SEAs, EIAs and Environmental Management Plans. In July 2003, he obtained certification as a registered EAP with the Interim Certification Board for EAPs of South Africa (EAPSA). He has been extensively involved in renewable energy projects over the last few years. He was the Project Leader for the Electrawinds Basic Assessment (BA) and EIA projects at the Coega Industrial Development Zone (IDZ), and was the Project Leader for the EIA for the Mainstream Kouga wind energy project (Phase 1) at Jeffreys Bay. Phase 1 of this project was granted EA by the Eastern Cape Government in March 2009. He was part of the CSIR team that prepared the EIA and EMP for the Eskom wind energy demonstration facility at Klipheuwel (Western Cape), which was approved by the Western Cape provincial government. He is currently the Project Leader for the SEA for the location and placement of wind and solar energy projects in South Africa. He has also recently led EIAs for Solar PV projects in the Free State and Northern Cape for Mainstream Renewable Energy, Solaire Direct and Mulilo Renewable Project Developments. He has also authored several Guidelines for national and provincial government, such as the Guideline for EMPs published in 2005 by the Western Cape government.

Surina Laurie – Surina is a Senior EAP in the EMS group of the CSIR and she has a Masters degree in Environmental Management and is a Registered Professional Natural Scientist (Registration Number: 400033/15) with the South African Council for Natural Scientific Professions (SACNASP). She has more than 5 years of experience in environmental assessment and management. Surina has experience in the management and integration of various types of environmental assessments in South Africa for various sectors, including renewable energy, industry and tourism. She has also been part of advisory teams advising on financing, real estate, corporate, construction, environmental and regulatory aspects for various sponsors, developers and lenders during the DOE's first and second bidding windows in 2012 and 2013. Surina is currently undertaking several Solar PV

EIAs in the Northern Cape and Free State. Surina was the Project Manager for the proposed (adjacent) Nieuwehoop Solar Development EIA projects, which have received positive EAs.

Rohaida Abed - Rohaida is a Junior EAP in the EMS group of the CSIR and she has a Masters degree in Environmental Science and is a Registered Professional Natural Scientist (Registration Number: 400247/14) with the SACNASP. She has experience in the Environmental Management field, and has been involved in various transport infrastructure related projects as an Environmental Control Officer. She has also been involved in EIAs relating to Port infrastructure and Bulk Liquid Storage facilities in the capacity of Project Manager.

1.6. Objectives for this EIA Report

This EIA Report was preceded by a comprehensive Scoping Process. During the Scoping Phase, the Scoping Reports were made available to Interested and Affected Parties (I&APs) and stakeholders for a 30-day comment period extending from 25 September 2015 to 27 October 2015. An Addendum to the Scoping Report was released to I&APs for a further 30-day comment period extending from 6 October 2015 to 5 November 2015. The addendum included additional information that was requested by the DEA relating to an assessment of alternatives in the Scoping Phase. The comments received from stakeholders during the 30-day review of both the Scoping Report and Addendum were incorporated into the Scoping Report (where required), and the finalised Scoping Report was submitted to the DEA in November 2015, in accordance with Regulation 21 (1) of the 2014 NEMA EIA Regulations, for decision-making in terms of Regulation 22 of the 2014 NEMA EIA Regulations. It is important to note that (for the purpose of completeness and continuity), the comments received from I&APs during the Scoping Phase have been included in Appendix G of this EIA Report. The DEA accepted the finalised Scoping Report and Plan of Study for EIA on 8 December 2015, which marked the end of the Scoping Phase (Appendix I.4 of this EIA Report), after which the EIA Process moved into the impact assessment and reporting phase. For background on the Scoping Process, the reader is referred to the Scoping Report (CSIR, 2015).

This EIA Report is currently being released to stakeholders for a 30-day review period (together with the BA Reports). All comments received will be included in the finalised EIA Report, which will be submitted to DEA for decision-making.

The primary objective of this EIA Report is to present stakeholders, I&APs and the Competent Authority, the DEA, with an overview of the predicted impacts and associated management actions required to avoid or mitigate the negative impacts; or to enhance the benefits of the proposed project.

In broad terms, the 2014 NEMA EIA Regulations (GN R982) stipulates that the EIA Process must be undertaken in line with the approved Plan of Study for the EIA, and that it must include a description of the potential environmental impacts, mitigation and closure outcomes, as well as the residual risks of the proposed activity.

Based on the 2014 NEMA EIA Regulations, the objectives of the EIA Process is to:

- determine the policy and legislative context within which the activity is located and note how the proposed activity complies with and responds to the policy and legislative context;
- describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
- identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
- determine the nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and the degree to which

these impacts (a) can be reversed; (b) may cause irreplaceable loss of resources, and (c) can be avoided, managed or mitigated;

- identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
- identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;
- identify suitable measures to avoid, manage or mitigate identified impacts; and
- identify residual risks that need to be managed and monitored.

In terms of legal requirements, a crucial objective of the EIA Report is to satisfy the requirements of Appendix 3 of the 2014 NEMA EIA Regulations (as noted in Regulation 23 (3) of the GN R982). This section regulates and prescribes the content of the EIA Report and specifies the type of supporting information that must accompany the submission of the EIA Report to the Competent Authority. An overview of where the requirements of Appendix 3 of the 2014 NEMA EIA Regulations are addressed in this EIA Report is presented in Table 1.3.

As noted in Regulation 23 (4) of the GN R982, the EMPr that is required as part of the EIA Process is provided in Part B of this EIA Report and has been structured to comply with the requirements outlined in Appendix 4 of the 2014 NEMA EIA Regulations, as well as the requirements of DEA's acceptance of the Scoping Report and Plan of Study for EIA (as shown in Appendix I.4 of this EIA Report). An overview of this compliance is shown Part B of this EIA Report. In addition, the specialist studies that have been conducted as part of the EIA Phase need to comply with Appendix 6 of the 2014 NEMA EIA Regulations. Each specialist study (Chapters 7 to 14) provides an overview table showing compliance with the regulations.

Furthermore, this EIA Process is designed to satisfy the requirements of Regulations 41, 42, 43 and 44 of the 2014 NEMA EIA Regulations relating to the PPP and, specifically, the registration of I&APs and recording of submissions from I&APs. All I&APs on the current database for this EIA (Appendix C) have been informed of the release of the EIA Report for a 30-day comment period. All comments received will be recorded and addressed in the finalised EIA Report (as applicable) for submission to the authorities for decision-making.

Table 1.3: Requirements for an EIA Report as defined in terms of Appendix 3 of GN R982

Section of the EIA Regulations	Requirements for an EIA Report in terms of Appendix 3 of the 2014 NEMA EIA Regulations (GN R982)	Location in this EIA Report
Appendix 3 - (3)(a)	Details of - i. the EAP who prepared the report; and ii. the expertise of the EAP, including a curriculum vitae;	Chapter 1 and Appendix A
Appendix 3 - (3)(b)	The location of the activity, including - i. the 21 digit Surveyor General code of each cadastral land parcel; ii. where available, the physical address and farm name; iii. where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	Chapter 2 and Chapter 3
Appendix 3 - (3)(c)	A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is - i. a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or ii. on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Chapter 2 and Chapter 3
Appendix 3 - (3)(d)	A description of the scope of the proposed activity, including – i. all listed and specified activities triggered and being applied for; ii. a description of the associated structures and infrastructure related to the development;	Chapter 2 and Chapter 4
Appendix 3 - (3)(e)	A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and	Chapter 4

Section of the EIA Regulations	Requirements for an EIA Report in terms of Appendix 3 of the 2014 NEMA EIA Regulations (GN R982)	Location in this EIA Report
	responds to the legislation and policy context;	
Appendix 3 - (3)(f)	A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location;	Chapter 1,Chapter 2 and Chapter 5
Appendix 3 – (3) (g)	A motivation for the preferred development footprint within the approved site;	Chapters 7 to 13 and Chapter 16
Appendix 3 - (3)(h)	A full description of the process followed to reach the proposed development footprint within the approved site, including - i. details of the development footprint alternatives considered; ii. details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; iii. a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; iv. the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; v. the impacts and risks identified, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts – (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated; vi. the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks; vii. positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; viii. the possible mitigation measures that could be applied and level of residual risk; ix. if no alternative development locations for the activity were investigated, the motivation for not considering such; and x. a concluding statement indicating the preferred alternative development location within the approved site;	Chapter 2, Chapter 4, Chapter 5, Chapter 6, Chapters 7 to 13 and Chapter 16
Appendix 3 - (3)(i)	A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including - i. a description of all environmental issues and risks that were identified during the environmental impact assessment process; and ii. an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	Chapter 5, Chapters 7 to 14, and Chapter 16
Appendix 3 – (3) (j)	An assessment of each identified potentially significant impact and risk, including- i. cumulative impacts; ii. the nature, significance and consequences of the impact and risk; iii. the extent and duration of the impact and risk; iv. the probability of the impact and risk occurring; v. the degree to which the impact and risk can be reversed; vi. the degree to which the impact and risk may cause irreplaceable loss of resources; and vii. the degree to which the impact and risk can be mitigated;	Chapter 5, Chapters 7 to 14, and Chapter 16
Appendix 3 – (3) (k)	Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication	Chapters 7 to 14, and Chapter

Section of the EIA Regulations	Requirements for an EIA Report in terms of Appendix 3 of the 2014 NEMA EIA Regulations (GN R982)	Location in this EIA Report
	as to how these findings and recommendations have been included in the final assessment report;	16
Appendix 3 – (3) (l)	An environmental impact statement which contains- i. a summary of the key findings of the environmental impact assessment: ii. a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and iii. a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Chapters 7 to 14, and Chapter 16 and Appendices J.1 and J.2
Appendix 3 – (3) (m)	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	Chapters 7 to 14, and Chapter 16
Appendix 3 – (3) (n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	Chapters 7 to 14, and Chapter 16
Appendix 3 – (3) (o)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Chapters 7 to 14, and Chapter 16
Appendix 3 – (3) (p)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Chapters 7 to 14, and Chapter 16
Appendix 3 – (3) (q)	A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Chapter 16
Appendix 3 – (3) (r)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	Not Applicable
Appendix 3 - (3)(s)	An undertaking under oath or affirmation by the EAP in relation to - i. the correctness of the information provided in the reports; ii. the inclusion of comments and inputs from stakeholders and interested and affected parties; i. the inclusion of inputs and recommendations from the specialist reports where relevant; and ii. any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	Appendix B
Appendix 3 - (3)(t)	Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	Chapter 16
Appendix 3 – (3) (u)	An indication of any deviation from the approved scoping report, including the plan of study, including - i. any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and ii. a motivation for the deviation;	Chapter 4
Appendix 3 - (3)(v)	Any specific information that may be required by the competent authority; and	Executive Summary, Chapter 13, Appendix 13.A (in Chapter 13), Chapter 15, Appendix J, Appendix K and Part B of the EIA

Section of the EIA Regulations	Requirements for an EIA Report in terms of Appendix 3 of the 2014 NEMA EIA Regulations (GN R982)	Location in this EIA Report
		Report
Appendix 3 - (3)(w)	Any other matters required in terms of section 24(4)(a) and (b) of the Act.	Not applicable at this stage

EIA REPORT

CHAPTER 2:

Project Description

Scoping and **Environmental Impact Assessment** for the Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province

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2 PROJECT DESCRIPTION

This chapter provides an overview of the conceptual project design and an overview of the site and technology selection process (as provided by Scatec Solar) for the proposed 75 MW Solar PV facility, referred to as Kenhardt PV 3.

The purpose of this chapter is to present sufficient project information to inform the EIA Process in terms of design parameters applicable to the project. It is important to note that the project description details are preliminary at this stage and it is likely that some of the details presented herein may change during the detailed design phase and upon further engineering investigations however the information provided below is seen as the worst-case scenario for the project. It is important to note that the specialist assessments have also been based on the worst-case scenario in terms of the project specifications (such as the development footprint, dimensions, height etc.).

2.1 Site Selection

Additional information regarding the site selection process is provided in Chapter 5 of this EIA Report. The preferred and alternative sites were selected based on national level considerations (high solar radiation in the Northern Cape) and the fact that the proposed site currently falls within the REDZ 7. On a site specific level, the site was deemed suitable due to all the site selection factors (such as land availability, distance to the national grid, site accessibility, topography, fire risk, current land use and landowner willingness) being favourable.

2.2 Technology Selection

The different options for solar panel types and mounting systems that were investigated by Scatec Solar and deemed feasible for the solar facility were discussed in the Scoping Report. The preferred mounting system to be constructed on site will be determined closer to the detailed design phase and after taking into consideration the economic viability, water requirements, land requirements, efficiency and potential environmental impacts.

2.2.1 Solar Panel Type

The Concentrated PV (CPV), Concentrated Solar Power (CSP) and conventional PV solar cells were considered for the proposed facility. The preferred solar panel type that will be constructed on site is the Conventional PV technology (Figure 2.1) that does not make use of any mirrors or lenses and generates electricity by converting solar radiation energy into a DC which then needs to be converted to an AC to connect to the grid.

Figure 2.1: Conventional PV Technology (right)[1]

[1] Sources: http://cleantechnica.com/2010/05/13/how-to-get-25-of-world-electricity-from-solar-energy-by-2050

2.2.2 Mounting System

Solar panels can be mounted in various ways to ensure maximum exposure of the PV panels to sunlight. The four main mounting systems considered as part of the EIA are:

- Single axis tracking systems;
- Fixed axis tracking systems;
- Dual axis tracking systems; and
- Fixed tilt mounting structures.

In a fixed axis tracking system, the PV panels are installed at a set tilt facing north and cannot move, whereas in a single axis tracking system the panels follow the sun (i.e. east to west) to ensure maximum exposure to sunlight. In a dual axis tracking system, the PV panels can follow the sun from east to west, as well as follow the suns altitude (which results in an optimal angle of radiation onto the panel (Vermaak, 2014)). Dual axis tracking systems can therefore follow the sun throughout the day both horizontally and vertically.

The type of mounting system will be confirmed during the detailed engineering phase and all options have been included in the proposed project description and whichever mounting system is selected would have no impact on any aspect assessed within the EIA.

2.3 Key Components of the Proposed Solar Energy Facility

A summary of the key components of the proposed project is described below. It is important to note at the outset that the exact specifications of the proposed project components will be determined during the detailed engineering phase (subsequent to the issuing of an EA, should such an authorisation be granted for the proposed project) but that the information provided below is seen as the worst-case scenario for the project.

This project is being developed to have a generation capacity of 75 MW AC and up to 100 MW DC. As mentioned in Chapter 1 of this EIA Report, once a Power Purchase Agreement (PPA) is awarded, the proposed facility will generate electricity for a minimum period of 20 years. The property on which the facility is to be constructed will be leased by Scatec Solar from the property owner/landowner for the life span of the project. The preferred location within the site, as determined during the Scoping Phase, includes approximately 1341 ha of land (which was increased from 1000 ha since the release of the Scoping Report, as explained in Chapter 1 of this EIA Report). Due to the fact that this project only requires approximately 250 ha of land, there is scope to avoid major environmental constraints through the final design of the facility. To this end, the larger 1341 ha buildable area was considered and assessed by the specialists in order to ensure that any development constraints or environmental sensitivities can be avoided in the final siting and location of the proposed facility. Based on the findings of the specialist studies, an environmental sensitivity map has been produced (and included in Chapter 16 of this EIA Report). This map shows the sensitivities on site (terrestrial, aquatic, and sensitive heritage features) within the larger 1341 ha buildable area that was assessed. Based on this map, the preferred location for the 250 ha Kenhardt PV 3 facility, also known as the Development Envelope, avoids (where possible) the sensitive features that were identified by the specialists within the original 1341 ha buildable area. Based on the boundaries of the Development Envelope and the constraints of the environmental sensitivities, a site layout has also been preliminarily determined for this project (as discussed in Chapter 16 of this EIA Report). It should be noted that even though a site layout has been provided, should the layout change following the issuing of the EA (should it be granted), that any alternative layout occurring within the boundaries of the Development Envelope would *not* change the scope of work or the *findings* of the impact assessments undertaken during this EIA. The Development Envelope is considered to be a “box” in which the proposed project components discussed within this chapter can be constructed at whichever location (**within the boundaries of the assessed Development Envelope)** without requiring an additional assessment or change in impact significance. Any changes to the layout are therefore considered to be non-substantive. This is discussed further in Chapter 16 of this EIA Report. It should be noted that a similar approach has been followed for the electrical infrastructure and transmission lines, which has been assessed as part of separate Basic Assessment Processes. To this end, an electrical infrastructure corridor has been proposed for proposed transmission lines (as shown in Figure 2.2).

As discussed above, this project will utilise PV technology to generate electricity. The two main components of the project will consist of the solar field (solar panels and building infrastructure) and the associated infrastructure. The technical components forming part of the solar facility are detailed discussed in Sections 2.3.1 and 2.3.2 below.

The solar facility will consist of the following components:

- **Solar Field**
  - Solar Arrays:
    - PV Modules;
    - Single Axis Tracking structures (aligned north-south), Fixed Axis Tracking (aligned east-west), Dual Axis Tracking (aligned east-west and north-south) or Fixed Tilt Mounting Structure;
    - Solar module mounting structures comprised of galvanised steel and aluminium; and
    - Foundations which will likely be drilled and concreted into the ground.

  - Building Infrastructure:
    - Offices;
    - Operational and maintenance control centre;
    - Warehouse/workshop;
    - Ablution facilities;
    - Converter station;
    - On-site substation building; and
    - Guard House.

- **Associated Infrastructure**
  - 132 kV overhead transmission line (which will be subject to a separate Basic Assessment Process, referred to as Kenhardt PV 3 – Transmission Line);
  - Associated electrical infrastructure at the Eskom Nieuwehoop Substation (including but not limited to an additional feeder bay, Busbars, transformer bay and extension to the platform at the substation) (which will be subject to a separate Basic Assessment Process, referred to as Kenhardt PV 3 – Transmission Line);
  - On-site substation;
  - 33 kV internal transmission lines/underground cables;
  - Underground low voltage cables or cable trays;
  - Access roads;
  - Internal gravel roads;
  - Fencing;
  - Panel maintenance and cleaning area;
  - Stormwater channels; and
  - Temporary work area during the construction phase (i.e. laydown area).

The overall locality of the proposed project is shown in Figure 2.2 below. Only the preferred site for Kenhardt PV 3 has been assessed during the EIA Phase.

As noted previously, the proposed project will take place on the remaining extent of Onder Rugzeer Farm 168 (Surveyor General 21-Digit Code: C03600000000016800000). The co-ordinates of the boundary/corner points of the preferred project site (i.e. Kenhardt PV 3) are shown in Table 2.1 below. The co-ordinates of the approximate mid-point of the preferred project site (i.e. Kenhardt PV 3) are 29° 12' 59.84" S and 21° 18' 1.22" E.

Table 2.1: Co-ordinates of the Corner Points of the Preferred Project Site

Point	Latitude	Longitude
Point A – North West	29° 12' 10.47" S	21° 17' 20.39" E
Point B - West	29° 13' 5.86" S	21° 16' 30.32" E
Point C – South West	29° 13' 57.88" S	21° 17' 4.62" E
Point D – South East	29° 14' 2.62" S	21° 19' 21.11" E
Point E – North East	29° 11' 57.35" S	21° 19' 3.46" E

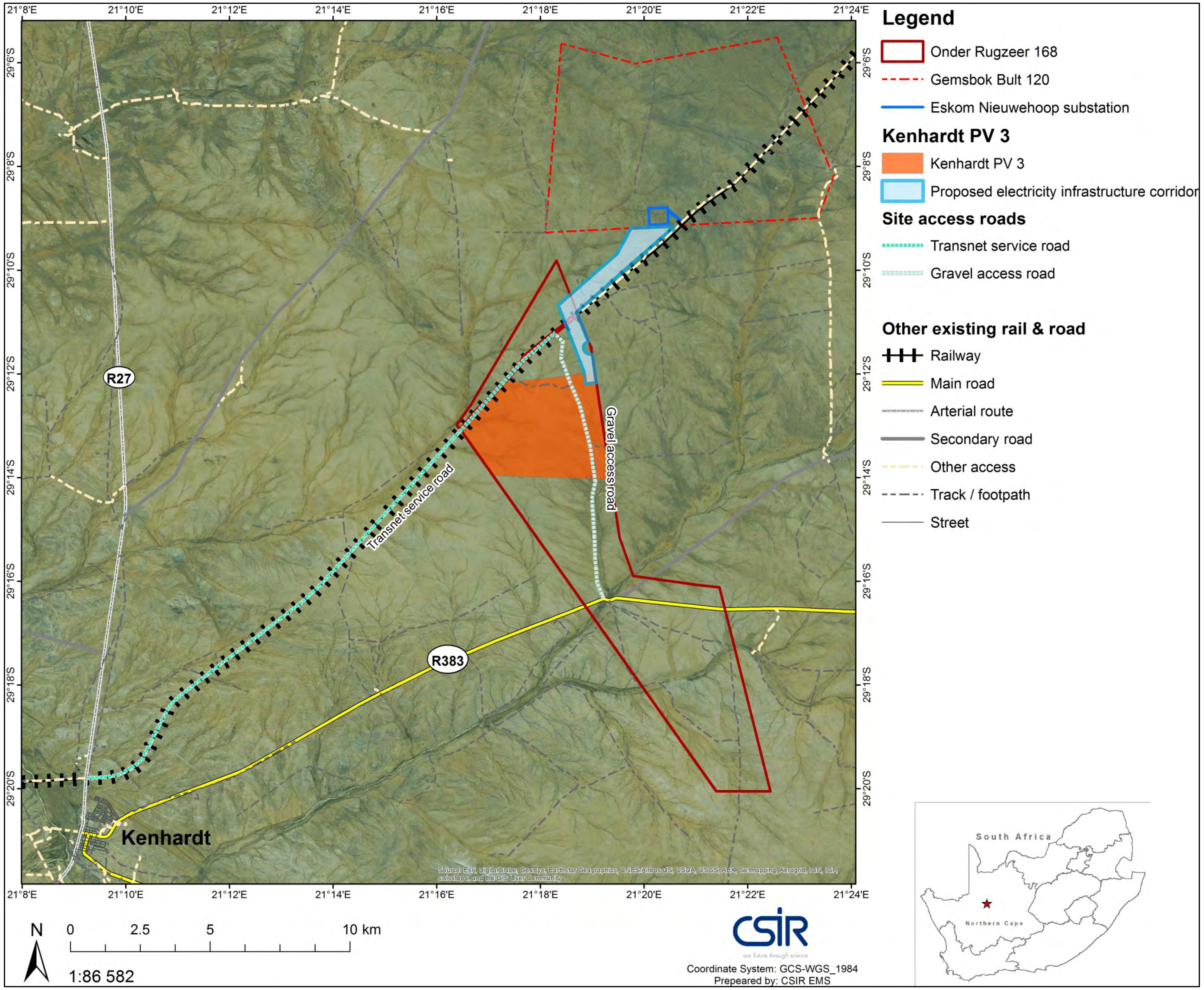

Figure 2.2: Proposed Locality of the Kenhardt PV 3 project (including the Electrical Corridor which is assessed seperately as part of a Basic Assessment Process)

2.3.1 Solar Field

The Solar Field will consist of the solar arrays (panels) and building infrastructure.

2.3.1.1 Solar Arrays

As noted above, the total footprint of the solar facility is estimated to be approximately 250 ha. This will include the development of the solar field including electrical infrastructure, the structure of the solar array and foundations. The exact number of solar panels arrays, confirmation of the foundation type and detailed design will follow as the development progresses but a preliminary site layout plan has been included in Chapter 16 and Appendix J of this EIA Report. The PV array is estimated to cover approximately 220 ha.

- **PV Modules**

The smallest unit of a PV installation is a cell. A number of cells form a module, and finally a number of modules form the arrays (Figure 2.3).

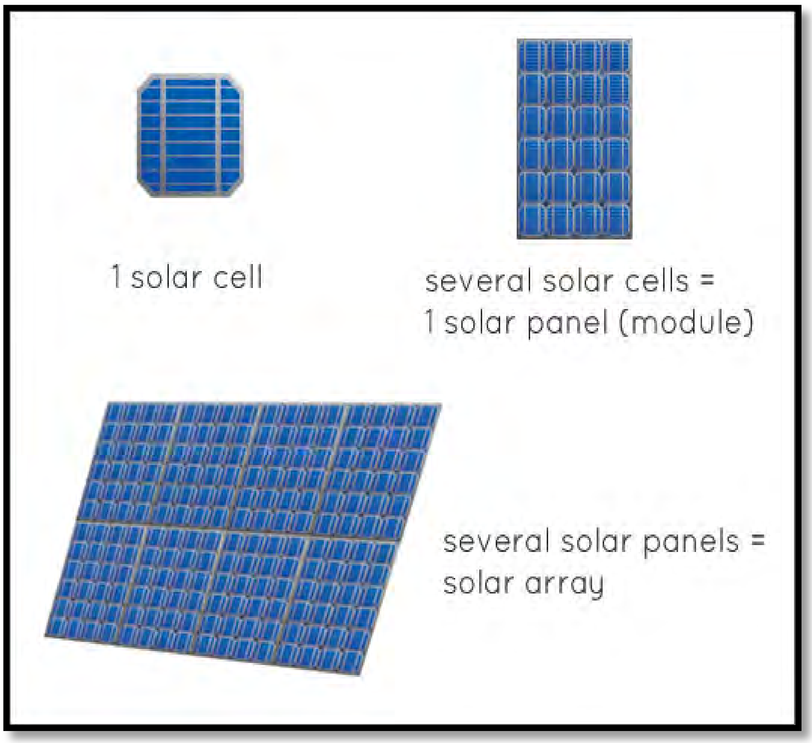

Figure 2.3: Components of the Proposed PV Installation (Source: Go Greena, 2013)

Modules are arranged into strings that form the solar field. Modules are arranged in section sizes of approximately 40 x 5 m called tables and are installed on racks which are made of aluminium or galvanised steel. The arrays and racks will be founded into the ground through either steel or concrete towers (which will be confirmed during the detailed engineering phase), as shown in Figure 2.4. The entire structure is not expected to exceed 10 m in height (measured from the ground), which is considered the worst-case. This system may be fixed, or may track the movement of the sun (either by adopting Fixed Axis Tracking, Single Axis Tracking, Dual Axis Tracking or Fixed Tilt Mounting Structures as explained above).

All the arrays will be wired to converter/inverter stations that converts DC into AC. Section 2.3.2.1 of this chapter provides additional detail regarding the converter stations and connection thereto. It should be noted that a converter station is also referred to as an inverter station.

Figure 2.4: PV Technology

In terms of the composition of PV panels, the glass used to manufacture solar PV technology is designed to maximise absorption of light and minimise reflection, glint and glare (Spaven Consulting, 2011; BRE, 2013). Subsequently, solar PV panels are less reflective than water (Figure 2.5).

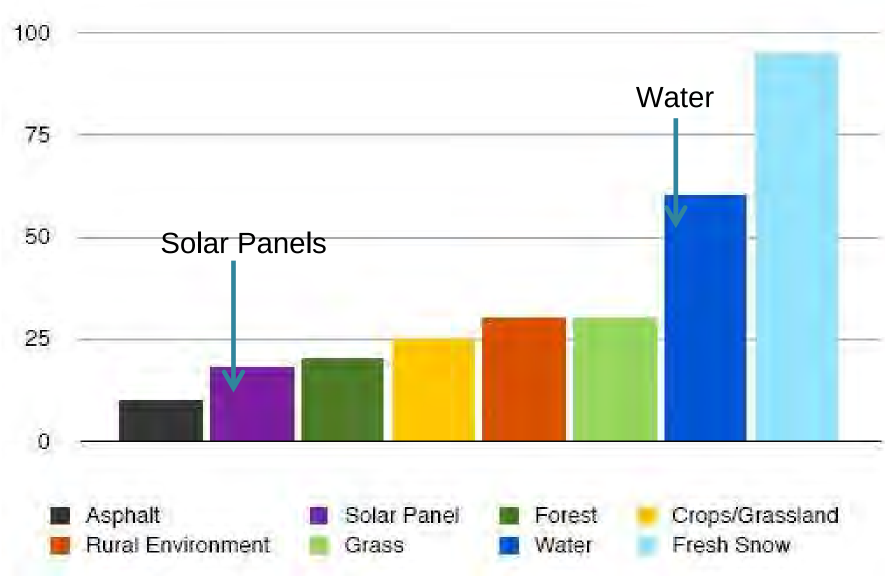

Figure 2.5: Reflected Energy Percentage of Solar Panels compared to other Materials (Source: Spaven Consulting, 2011)

No known adverse effects associated with the possible reflection and glare from solar PV panels on livestock have been flagged in solar PV planning research. One of the benefits of solar PV fields is that the landscape becomes multi-functional: not only is electricity generated by the solar arrays, but livestock (especially sheep and even cattle, depending on the height of the solar arrays) can potentially utilise the area for grazing (Spaven Consulting, 2011; BRE, 2013). Any grazing potential amongst the panels will be determined by Scatec Solar at the commencement of the construction phase on a case by case basis. In addition, due to the low reflectivity of the panels compared to water, it is unlikely that birds will mistake it for water.

2.3.1.2 Building Infrastructure

The solar field will require on-site buildings, including an operational and maintenance control centre, offices, warehouse/workshop (for storage of equipment), ablution facilities, converter stations, on-site substation and substation building, laydown areas and security enclosures. The on-site substation building is expected to extend approximately 12 m in height, with a maximum footprint of 20 000 m^2. The Visual Impact Assessment (Chapter 8 of this EIA Report) considered a height of 30 m for the on-site substation building, as a worst case scenario. Ablution facilities are likely to be incorporated into the office structures. The buildings will likely be of single storey design, with the largest building (i.e. Control Centre Building) unlikely to exceed 6 m in height and 500 m^2 plan dimensions. The offices, operational and maintenance control centre, warehouse/workshop and operations offices (including ablution facilities) are expected to extend approximately 7 m high. The converter stations are expected to extend approximately 2.5 m high (with a maximum height of 7 m) and cover an area of 2500 m^2. Security will be required to guard the main facility and support infrastructure and therefore two guard cabin will also be constructed (with an approximate height of 3 m). The buildings are required to support the functioning of the facility and to provide services to personnel that will operate and maintain the facility. Detailed design will follow as the development progresses however a preliminary site layout plan has been included in Chapter 16 and Appendix J of this EIA Report.

2.3.2 Associated Infrastructure

2.3.2.1 Electrical Infrastructure

As mentioned above, the solar arrays are typically connected to each other in strings, which are in turn connected to inverters that convert DC to AC. The strings will be connected to the converter stations by low voltage underground (internal) DC cables or cable trays. Power from the converter/inverter station will be collected in medium voltage transformers through underground (internal) AC cables, cable trays or AC cables which are pole-mounted depending on voltage level and site conditions.

The converter stations will in turn be connected to the proposed on-site substation, via medium voltage (33 kV) underground (internal) cables or overhead lines (extending approximately 9 m high with an estimated maximum footprint of 7500 m^2), which will increase the voltage and transmit the power produced via a 132 kV overhead transmission line into the national grid system via the Eskom Nieuwehoop substation which is currently being constructed on the Gemsbok Bult Farm (as mentioned above). An overhead transmission line (132 kV/33 kV/22 kV) will be constructed for each 75 MW Solar PV Facility and is expected to extend approximately 4 - 9 km in length (between the proposed on-site substation and the Eskom Nieuwehoop Substation), with steel or concrete tower structures (extending approximately 22.5 to 30 m in height). Various options have been put forward for the connection of the transmission lines for the Kenhardt PV 1, PV 2 and PV 3 projects. The transmission lines and electrical infrastructure required to connect the proposed projects to the national grid will be constructed within an electrical infrastructure corridor (extending between 300 m and 1000 m wide) as shown in Figure 2.2. Currently, Scatec Solar will implement the Self-Build option and may transfer the ownership of the transmission line to Eskom. Therefore, as mentioned in Chapter 1 of this EIA Report, this corridor has been assessed as part of separate Basic Assessment Processes. The proposed electrical infrastructure, which includes the transmission line corridor and a collector substation, will be assessed separately as part of a Basic Assessment Process (i.e. Kenhardt PV 3 – Transmission Line).

<u>It is important to note that all high voltage infrastructure leading up to the Point of Connection (i.e. Scatec Solar's section of the proposed collector substation) will be covered by this EIA Process (i.e. for Kenhardt PV 3). High voltage infrastructure extending from the Point of Connection (i.e. Eskom's section of the proposed collector substation) up to the line bay at the Eskom Nieuwehoop Substation may be handed over to Eskom and will be assessed separately as part of a Basic Assessment Process (i.e. Kenhardt PV 3 – Transmission Line).</u>

As previously mentioned, a separate EA was granted to Eskom Holdings SOC Limited for the construction of the Nieuwehoop Substation on 21 February 2011 (DEA Reference Number: 12/12/20/1166).

Figure 2.6 provides a summary of the electrical connections required for the Kenhardt PV 3 and Kenhardt PV 3 transmission line project.

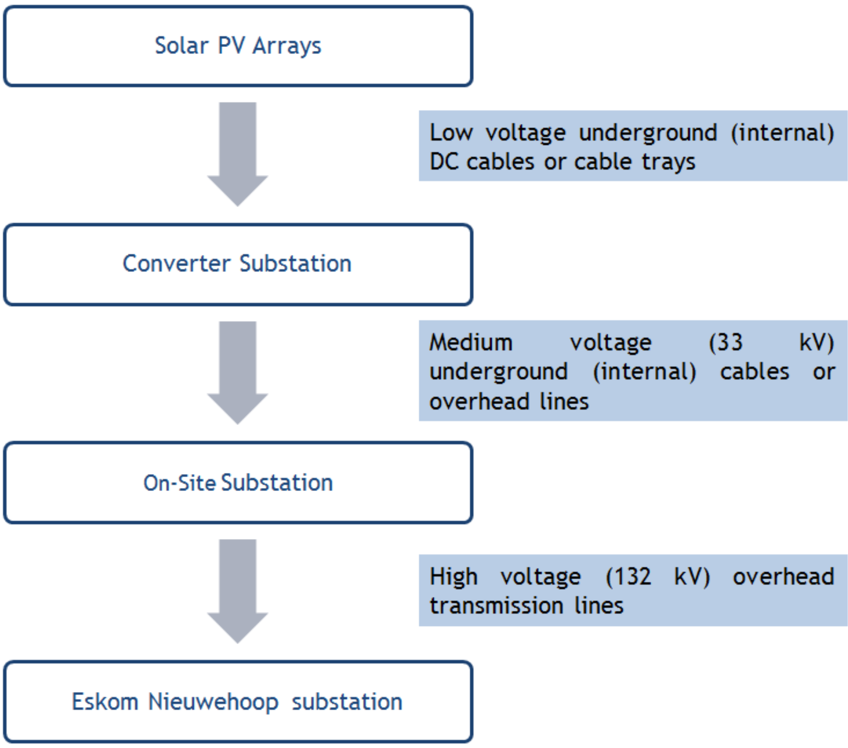

Figure 2.6: Components of the Proposed PV Installation and Electrical Connections

2.3.2.2 Roads

The proposed project site can be accessed via an existing gravel road (an unnamed farm road) and the existing Transnet Service Road (private). Both access routes will be considered in the design of the facility and have been included in the proposed project. The R27 extends from Keimoes (in the north) to Vredendal in the south. The R27 is 6 m wide and falls within a 45 m road reserve. This National Road is designed for minimum daily traffic exceeding 1000 vehicle units. The Transnet Service Road can be accessed from the R27. The existing gravel road can be accessed from the R383 Regional Road also via the R27 National Road. The Transnet Service Road and unnamed farm road are both 7-8 m wide, however in certain sections, the unnamed farm road is believed to be about 2-3 m wide. A further access road will be constructed from either the Transnet Service Road or the unnamed farm road to the proposed Kenhardt PV 1, 2 and 3 facilities.

Should the Transnet Service Road be considered the preferred access road, it is proposed that an internal gravel road be constructed from the road to the proposed site. This internal gravel road is not expected to exceed 6 m in width. The length of the internal gravel road will be confirmed as the location, design and layout of the facility progresses; however a preliminary site layout plan has been included in Chapter 16 and Appendix J of this EIA Report. It is estimated that the internal gravel access roads will be 6 m wide and 2000 m long. Discussions have been initiated and held with Transnet and the Project Applicant during the Scoping and EIA Process regarding the potential use of the Transnet Road and associated specific requirements. Transnet have informed the Project Applicant of their requirements that need to be met by the Project Applicant should the Transnet

Service Road be used as to gain access to the site. These requirements will be considered in the design of the facility where required, and the details of the agreement will be finalised outside of this EIA Process.

However, should the Transnet Service Road not be used for access to the preferred site, then the unnamed farm gravel road will be used and widened to by more than 6 m (where required). Exact specifications of the widening and upgrading of the unnamed farm gravel road will be confirmed during the detailed design phase. It is expected that the widening of the unnamed farm road will result in crossings of major and minor drainages lines on site. The details of these crossings will be determined during the detailed design phase.

Internal roads extending approximately 4 m wide will be constructed within the project footprint of the proposed PV plant. A perimeter road will also be constructed along the boundary of the proposed PV plant, which will extend approximately 2.5 m wide.

Overall, the proposed internal roads, the gravel access road, the perimeter roads will have a maximum length of 20 000 m in total.

In terms of traffic generation, a Traffic Impact Statement has been provided in Chapter 14 of this EIA Report.

The types of materials that will need to be transported to site during the construction phase include the following:

- Transformers;
- PV Modules;
- Converter components;
- Steel and Aluminium for Racking;
- Switchgear and equipment;
- Cables;
- Gravel and sand;
- Concrete;
- Water;
- Reinforcement; and
- Other material.

During the operational phase, fewer materials will need to be transported to site. Trips will also be generated for the transportation of staff during the construction and operational phases. A description of the vehicle trips are provided in Chapter 14 of this EIA Report.

2.3.2.3 Fencing

For various reasons (such as security, public protection and lawful requirements), the proposed facility will be secured via the installation of boundary fencing. The fencing is planned to be approximately 2.6 to 3 m high. Access points will be managed and monitored by an appointed security service provider. The type of fencing will either be of palisade or mesh type; however it may be a fully electrified option. Detailed design will follow as the development progresses but a preliminary site layout plan has been included in Chapter 16 and Appendix J of this EIA Report.

2.3.2.4 Panel Maintenance and Cleaning

The accumulation of dust on solar panels generally negatively influences the productivity of solar facilities. As such the panels require regular cleaning. Cleaning and maintenance of the panels will require water. During the Scoping Phase, it was noted that the Project Applicant intended to make use of existing boreholes to source groundwater (if available and if suitable) for the panel cleaning process. If the groundwater was available and suitable, the water will be transported from the boreholes to the Solar PV facility via water pipelines and stored on site in suitable containers during the operational phase. However, the Geohydrological Assessment undertaken as part of the EIA

Phase (Chapter 11 of this EIA Report) studied the quality of the groundwater and its suitability for use. The Geohydrological Assessment noted that the groundwater on site is extremely low in terms of yields and is not suitable for use. The specialists do not recommend that groundwater be used as a source of water during the construction and operational phase.

Based on the findings of the Geohydrological Assessment (Chapter 11 of this EIA Report), the Applicant no longer plans to make use of groundwater during the construction and operational phase. As noted in the Scoping Report, if the groundwater is not sufficient or suitable for use, water will then be sourced from the municipal supply if required (i.e. delivery via water tankers).

It is proposed that panel cleaning will take place quarterly; however this may be revised should the site conditions warrant more frequent cleaning. It is estimated that the panel washing process will require approximately 4 million to 6 million litres of water per year during operations. The quality of the groundwater and its suitability for use has been determined as part of the Geohydrological Assessment (Chapter 11 of this EIA Report).

At this stage, no water is planned to be abstracted from or discharged to any surface water systems.

2.3.2.5 Stormwater Channels and Water Pipelines

Stormwater channels will be constructed on site to ensure that stormwater run-off from site is appropriately managed. At this stage of the design it is understood that the stormwater infrastructure will extend approximately 3000 m in length, and will have an internal diameter less than 0.36 m, and a peak throughput of less than 120 l/s. Water from these channels will not contain any chemicals or hazardous substances, and will be released into the surrounding environment based on the natural drainage contours.

The proposed project may also entail the construction drainage structures (i.e. French drains) for the transfer of waste water generated by the proposed facility. These structures will not exceed 1000 m in length, and will have an internal diameter of less than 0.36 m, and possibly a peak throughput of less than 120 l/s.

The project will require sewage services during the construction and operational phases. Low volumes of sewage or liquid effluent are estimated during both phases. Liquid effluent will be limited to the ablution facilities during the construction and operational phases. Portable sanitation facilities (i.e. chemical toilets) will be used during the construction and operational phases, which will be regularly serviced and emptied by a suitable (private) contractor on a weekly basis. The waste water will be transported to a nearby Waste Water Treatment Works for treatment. Due to the remote location of the project site; a conservancy tank or septic tank system could be used on site, which is expected to be serviced by the municipality. Feedback from the municipality (in terms of capacity) will be sought during the EIA Phase. Due to the remote locality of the farm, sewage cannot be disposed in the municipal waterborne sewage system.

In terms of waste generation, general waste generated during the construction and operational phases will be temporarily and safely stored in a skip on site and periodically removed on a regular basis to a licenced waste disposal facility by a suitable contractor. During the construction phase an estimated amount of less than 5 m^3 non-hazardous solid construction waste is likely to be produced per month. In addition, a skip will be placed on site and any damaged or broken PV panels (i.e. those not returned to the supplier) will be stored in this skip. A specialist waste management company will be commissioned to manage and dispose of this waste. During the operational phase after construction, the facility will produce minor amounts of general waste (as a result of the offices). Waste management is discussed in the EMPr (Part B of this EIA Report).

As discussed above (in Section 2.3.2.4), water pipelines will no longer need to be constructed to transfer groundwater from existing boreholes to the proposed facility (based on the findings of the Geohydrological Assessment). Water will instead be supplied by the municipality and transported to the site via tankers (as discussed in Section 2.3.2.4 above). During the construction and operational phases, it is proposed to have 5 to 10 water tanks (i.e. suitable containers or reservoir tanks (or similar)) on site. The capacity of the tanks are estimated to be approximately 10 000 litres. During the construction phase, delivery of water will be required once every two days (via water tankers from the municipality). During the operational phase, water will be delivered twice a month (via water tankers from the municipality). It is estimated that approximately 10 000 m^3 and 5 000 m^3 of water will be required per year during the construction and operational phase, respectively.

In terms of electricity supply, the developer will be provided with auxiliary supply from already existing Eskom infrastructure. The exact location of this source as well route for provision of such supply is still to be determined by Eskom.

The project Applicant will consult with the municipality in order to confirm the supply of services (in terms of water, waste removal, sewage and electricity) for the proposed project.

2.3.3 Summary of Infrastructure

A summary of the project components are shown in Table 2.2 below. Refer to Appendix J for the site layout plan which also provides these details.

Table 2.2: Specifications of the Project Components

Component	Description
Solar Field: 250 ha	
Type of Technology	PV Technology
Generation Capacity	75 MW AC and up to 100 MW DC
PV Panels Structure (with following possible tracking and mounting systems): ▪ Single axis tracking systems; ▪ Fixed axis tracking systems; ▪ Dual axis tracking systems; and ▪ Fixed tilt mounting structures.	Height: 10 m (maximum)
Area of PV Array	Footprint: 220 ha (maximum)
Total Surface Area to be covered (including all associated infrastructure and roads etc. (excluding main access road to site))	Footprint: 250 ha
Building Infrastructure	
Total Area occupied by buildings	Footprint: 1 500 m^2
Offices	Height: 7 m Footprint: 1 000 m^2 (maximum)
Operational and Maintenance Control Centre	Height: 6 m (7 m worst case) Footprint: 500 m^2
Warehouse/Workshop	Height: 7 m Footprint: 500 m^2
Ablution Facilities	Height: 7 m Footprint: 50 m^2
Converter Stations	Height: 2.5 m to 7 m (maximum) Footprint: 2 500 m^2
Number of Converter/Inverter Stations Required	24
Area occupied by the Converter/Inverter, Transformers and Substations	Footprint: 3 500 m^2
On-site Substation and Building	Capacity: 80 MVA Height: 30 m Footprint: 20 000 m^2 (maximum)
Guard Houses	Height: 3 m Footprint: 40 m^2
Associated Infrastructure	
33 kV internal transmission lines/underground cables.	Height = 9 m if aboveground or could be underground

Component	Description
	Length: 7 500 m^2
Underground low voltage cables or cable trays	Capacity: Cables 1800V (DC) and 240mm^2 which has a current rating of 400A in the cable tray and 440A if buried 1 m Depth belowground: Unlikely to be buried, maximum depth of 1 m
Access Roads: Unnamed Farm Road (Widening)	Length: To be confirmed Width: More than 6 m
Access Roads: From Transnet Service Road or Unnamed Farm Road	Length: 2 000 m Width: Approximately 6 m
Internal gravel roads	Width: Approximately 4 m
Perimeter roads	Width: Approximately 2.5 m
Total Length of Internal Gravel and Perimeter Roads	Length: Approximately 20 000 m
Fencing	Type: Palisade or Mesh Height: 2.6 m to 3 m
Stormwater channels	Length: 3 000 m
Temporary work area during the construction phase (i.e. laydown area)	Footprint: Maximum 5 ha
Area occupied by both permanent and construction laydown areas (including panel maintenance and cleaning area during the operational phase).	Footprint: 20 ha (maximum) Refer to site layout plan in Appendix J of this EIA Report. Note that the panels will be cleaned in the field during operation. Maintenance of plant equipment will be done in the workshop of the Operations and Maintenance building (and in the operations laydown area if additional space is required).
High Voltage Overhead Transmission Lines (assessed separately as part of the Basic Assessment Process)	Height = 22.5 m to 30 m Length = 4 – 9 km
Proximity to Grid Connection	Approximately 4 km (Maximum 8 km)

2.4 Overview of Project Development Cycle

The project can be divided into the following three main phases:

- Construction Phase;
- Operational Phase; and
- Decommissioning Phase.

Each activity undertaken as part of the above phases may have environmental impacts and has therefore been assessed by the specialist studies (Chapters 7 – 15 of this EIA Report).

2.4.1 Construction Phase

The construction phase will take place subsequent to the issuing of an Environmental Authorisation (EA) from the DEA and a successful BID in terms of the REIPPPP (i.e. the issuing of a PPA from the DOE). The construction phase for the proposed Kenhardt PV 3 project is expected to extend 14 months (however the construction period is subject to the final requirements of Eskom and the REIPPPP Request for Proposal provisions at that point in time).

As noted above, the construction phase will involve the transportation of personnel, construction material and equipment to the site, and personnel away from the site. In terms of site establishment, laydown areas will be required at the outset of the construction phase, as well as dedicated access routes from the laydown areas to the working areas. Haul roads for construction traffic (for the delivery of concrete, road materials and other construction materials) will be required, as described in Section 2.3.2.2 above.

The laydown area will either be located adjacent to or at the project site. It is expected that the laydown area will be temporary in nature (for the duration of the construction phase) and will include the establishment of the construction site camp (including site offices and other temporary facilities for the appointed Contractors). The laydown area is expected to cover a maximum area of 5 ha (depending on the contracting strategy at the time). If the laydown area is located outside of the footprint of the solar facility itself, the area will thereafter be rehabilitated (i.e. returned to its pre-construction condition) at the end of the construction phase. It is planned that each PV facility will have its own site camp area.

All efforts will be made to ensure that all construction work will be undertaken in compliance with local, provincial and national legislation, local and international best practice, as well as the EMPr, which is included in Part B of the EIA Report. During the construction phase, both skilled and unskilled temporary employment opportunities will be created. It is difficult to specify the actual number of employment opportunities that will be created at this stage; however between 90 and 150 skilled and 400 and 460 unskilled employment opportunities are expected be created during the construction phase. Additional details regarding the employment opportunities are provided in the Social Impact Assessment (Chapter 13 of this EIA Report). The employment creation is also dependent on the REIPPPP bidding requirements and the final engineering design.

The main activities that will form part of the construction phase are:

- Removal of trees and large bushes and ground-vegetation clearance for buildings and substations;
- Excavations for infrastructure and associated infrastructure;
- Establishment of a laydown area for equipment;
- Construction of internal access roads where required;
- Stockpiling of topsoil and cleared vegetation;
- Transportation of material and equipment to site; and
- Construction of the solar field (consisting of the solar arrays and buildings) and additional infrastructure.

2.4.2 Operational Phase

The proposed Kenhardt PV 3 project is expected to become operational by 2018. The following activities will occur during the operational phase:

- Generation of 75 MW of electricity to add to the national grid; and
- Maintenance of the solar facility, including washing of panels (as explained in Section 2.3.2.4).

The projected operations are expected to provide several services and added economic spin offs (as highlighted in Chapter 1 of this EIA Report). The solar facility is expected to generate electricity for a minimum period of 20 years. The operational phase of the project is expected to create skilled employment opportunities. However, other opportunities may arise for unskilled labour to be integrated to the ancillary activities. Approximately 20 skilled and 40 unskilled employment opportunities will be created over the 20 year lifespan of the proposed facility. Additional details regarding the employment opportunities are provided in the Social Impact Assessment (Chapter 13 of this EIA Report).

2.4.3 Decommissioning Phase

The main aim of decommissioning is to return the land to its original, pre-construction condition. Should the unlikely need for decommissioning arise (i.e. if the facility becomes outdated or the land needs to be used for other purposes), the decommissioning procedures will be undertaken in line with the EMPr and the site will be rehabilitated and returned to its pre-construction state.

If the site is not decommissioned, it is possible that a lease extension could be granted based on agreements with the landowner, as well as a renewed PPA. If this occurs, the site and technologies could possibly be advanced and upgraded, subject to the legislative requirements at that point in time.

EIA REPORT

CHAPTER 3:

Description of the Affected Environment

Scoping and **Environmental Impact Assessment** for the Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province

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3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

This chapter of the EIA Report provides a broad overview of the affected environment for the proposed Kenhardt PV 3 project and the surrounding region. The receiving environment is understood to include biophysical, socio-economic and heritage aspects which could be affected by the proposed development or which in turn might impact on the proposed development.

This information is provided to identify the potential issues and impacts of the proposed project on the environment. The information presented within this chapter has been sourced from:

- Preliminary scoping input from the specialists that form part of the project team;
- Review of information available on the South African National Biodiversity Institute (SANBI) Biodiversity Geographical Information System (BGIS) and Agricultural Geo-Referenced Information System (AGIS); and
- !Kheis Local Municipality and ZF Mgcawu District Municipality IDPs and the Northern Cape PSDF.

It is important to note that this chapter intends to provide a broad overview and does not represent a detailed environmental study. Detailed descriptions of the preferred project site (Kenhardt PV 3) focused on significant environmental aspects of this project are provided in the relevant specialist studies (which are included in Chapters 7 to 15 of this EIA Report). Refer to the finalised Scoping Report (CSIR, 2015) for a general description of the alternative site (i.e. Kenhardt PV 3b) that was considered during the Scoping Phase (however not assessed during the EIA Phase).

3.1 Background

The proposed project is situated on the remaining extent of Onder Rugzeer Farm 168. The total farm property covers approximately 5552 ha in area and the preferred site will extend approximately 250 ha for Kenhardt PV 3. If all three solar PV projects proceed, only 13.5 % of the total farm area will be developed on. As previously noted, the site is located approximately 30 km north-east of Kenhardt, in the ZF Mgcawu District Municipality and the !Kheis Local Municipality in the Northern Cape Province. The co-ordinates of the corner points of the preferred project area are provided in Table 2.1 of Chapter 2 of this EIA Report. Figure 3.1 provides a locality map of the proposed project area within a regional setting.

3.2 Preliminary Sensitivity Screening

Figure 3.2 represents the regional setting of the proposed Kenhardt PV 3 project in terms of the surrounding sensitive ecosystem features and sensitive geographical areas (as indicated in Listing Notice 3 of the 2014 EIA Regulations) in proximity to the site. Figure 3.2 includes the Geographic Information System (GIS) information required by the DEA solar energy EIAs.

Based on the preliminary sensitivity screening undertaken for the site, the proposed project area does not fall within any threatened ecosystems, National Protected Areas, National Protected Area Expansion Strategy (NPAES) Focus Areas or areas of conservation planning. The closest protected area is approximately 113 km away from the proposed project site. This information has been confirmed in the Ecological Impact Assessment (Chapter 7 of this EIA Report). An Ecological Support Area (i.e. a buffer around the Hartbees River) is located approximately 14 km west of proposed project as part of the Namakwa District Biodiversity Sector Plan. There is no conservation plan for the !Kheis Local Municipality and the ZF Mgcawu District Municipality, hence Critical Biodiversity Areas are not present or defined. In terms of the National Biodiversity Assessment (NBA) (2011), rivers are classified into critically endangered, endangered, vulnerable and least threatened. Figure 3.2 shows the rivers that flow through the remaining extent of Onder Rugzeer Farm 168. These rivers are “Rugseers”, “Rooiput se Leegte” and Wolfkop se Loop”. However, these rivers are classed as not/least threatened. Refer to the Ecological Impact Assessment (included in Chapter 7 of this EIA Report) for additional details regarding terrestrial and aquatic ecological sensitive features.

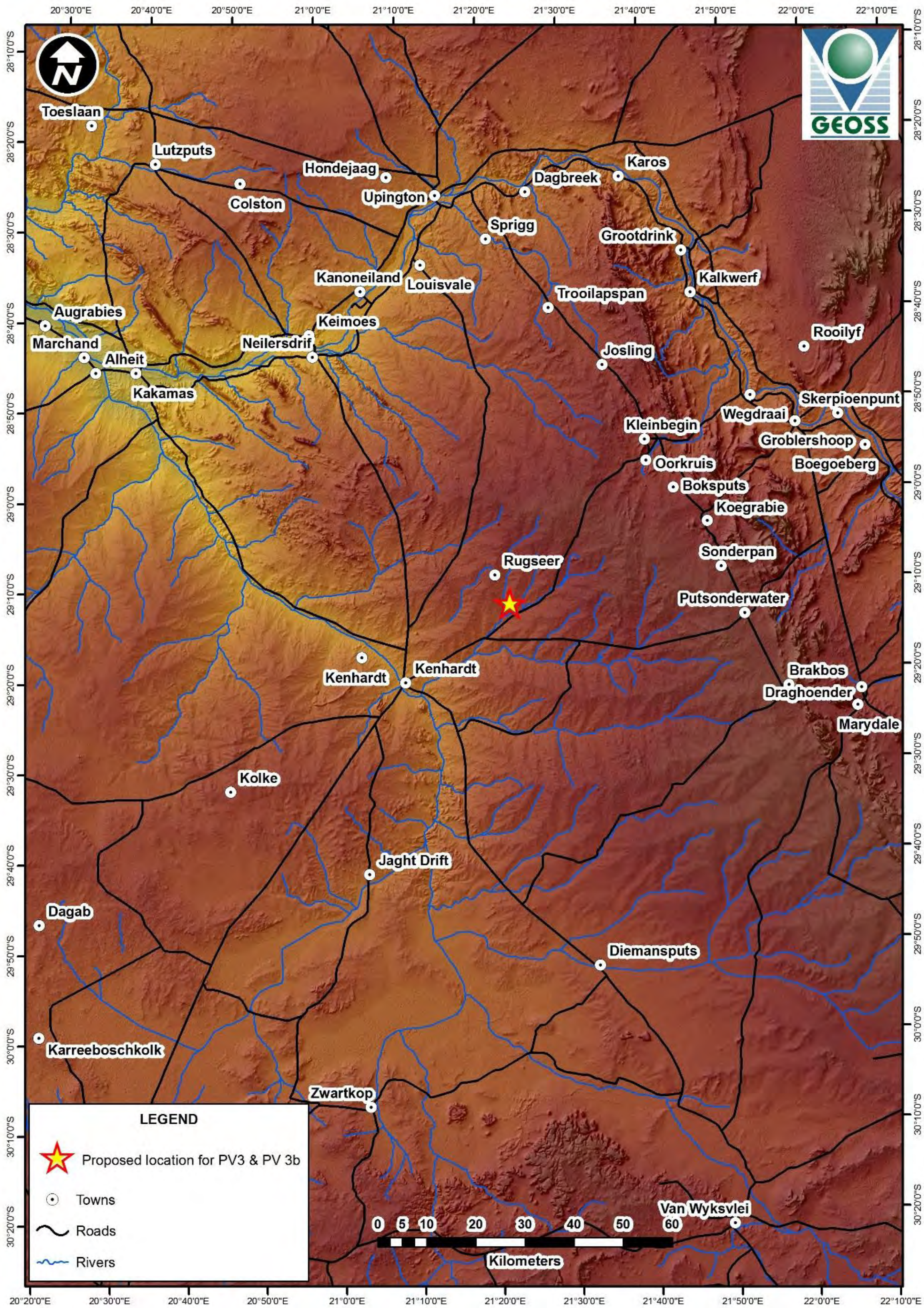

Figure 3.1: Locality Map for the proposed Kenhardt PV 3 Project within a Regional Setting (GEOSS, 2015)

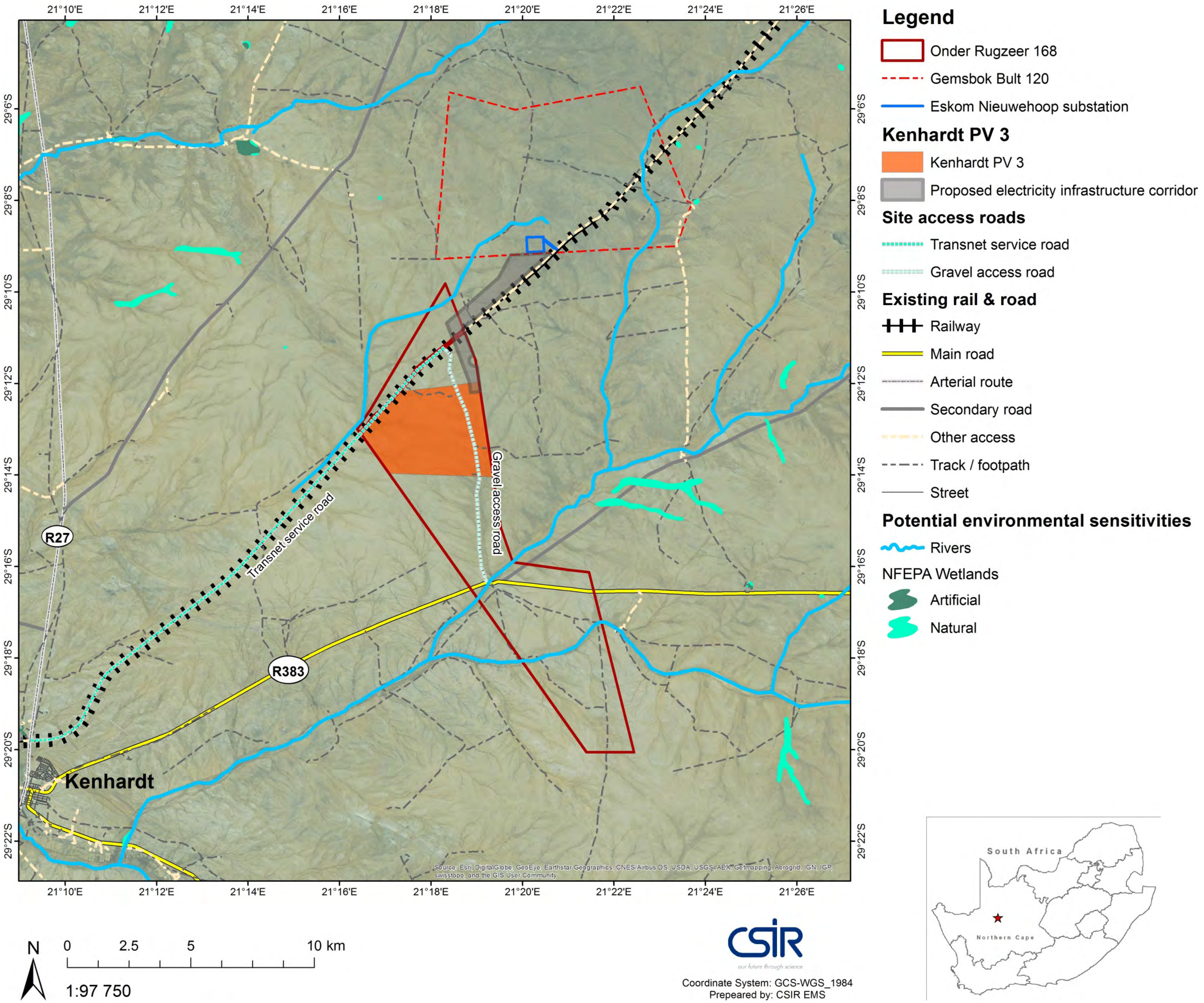

Figure 3.2: Sensitivity Map for the proposed Kenhardt PV 3 project (including the electrical corridor which is assessed in a separate Basic Assessment Process)

3.3 Biophysical Environment

3.3.1 Climatic Conditions

The mean annual rainfall of South Africa is shown in Figure 3.3 below. The climate of the Northern Cape is semi-arid with a late summer-autumn rainfall regime. Average rainfall of the area varies from 50 mm to 400 mm per year. Evaporation levels within this province exceed the annual rainfall. Climate conditions are extreme (i.e. very cold in winter and extremely hot in summer).

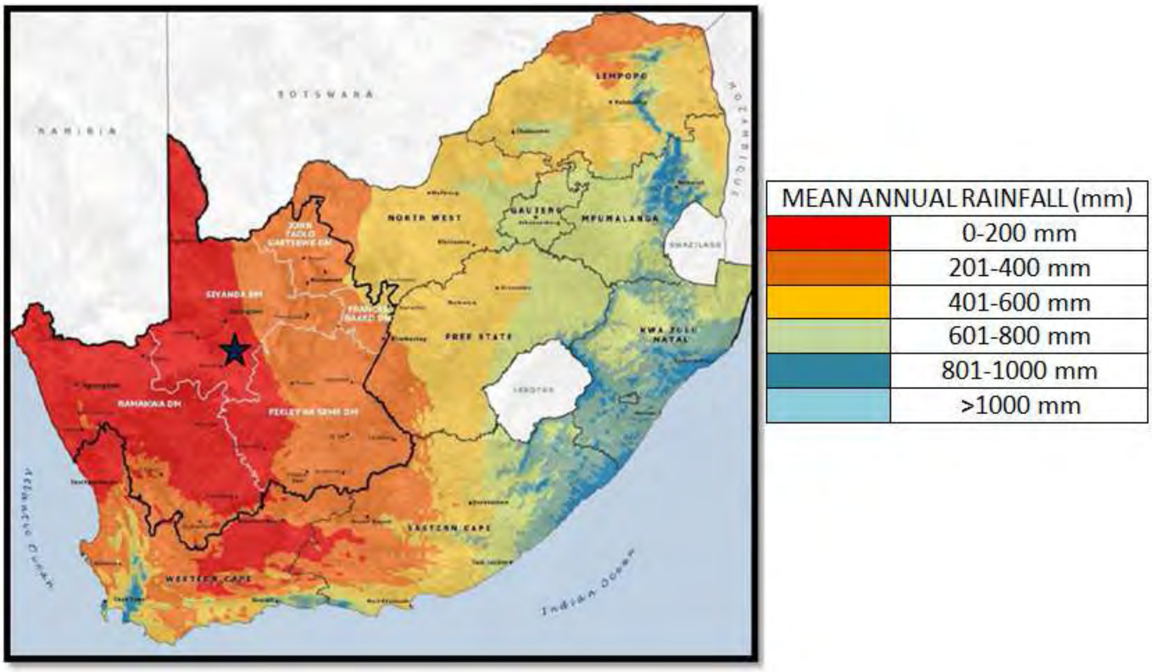

Figure 3.3: Mean Annual Rainfall Levels of South Africa (Source: Northern Cape PSDF, 2012)

The Kenhardt area (in which the proposed projects fall) has a very low rainfall level, 183 mm per annum, with a standard deviation of 71 mm, according to the South African Rain Atlas (Water Research Commission, undated)[1]. The average monthly distribution of rainfall is shown in Table 3.1.

Table 3.1: Average Monthly Rainfall (mm) for the Kenhardt area (Water Research Commission, undated)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
25	33	38	24	11	5	3	4	5	8	11	16	**183**

Most rainfall in Kenhardt occurs mainly during autumn. Figure 3.4 (a) shows the average rainfall values for Kenhardt per month. It typically receives the lowest rainfall (0 mm) in June and the highest (23 mm) in March (GEOSS, 2015).

[1] Data available online at: http://134.76.173.220/rainfall/index.html

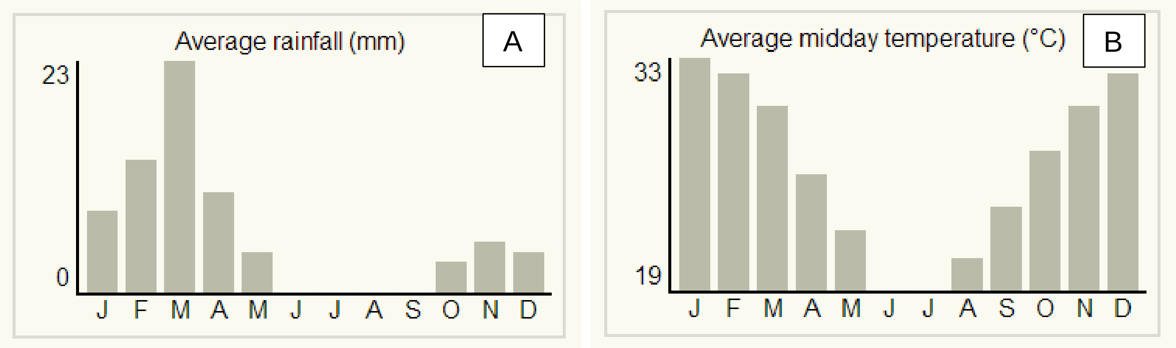

Figure 3.4: a) Rainfall and b) Average Midday Temperature for Kenhardt (www.saexplorer.co.za in GEOSS, 2015)

The monthly distribution of rainfall and evaporation for the remaining extent of Onder Rugzeer Farm 168 is shown in Figure 3.5. Since the area receives most of its rainfall during autumn it has a semi-arid to arid climate (as noted above). The relevance of this information is that the rainfall occurs whilst temperatures are quite high still and associated evaporation rates will be high. This implies that groundwater recharge will be very low. Figure 3.5 shows the long term monthly rainfall and evaporation distribution respectively (GEOSS, 2015).

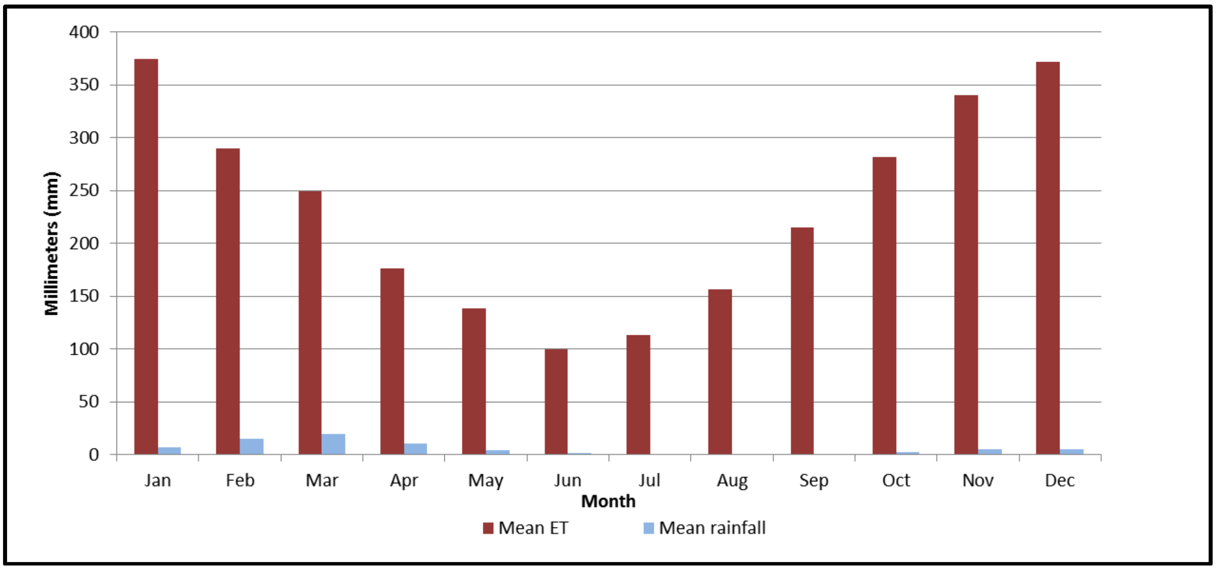

Figure 3.5: Long Term Average Rainfall and Evaporation (Schulze et al., 2008 in GEOSS, 2015)

Figure 3.6 shows the average monthly climatic chart for Kenhardt[2]. As shown in Figure 3.6, the highest temperatures are reached in the summer months (December to January) and the lowest in the winter months (June to August). The average temperature of the area is 19.6˚C, with an annual average high temperature of 28˚C and an annual average low temperature of 11˚C. The monthly distribution of average daily maximum temperatures (Figure 3.4 (b)) shows that the average midday temperatures for Upington range from 19°C in June to 33°C in January (GEOSS, 2015).

The average daily solar radiation levels in South Africa range between 4.5 and 6.5 kilowatt-hour per square meter (kWh/m^2). In South Africa the measured solar radiation is the highest in the Northern Cape, North West Province and the Free State. As discussed in Chapter 2 and Chapter 5 of this EIA Report and shown in Figure 5.4, the site was selected because of the high solar radiation levels of the area (2300 kWh/m^2 per annum or 6.3 kWh/m^2 per day).

[2] Data available online at: http://www.climatedata.eu

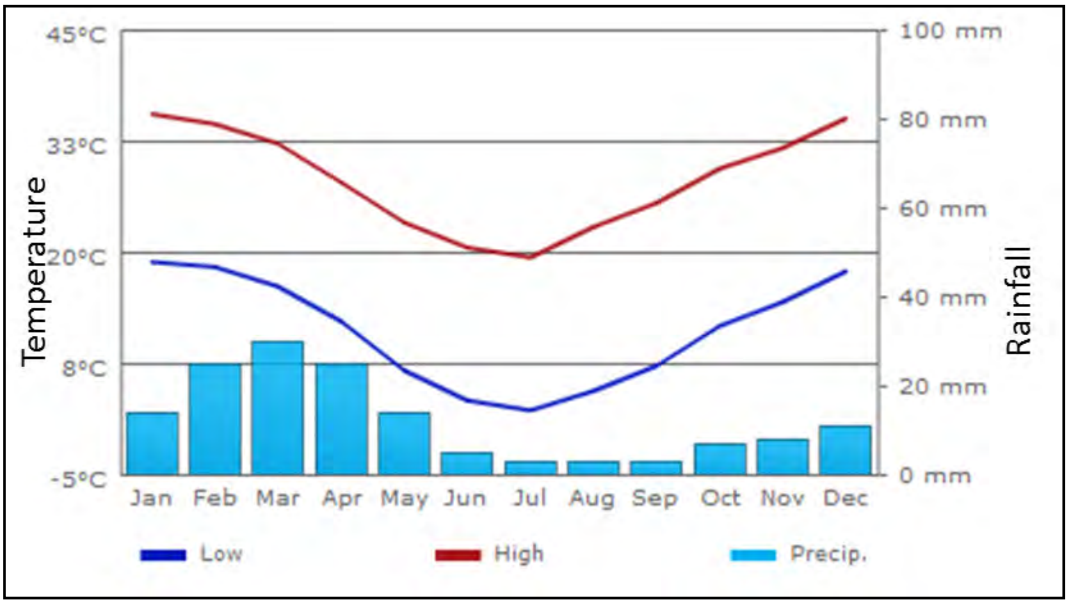

Figure 3.6: Climate chart for Kenhardt showing the monthly maximum and minimum temperatures (lines) and the average rainfall (bars) (Source: Climatedata)

One of the most important climate parameters for agriculture in a South African context is moisture availability, which is the ratio of rainfall to evapotranspiration. Moisture availability is classified into 6 categories across the country (as shown in Table 3.2). The proposed development site falls within class 6 which is described as a very severe limitation to agriculture (Lanz, 2015).

Table 3.2: The classification of moisture availability climate classes for summer rainfall areas across South Africa (Agricultural Research Council, Undated)

Climate class	Moisture availability (Rainfall/0.25 PET)	Description of agricultural limitation
C1	>34	None to slight
C2	27-34	Slight
C3	19-26	Moderate
C4	12-18	Moderate to severe
C5	6-12	Severe
C6	<6	Very severe

The specialist studies included in Chapters 7 to 15 of this EIA Report provide additional details regarding the climatic conditions on site.

3.3.2 Topography and Landscape

The topography of the region is flat with gentle, open undulations (West-East elevations ranging between 936 m and 1000 m, and North-South elevations ranging between 895 m and 1018 m (Holland, 2015). The underlying geology of the sites belongs to the Vyfbeker Metamorphic Suite and represents supracrustal rocks (sediments which have undergone several episodes of metamorphism and deformation) of the Kakamas Terrane (Johnson, Anhaeusser, and Thomas 2006). Erosion resistant rocks of this suite form distinctive low rocky hills that are often visible in the distance, although none occur in the study area. Vegetation consists of low shrubs and grassland with occasional quiver trees (kokerboom), and produces a mottled background to most views which is effective at making some development types such as power lines and pylons blend in with the background (Holland, 2015).

Furthermore, the proposed development site lies across a low ridge that effectively bisects the area into two watersheds (SDP, 2015). Some shallow depressions are also evident arising from the variable sandy ridges that overlie the sandstone - dolerite geology of the area (SDP, 2015). Slopes across the site are almost entirely less than 2% with slightly steeper relief in some isolated spots (Lanz, 2015).

The Kenhardt landscape is arid with brown sand occurring widely being occasionally interspersed with black boulders. Because of the lack of trees in the area, a large number of weaver birds make use of the telegraph poles along the road to build their community nests (GEOSS, 2015).

A description of the geology and vegetation of the region is respectively provided in Section 3.3.3 and Section 3.3.8 of this chapter.

Detailed descriptions of the topography and landscape of the Kenhardt PV 3 site and surrounding regions are provided in the Ecological Impact Assessment (Chapter 7), Visual Impact Assessment (Chapter 8) and Heritage Impact Assessment (Chapter 9).

3.3.3 Regional Geology

The Geological Survey of South Africa (now the Council for Geoscience) has mapped the area at 1:250 000 scale (2920 - Kenhardt). The main geology of the area is listed in Table 3.3. The formations occurring within the study area are indicated in bold (and shaded) in Table 3.3 (GEOSS, 2015).

Table 3.3: Geological Formations within the Study Area

Symbol	Name	Group	Description
Qg	**Gordina Formation**	**Kalahari**	**Wind-blown dunes**
Mks	**Klip koppies granite**	**Keimoes suite**	**Grey, fine to medium grained porphyritic granite**
Mb	Brussel granite		Grey, fine to medium grained porphyritic granite
Me	Elsie se goria granite		Grey, medium grained granite, well-foliated.
Mva	Valsvei	Biesje poort	Yellow weathered, medium grained quarzitic gneiss with lenses of calc-silcate politic gneiss
Msa	Sandputs		Grey to brown, fine grained weather calc-bearing quartzite
Mja	**Jacomyns pan**	**Jacomyns pan**	**Pelitic gneisses with quartzite, leuco-gneiss, amphibolite and calc-silcate rocks.**
Mke	Kenhardt migmatiet	Metamorphic suite	Migmatitic biotite gneiss, amphibolite, leucogneiss and porphyroblastic biotite.

The oldest rocks in the area comprise of metamorphic gneisses (altered granite) which belong to the Jacomyns Pan Formation (Mja). The Jacomyns Pan Formation is also part of the Jacomyns Pan

Group. These rocks mainly occur in the northern and central portion of the study area and are presumed to be bedrock.

The study area is overlain by wind-blown sand (Qg) of the Gordonia Formation. The Gordonia Formation is part of the Kalahari Group (GEOSS, 2015). The stream channels are filled with alluvial material (Slabbert, 1999). Two structural features are indicated as faults on the map sheet trend in a north-west to south-east direction. The structural features cross through the centre of the Kenhardt PV 3 boundary (GEOSS, 2015).

A detailed description of the geology of the region is provided in the Palaeontological Impact Assessment (Chapter 10) and the Geohydrological Assessment (Chapter 11) of this EIA Report.

3.3.4 Soil Types and Soil Potential

All the information on soils and agricultural potential in this chapter has been obtained from the online AGIS, produced by the Institute of Soil, Climate and Water (Agricultural Research Council, undated). A detailed description of the soil types and soil potential within the region is provided in the Soils and Agricultural Potential Assessment (Chapter 12 of this EIA Report).

The land type classification is a nationwide survey that groups areas of similar soil, terrain and climatic conditions into different land types. As noted in the Soils and Agricultural Potential Assessment (Chapter 12 of this EIA Report), the proposed development is located on two land types, Ag6 in the north and the very similar Ag2 in the south. These land types comprise predominantly shallow, red, sands to loamy sands on underlying rock, hard-pan carbonate, or hard-pan dorbank. The soils fall into the arid Silicic, Calcic, and Lithic soil groups according to the classification of Fey (2010). A summary detailing soil data for the land type is provided in Appendix 12.1 of the Soils and Agricultural Potential Assessment (Chapter 12 of this EIA Report). As noted in the Soils and Agricultural Potential Assessment, the land has a low to moderate water erosion hazard, mainly due to the low slope, but it is susceptible to wind erosion because of the sandy texture of the soil (Lanz, 2015).

3.3.5 Agricultural Capability and Sensitivity

A detailed description of the agricultural capability and sensitivity within the region is provided in the Soils and Agricultural Potential Assessment (Chapter 12 of this EIA Report).

As noted in the Soils and Agricultural Potential Assessment, land capability is the combination of soil suitability and climate factors. The area has a land capability classification, on the 8 category scale, of Class 7 - non-arable, low potential grazing land. The limitations to agriculture are aridity and lack of access to water plus the shallow soil depth and rockiness. Because of these constraints, agricultural land use is restricted to low intensity grazing only. The natural grazing capacity is low, at mostly 31-40 hectares per animal unit (Lanz, 2015).

In terms of agricultural sensitivity, the farm is located within a sheep farming agricultural region and there is no cultivation on the farm. Agricultural potential is uniformly low across the farm. No agriculturally sensitive areas occur within the site.

3.3.6 Regional Hydrogeology

A detailed description of the regional hydrogeology of the region is provided in the Geohydrological Assessment (Chapter 11) of this EIA Report. According to the 1:500 000 scale groundwater map of Prieska (2920) the entire study area does host an “intergranular and fractured” aquifer (i.e. wind-blown sands and river alluvium as well as fractures within the bedrock constituting the aquifer) with an average borehole yield of 0.1 L/s to 0.5 L/s (DWAF, 2002)(GEOSS, 2015). This is indicated in Map 4 in Appendix 11.A of the Geohydrological Assessment (Chapter 11 of this EIA Report).

With such low rainfall in the area, and thus associated low groundwater recharge conditions, it is anticipated that the groundwater quality will be poor. The regional 1:500 000 groundwater quality maps (shown in Map 5 in Appendix 11.A of the Geohydrological Assessment (Chapter 11 of this EIA Report)), indicates that the groundwater quality in the southern portion of the study area will be of relatively better groundwater quality. Using Electrical Conductivity (EC) as a groundwater quality indicator, the EC ranges from 70 – 300 mS/m, in these two areas. In terms of domestic supply this is classified as "marginal", it cannot be used for irrigation (unless of very salt tolerant plants) or for the washing down of solar panels as it will most probably leave a salty deposit. In the northern part of the study area, the groundwater quality is even worse and the EC ranges from 300 – 1 000 mS/m. In terms of domestic supply this is "poor" water quality and cannot be used for irrigation or washing down of solar panels as it will most probably leave a salty deposit on the panels (as also noted in Chapter 2 of this EIA Report).

According to the national scale groundwater vulnerability map, which was developed according to the DRASTIC methodology (DWAF, 2005), Kenhardt PV 3 has been classified as "medium" (as shown in Map 6 in Appendix 11.A of the Geohydrological Assessment (Chapter 11 of this EIA Report)).

However this assessment is based on national scale mapping. Based on the local conditions at the study area there is a very low risk of groundwater contamination in this area as the groundwater level is relatively deep (GEOSS, 2015).

3.3.7 Existing Groundwater Data

A search was completed of the National Groundwater Archive database which provides data on borehole positions, groundwater chemistry and yield for the study area. During the Scoping Phase, a search radius of 1 km search was used for the Kenhardt PV 3 site and around the boundary. The National Groundwater Archive database indicated no boreholes within the 1 km search radius (GEOSS, 2015).

In November 2014 GEOSS conducted a hydrocensus on the adjacent farm Boven Rugzeer Remaining Extent of 169, and during the field hydrocensus the locations of the 10 boreholes were identified within the farm portion and three were found within the Transnet servitude (GEOSS, 2015).

The hydrocensus boreholes were found to be dry or to have very low yields (GEOSS 2014). Relevant information regarding borehole yields, borehole and groundwater depths and groundwater quality was also obtained from the land owner. It has been reported that borehole depths are typically between 60 – 120 m deep and fractures occur within the highly metamorphic rocks between two zones of between 15 - 30 m and 100 - 120 m below ground level (GEOSS, 2015). A summary of hydrocensus boreholes and their field chemistry are listed in Table 3.4.

The hydrocensus revealed that the potential for groundwater within the area is very limited and of poor quality and saline. The total dissolved solids within the study area range from 1 200 – 7 780 mg/L and salinity has a range of 840 – 4 700 mg/L. Groundwater is primarily used for livestock and to a limited extent for domestic use (GEOSS, 2015).

Overall, the proposed site for the proposed solar PV project will have a minimal effect on the geohydrology. The study area is located in a highly metamorphic geological setting. Metamorphic rocks rarely produce sufficient groundwater and are considered an effective barrier to groundwater flow. The poor potential for groundwater development is related to the low occurrence of fractured networks within the formations. Fractures bearing groundwater may likely occur near contacts between geological formations or fault/ shear zones (GEOSS, 2015).

A detailed description of the regional groundwater and the vulnerability to surface based contamination is provided in the Geohydrological Assessment (Chapter 11) of this EIA Report.

Table 3.4: Hydrocencus Boreholes (11 - 13 November 2014)

Location	Latitude (WGS84)	Longitude (WGS84)	WL (mbch)	CH (m)	WL (mbgl)	pH	Temp. (°C)	ORP (mV)	EC (mS/m)	TDS (mg/L)	Salinity (mg/L)	Comment
HBH1	-29.2185	21.3701	19.506	0.37	19.136	7.32	17.3	-18	876	7780	4700	Low yield ~0.04 L/s
HBH2	-29.2048	21.39401	-	-	-	7.80	25	-	337.5	1951	-	No Access point for WL
HBH3	-29.1600	21.33626	43	0.3	42.7	-	-	-	-	-	-	Dry, water from seep
HBH4	-29.1226	21.37785	-	-	-	-	-	-	-	-	-	1.2 L/s Transnet BH
HBH5	-29.1233	21.37715	-	-	-	-	-	-	-	-	-	0.6 L/s Transnet BH
HBH6	-29.1498	21.37715	-	-	-	-	-	-	-	-	-	Dry
HBH7	-29.1498	21.31763	-	-	-	7.28	17.4	-17	563	4320	2960	0.08 L/s sample from reservoir
HBH8	-29.1177	21.3320	-	-	-	7.16	17.5	-10	537	4110	2840	0.1 L/s, sample from reservoir
HBH9	-29.1833	21.33219	-	-	-	7.29	17.6	-10	228	1680	1150	Low yield windpump
HBH10	-29.1489	21.32297	-	-	-	-	-	-	-	-	-	Dry
HBH11	-29.1542	21.3288	-	-	-	-	-	-	-	-	-	Dry
HBH12	29.11688	21.3775	-	-	-	7.7	17.4	-43	167.8	1200	840	0.13 L/s windpump no WL access
HBH13	-29.1441	21.35368	-	-	-	-	-	-	-	-	-	Dry

HBH = hydrocensus borehole
WL = water level mbch = metres below collar height mbgl = metres below ground level
CH = collar height m = metres
Temp = temperature
ORP = oxygen reduction potential mV = milliVolts
EC = electrical conductivity mS/m = milliSiemens per metre
TDS = total dissolved solids mg/L = millgrams per metre

3.3.8 Aquatic and Terrestrial Environment

The SANBI BGIS has been used to define the regional vegetation, water resources, faunal and avifaunal and anticipated ecological sensitivity of the study area. A literature review of existing reports, scientific studies, databases, reference works, guidelines and legislation relevant to the study area was conducted to establish the baseline ecological and vegetative condition of the site and associated environment. Details pertaining to the aquatic and terrestrial environment are provided in the Ecological Impact Assessment specialist study (which is included in Chapter 7 of this EIA Report).

3.3.8.1 Aquatic Environment (Surface Water, Drainage, and Wetland Ecosystems)

The Northern Cape is divided into the following four Water Management Areas:

- Lower Orange;
- Upper Orange;
- Olifants/Doorn; and
- Lower Vaal.

The proposed development area falls within the Lower Orange Water Management Area. The Orange River system drains 47 % of South Africa's surface area and is the river supporting the most water uses, including agricultural, mining, industry and municipal.

The National Freshwater Ecosystems Protected Areas (NFEPA) project earmarked several important catchments (sub-quaternaries) based either on the presence of important biota (e.g. rare or endemic fish species) or the degree or lack thereof with regard to riverine degradation, i.e. the greater the catchment degradation the lower the priority to conserve the catchment. The important catchments areas are then classified as Freshwater Ecosystem Protection Areas (FEPAs). No FEPAs are located within the study area or immediately downstream of the study area (SDP, 2015).

Figure 3.7 shows the surface water and drainage associated with the site and the FEPAs in the greater region. A number of surface water drainage features are associated with the development area and these major and minor drainage lines are described in the Ecological Impact Assessment (Chapter 7 of this EIA Report).

Desktop research undertaken by Colloty (2014) for an adjacent proposed solar PV project indicates that the area falls within two quaternary catchments namely D53C and D53B of the Hartbees River. Several main stem rivers are found within these catchments. These tributaries include:

- Rugseers;
- Rooiput se Leegte;
- Nrougas se Loop; and
- Several unknown tributaries.

As shown in Figure 3.2 above, three river systems flow through the remaining extent of the Onder Rugzeer Farm 168 (the project site), which include the Rugseers, Wolfkop se Loop and the Rooiput se Leegte (which is a tributary of the Rugseers river), which lead to the Hartbees River. Drainage consists mainly of dry or ephemeral water courses and the major water courses are tributaries of the Orange River (Holland, 2015). A description of the surface water features that fall within the Kenhardt PV 3 project area is provided in detail in the Ecological Impact Assessment specialist study (Chapter 7 of this EIA Report).

From an aquatic vegetation point of view, the general area is dominated by species associated with the Nama Karoo (Bushmanland Arid Grassland) vegetation ecosystem. These systems are thus usually devoid of any trees with strict riparian or wetland affiliations due to the largely ephemeral nature of the rivers/water courses within the region (Colloty, 2014).

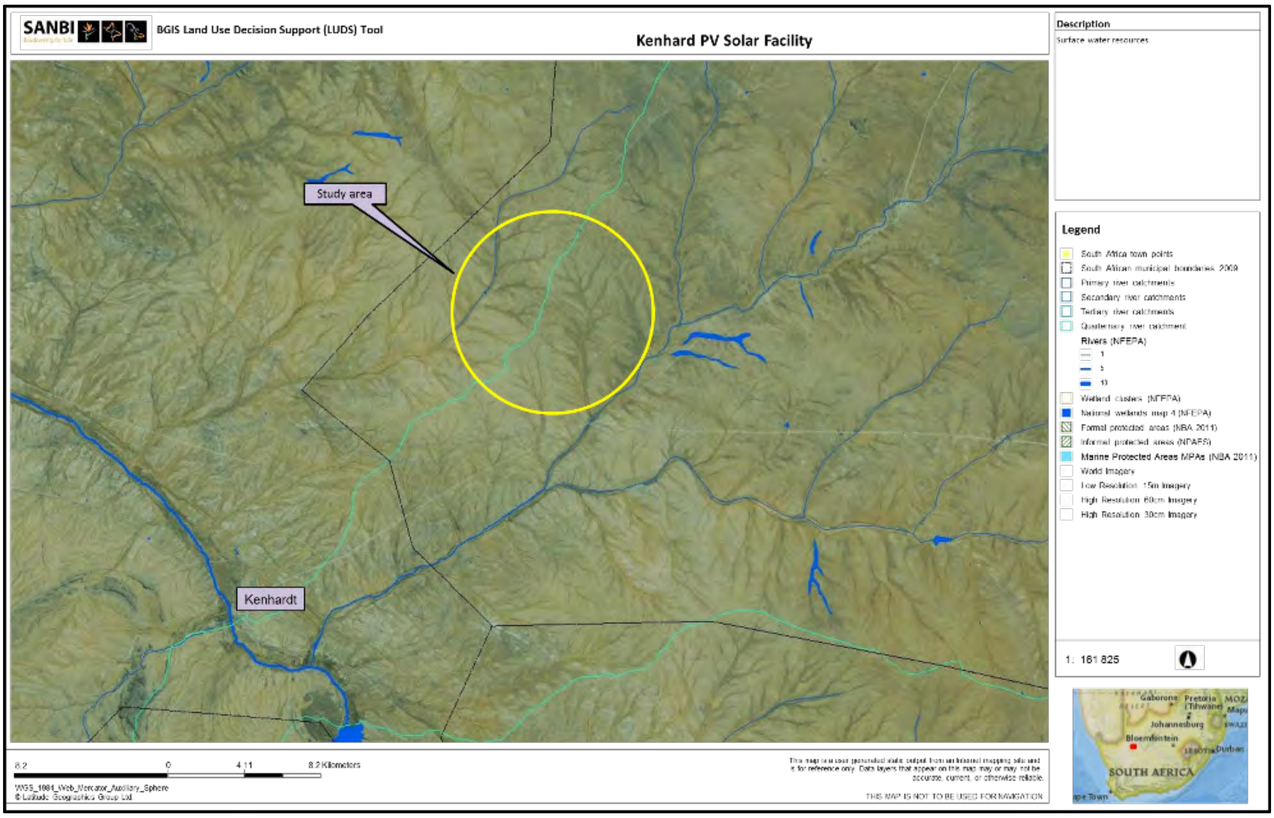

Figure 3.7: Surface Water Drainage and Wetlands (DWA and SANBI, 2015)

3.3.9 Terrestrial Environment

3.3.9.1 General Vegetation Description

The study area is located in the Nama Karoo biome of South Africa. The site falls within the Bushmanland Arid Grassland (Nkb3) vegetation type (Mucina and Rutherford 2006). This vegetation unit is the second most extensive vegetation type in South Africa extending from around Aggeneys in the east to Prieska in the west. It is associated with freely draining alkaline soils common to this area. This vegetation form comprises, under a natural state, primarily of arid grassland dominated by *Aristrida spp* and *Stipagrostis spp* (SDP, 2015).

More than 99% of the original extent of the vegetation type is considered to be remaining intact and as a consequence, its' conservation status is classified as "least threatened" (i.e. this vegetation type is not listed as Threatened Ecosystems under the NEMBA). Mucina and Rutherford (2006) list 6 endemic species for this vegetation type, namely the succulent shrubs *Dinteranthus pole-evansii*, *Larryleachia dinteri*, *L marlothi*, *Ruschia kenhardtensis* and herbs *Lotononis oligocephala* and *Nemesia maxi*. A biogeographically important taxon is *Tridentea dwequensis* (SDP, 2015).

A detailed description of the terrestrial habitat and vegetation that fall within the Kenhardt PV 3 project area is provided in the Ecological Impact Assessment specialist study (Chapter 7 of this EIA Report).

3.3.9.2 Fauna

The fauna that can be expected in the study area (as determined from known distribution records and other studies) are presented in Table 3.5.

Table 3.5: List of Species likely to occur in the Study Area

Common Name	Species Name	Red Data List Category
Mammals		
Black-backed Jackal	*Canis mesomelas*	Least concern
Bat eared fox	*Otocyon megalotis*	Least concern
Namaqua Rock Mouse	*Aethomys namaquensis*	Least concern
Large spotted gennet	*Genetta tigrina*	Least concern
Amphibians		
Tremelo Sand Frog	*Tomopterna cryptotis*	Least Concern
Reptiles		
Verreaux's Tent Tortoise	*Psammobates tentorius*	Not listed
Southern Rock Agama	*Agama atra*	Least concern
Variegated Skink	*Trachylepis variegata*	Least concern

Very few signs of animal activities were noted during the surveys conducted by Envirolution Consulting in November 2013 for the updating of the Eskom Nieuwehoop Substation Construction and Operational Environmental Management Programme (COEMPr)[3]. Evidence was limited to small mammals such as Cape Ground Squirrel (*Xerus inauris*) and runways of the Striped mouse (*Rabdomys pumilio*). As shown in Table 3.5 above, additional species are expected in the greater study area, which has been surveyed during the EIA Phase. The Ecological Impact Assessment specialist study (Chapter 7 of this EIA Report) provides a detailed list of species or evidence of their presence observed on site (during the specialist site visit), as well as the species that are likely to be encountered on site.

3.3.9.3 Avifauna

According to the South African Bird Atlas Project (SABAP2), an average of 182 bird species have been recorded in the greater study area. The study area does not fall within or in close proximity to any Important Birds Areas (IBAs), with the closest being the Augrabies Falls National Park, located over 100 km to the north west of the study area (SDP, 2015).

According to the South African Bird Atlas Project (SABAP2), an average of 182 bird species has been recorded in the greater study area. The study area does not fall within or in close proximity to any Important Birds Areas (IBAs), with the closest being the Augrabies Falls National Park, located over 100 km to the north west of the study area (SDP, 2015). The Ecological Impact Assessment specialist study (Chapter 7 of this EIA Report) provides additional information on avifauna, as well as a detailed list of species observed on site (during the specialist site visit).

3.3.10 Protected Areas

As noted in Section 3.2 above, the site does not fall within any protected areas defined in the NPAES or South African National Parks (NBA). There are no formal protected areas within 20 km of the proposed site (SDP, 2015). The closest NPAESs are the Gariep NPAES, located 30km to the south-east of the site and the Kamiesberg Bushmanland Augrabies NPAES located 43 km north-west of the site. The Augrabies Falls National Park is approximately 115 km north-west of the site.

[3] Report sourced from: mp2mas17.eskom.co.za/tenderbulletin/File_Show.asp?ID=89791

3.3.11 Heritage Profile

3.3.11.1 Palaeontology

The study area for the proposed Kenhardt PV 3 project, located on the Farm Onder Rugzeer 168, is situated within the semi-arid Bushmanland region between c. 950 to 900 m above mean sea level (amsl), with a general slope towards the south. It is drained by a dendritic network of shallow, southwest-flowing tributary streams of the Hartbeesrivier, such as the Rugseersrivier in the south and the Wolfkop se Loop in the north (Almond, 2015).

The geology of the study area is shown on 1: 250 000 geology sheet 2920 Kenhardt (Council for Geoscience, Pretoria) (Figure 3.8). The entire area is underlain at depth by a variety of Precambrian basement rocks (c. 2 billion years old) assigned to the Namaqua-Natal Province. These ancient igneous and high-grade metamorphic rocks (mainly granites and gneisses) crop out at surface as small patches and are entirely unfossiliferous. The Precambrian crustal rocks are transected by a NW-SE trending fault zone and lie to the north of the major Wolfkop Fault. A large proportion of the basement rocks are mantled by a range of superficial sediments of Late Caenozoic age, some of which are included within the Kalahari Group. These predominantly thin, unconsolidated deposits include small patches of calcretes (soil limestones), gravelly to sandy river alluvium, pan sediments along certain watercourses, surface gravels, colluvium (scree) as well as – especially – Quaternary to Recent aeolian (wind-blown) sands of the Gordonia Formation (Kalahari Group). Most of these younger rock units are of widespread occurrence and low palaeontological sensitivity. Scientifically important vertebrate fossil remains (e.g. Pleistocene mammalian bones and teeth) have been recorded within older stratified pan and river sediments in the Bushmanland region where they are often associated with stone artefacts, while a limited range of trace fossils (e.g. plant root casts, termitaria and other invertebrate burrows) may be found within calcrete horizons (Almond, 2015). The PV 3 study area (Figure 3.8, black) is underlain by Precambrian basement rocks of the Keimoes Suite. The basement rocks are largely mantled by aeolian sands of the Gordonia Formation as well as Late Caenozoic alluvial deposits (Almond, 2015).

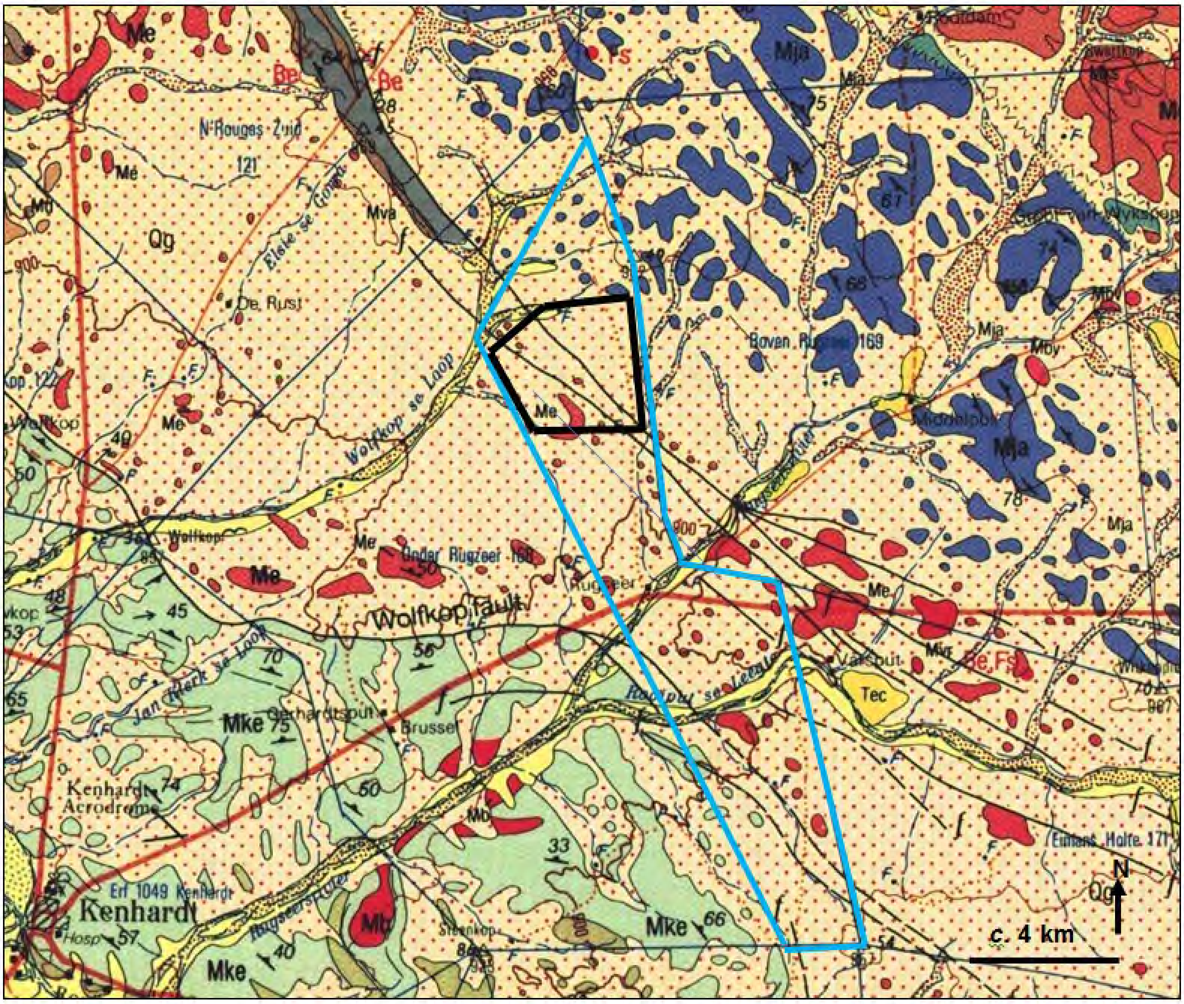

Figure 3.8: Extract from 1: 250 000 scale geological map sheet 2920 Kenhardt (Council for Geoscience, Pretoria) showing the geology of the Scatec Solar PV Facilities study area on Farm Onder Rugzeer 168 situated to the NE of Kenhardt, Northern Cape. The PV 3 study site is approximately indicated by the two black polygon in the north (Almond, 2015)

The main geological units represented within the broader study region include (Almond, 2015):

Precambrian Basement Rocks

- Keimoes Suite
  - Red (Me) = Elsie se Gorra Granite
- Korannaland Supergroup
  - Brown (Mva) = Valsvlei Formation, Biesje Poort Group
  - Grey (Msa) = Sandputs Formation, Biesje Poort Group
  - Blue (Mja) = Sandnoute Formation, Jacomyns Pan Group
- Vyfbeker Metamorphic Suite
  - Pale blue-green (Mke) = Kenhardt Migmatite

Late Caenozoic Superficial Sediments

- Pale yellow with sparse red stipple (Qg) = aeolian sands of the Gordonia Formation (Kalahari Group)
- Pale yellow with dense red stipple = alluvial and pan sediments
- Dark yellow (Tec) = calcrete

A detailed description of the palaeontological features within the study area, along with associated potential impacts of the proposed project, is included in the Palaeontological Impact Assessment (Chapter 10) of this EIA Report.

3.3.11.2 Archaeology

A detailed description of the archaeological features within the study area is included in the Heritage Impact Assessment (Chapter 9) of this EIA Report.

In common with much of Bushmanland, the project area is a flat expanse of relatively flat terrain but with many ephemeral drainage lines visible on aerial photography. Previous work in the area (Orton 2014a, 2014b, 2014c) suggests that vegetation cover is likely to be very sparse with the ground surface openly visible at all times. Aside from the ephemeral stream lines, Kenhardt PV 1 and Kenhardt PV 3 all appear to be free of other landscape features. Kenhardt PV 2 contains a small pan in the north, close to the railway line, while a small rocky outcrop lies just outside and to the east of the layout area (ASHA Consulting, 2015).

In terms of expected heritage resources, Bushmanland is well known for the vast expanses of gravel that occur in places and which frequently contain stone artefacts in varying densities (Beaumont, 1995). Such material is referred to as 'background scatter' and is invariably of very limited significance. At times, however, the scatter can become very dense and mitigation work is occasionally called for. The artefacts located in these contexts are largely Early Stone Age (ESA) and Middle Stone Age (MSA) and are not associated with any other archaeological materials – these would have long since decomposed and disappeared. Previous experience immediately east of the present site suggests that such dense accumulations of artefacts are unlikely to occur in this area (ASHA Consulting, 2015).

Of potentially more significance, however, are Later Stone Age (LSA) sites which are commonly located along the margins of water features in Bushmanland. These features include both pans and ephemeral drainage lines. Such sites were identified to the east of the present study area in association with pans but artefact scatters associated with drainage lines were rare (Orton 2014a, 2014b, 2014c). The drainage lines on the present site, however, are more prominent and perhaps more likely to reveal LSA camp sites. These sites would typically contain mostly stone artefacts, but fragments of ostrich eggshell (used as water containers and also as a food source) and pottery are also found at times, while bone is rare and likely confined to sites that are very recent. Similar LSA sites can also be found in association with rocky outcrops but none appear to occur within the present study area. Because of their positions along water courses and adjacent to rocky areas, such sites are often avoided by development proposals because of the need to avoid the relevant natural features. Despite the increased likelihood of locating archaeology along streams, Morris (2009) noted that a search along the banks of the Hartebees River close to Kenhardt, where he expected elevated frequencies of archaeological material, revealed virtually nothing (ASHA Consulting, 2015).

Another kind of archaeological site fairly commonly encountered in Bushmanland is small rock outcrops that have been quarried as a source of stone material for making stone tools. Several such occurrences were noted to the east where quartz outcrops where frequently flaked (Orton 2014a, 2014b, 2014c). In terms of protected species, if dense stands of quiver trees are present it would be advisable to avoid these as they are an iconic feature of the drylands of north-western South Africa. Based on previous research, there are two quiver tree forests located towards the north, on the Gemsbok Bult Farm (ASHA Consulting, 2015).

The built environment is sparsely represented in Bushmanland because the farms tend to be so large. The vast majority of structures appear to be quite recent in age (20th century) and are of very limited heritage significance. In any case, the development will not affect any buildings.

Graves are also very rare. Some older farms may have small graveyards located close to their farm buildings but, again, these are highly unlikely to be included within the areas proposed for development. Unmarked pre-colonial graves can, in theory, be located anywhere, although they are generally more common in sandy areas where excavation of graves was easier and in more productive areas where population densities would have been higher. It is highly unlikely that pre-colonial graves would be encountered in the study area (ASHA Consulting, 2015).

Although the Anglo-Boer War was fought across the Northern Cape, there is little of significance in the Kenhardt area (ASHA Consulting, 2015). The town was occupied by the Boers early on 25 February 1900 but they surrendered to the British who occupied the town on 31 March 1900 (Grobler, 2004).

3.3.11.3 Cultural and Natural Landscape (i.e. Visual Baseline)

The cultural and natural landscape should also be considered in terms of heritage significance. However, the cultural landscape is very poorly developed in this area with fences, water troughs and wind pumps being the primary features. The natural landscape lacks visually interesting and sensitive features (ASHA Consulting, 2015).

The proposed site for the PV plant is in a remote and sparsely populated region with the nearest town, Kenhardt, more than 10 km from the site. Sheep farming is the major agricultural activity and the sites are located on sheep farming land. The Sishen-Saldanha iron ore railway line traverses the properties on which the proposed plants will be built, and passes within 5 km of the proposed solar plant sites (i.e. Kenhardt PV 1, Kenhardt PV 2, and Kenhardt PV 3). The railway line was recently renovated. The Nieuwehoop Substation, currently under construction, is located on the adjacent Remaining Extent of Portion 3 of Gemsbok Bult Farm Number 120. The cultural landscape is of low value and because of the Sishen-Saldanha Railway and the already approved Eskom Nieuwehoop Substation that will be constructed on the farm. The area therefore lends itself to an industrial character to the immediate landscape (Orton, 2014).

The R27, a major road between Cape Town and Upington, is more than 10 km west of the proposed site. The road is relatively busy and tourists visiting towns along the Orange River valley form part of its users. A secondary road, R383, passes more than 10 km from the site and connects Kenhardt with Marydale. Based on the distance between these roads and the proposed site, it is highly unlikely to be visible to anyone other than local residents making use of the gravel road along the railway line. Solar PV facilities are not very tall and, if an earthy coloured paint is used for the buildings, they can be almost invisible from as little as 1 km away (ASHA Consulting, 2015). Several communication towers are visible in the landscape. There are several buildings within 10 km of the proposed development and it is possible that existing views from these may be affected by the proposed development (Holland, 2015).

3.3.12 Socio-Economic Environment

It must be noted that documented data on the study area, particularly in terms of area specific (i.e. Kenhardt and surrounds) socio-economic data, is very limited. Accordingly, the available data is interpreted in terms of professional opinion and generally accepted trends within the study area and South Africa.

Additional detail regarding the Socio-Economic environment is provided in the Social Impact Assessment, which is included in Chapter 13 of this EIA Report.

3.3.12.1 Demographic Profile

The ZF Mgcawu District Municipality (DM) comprises six Local Municipalities namely: Mier; Kai! Garib; Khara Hais; Tsantsabane, !Kheis and Kgatelopele and is classified as a Category C municipality (Figure 3.9). The ZF Mgcawu DM covers an area of approximately 100 000 km^2 (almost 30 % of the Province) (ZF Mgcawu DM IDP, 2014) and according to the 2011 Census has approximately 236 783 inhabitants.

The actual project footprint (Remaining Extent of Onder Rugzeer Farm 168) is located within the !Kheis Local Municipality. However, the closest urban center, Kenhardt, is located in the Kai !Garib Local Municipality.

A total of 16 703 households resides in the Kai !Garib Local Municipality, with 35 % of households being female headed. The total female population dominates the total male population by 8.5 % (Kai !Garib Draft IDP, 2014). Population of the working age demographic (i.e. 15 to 65 years) makes-up 70.5 % of the population, whereas those below 15 years of age comprise 24.4 % of the population, and the above 65 years age group makes-up 5.1 % of the population of the Kai !Garib Local Municipality. Accordingly, the dependency ratio (i.e. the economically active population vs. the non-economically active population: 24.4 % + 5.1 %) is 29.5 % (du Toit, 2015).

The !Kheis Local Municipality consists of a total of 4146 households, with 34.6 % of households being female headed. Population of the working age demographic (i.e. 15 to 65 years) makes-up 70.5 % of the population, whereas those below 15 years of age comprises 35 % of the population, and the above 65 years age group makes-up 5.1 % of the population (Statistics SA, 2015).

This data is suggestive of an area with a relatively high level of vulnerable people groups (i.e. woman and children) and, potentially, a corresponding high level of vulnerable households.

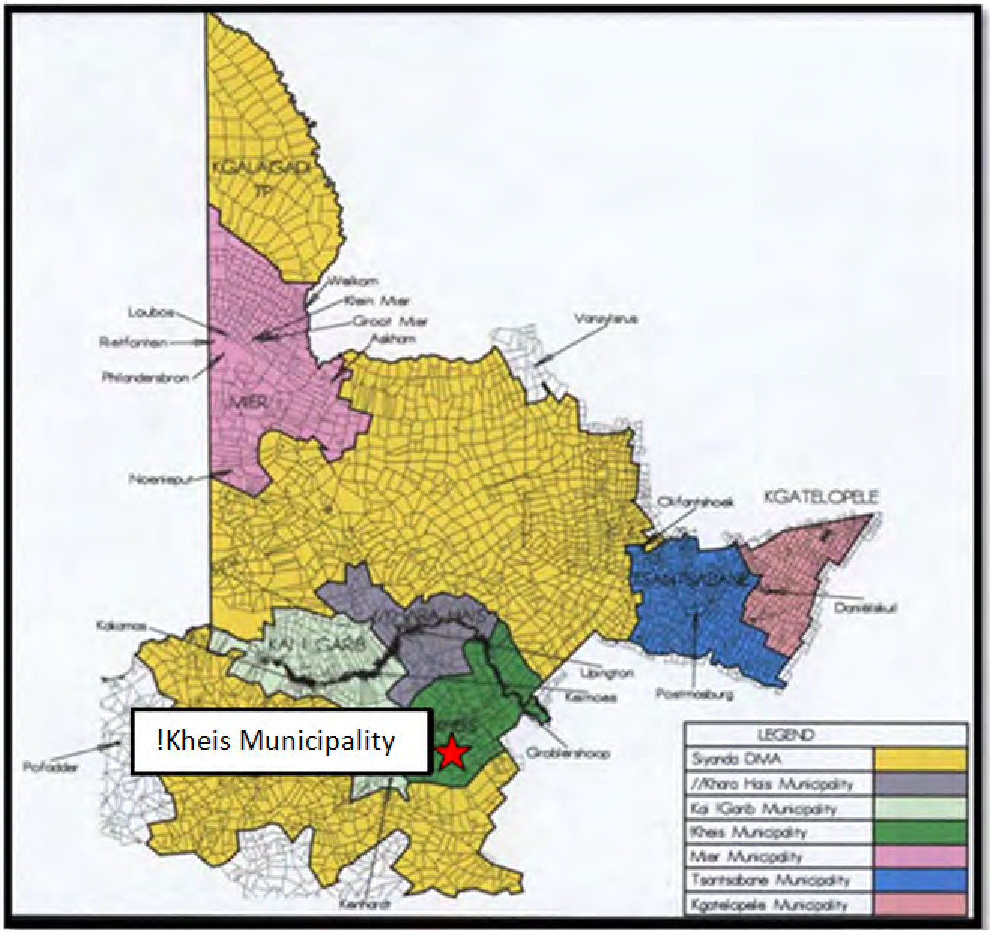

Figure 3.9: Siyanda DM (now known as ZF Mgcawu DM) boundary and boundaries of local municipalities (Siyanda DM IDP, 2013)

The !Kheis Local Municipality, in which the proposed project is located, has a population of 16 637, according to the 2011 Census (Statistics SA, 2015). As shown in Table 3.6, the !Kheis Local Municipality constitutes 8 % of the total population of the ZF Mgcawu DM.

Table 3.6: Population of the Local Municipalities within the ZF Mgcawu DM (Statistics SA, 2011)

Municipality	Census 2001	Census 2011	% of the total population	Difference	Area (Km²)	Persons / Km²
Mier	7207	7003	3%	493	22468	0.3
Kai Garib	58 617	65 869	24%	799	26357	2.1
//Khara Hais	77 919	93 494	42%	25249	21780	4.6
!Kheis	16 538	16 637	8%	2797	11107	1.7
Tsatsabane	27 082	35 093	12%	4018	18330	1.5
Kgatelopele	14 743	18 687	9%	6755	2478	8.7
Total	**202 106**	**236 783**	**100%**	**35903**	**102520**	**2.3**

Afrikaans is the dominant language (76.4 %) and Setswana the second largest language (15.8 %) spoken in the ZF Mgcawu DM. Within the !Kheis Local Municipality 94 % of the population speaks Afrikaans and 1.9 % Setswana. The population of the ZF Mgcawu DM is predominantly Coloured (61.2 %), followed by Black Africans (29.8 %) and Whites (8.3 %), with the !Kheis Local Municipality containing a similar racial population group composition (as shown in Figure 3.10).

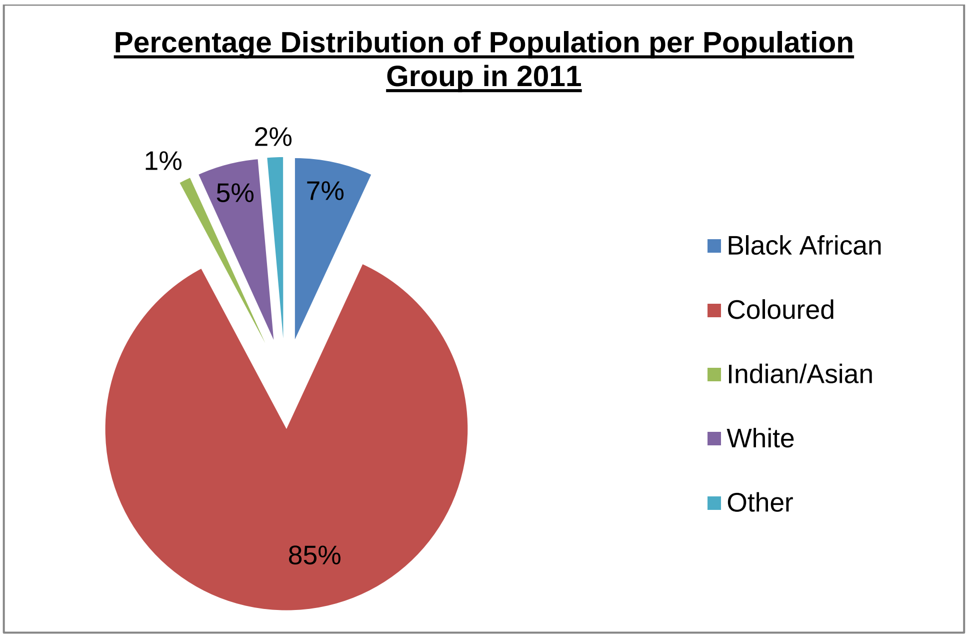

Figure 3.10: Percentage Distribution of Population per Population Group for the !Kheis Local Municipality in 2011 (Statistics South Africa, 2015).

The age distribution of the ZF Mgcawu DM (shown in Figure 3.11 below) is represented by a majority of young people, i.e. persons younger than 40 years old (Statistics SA, 2011).

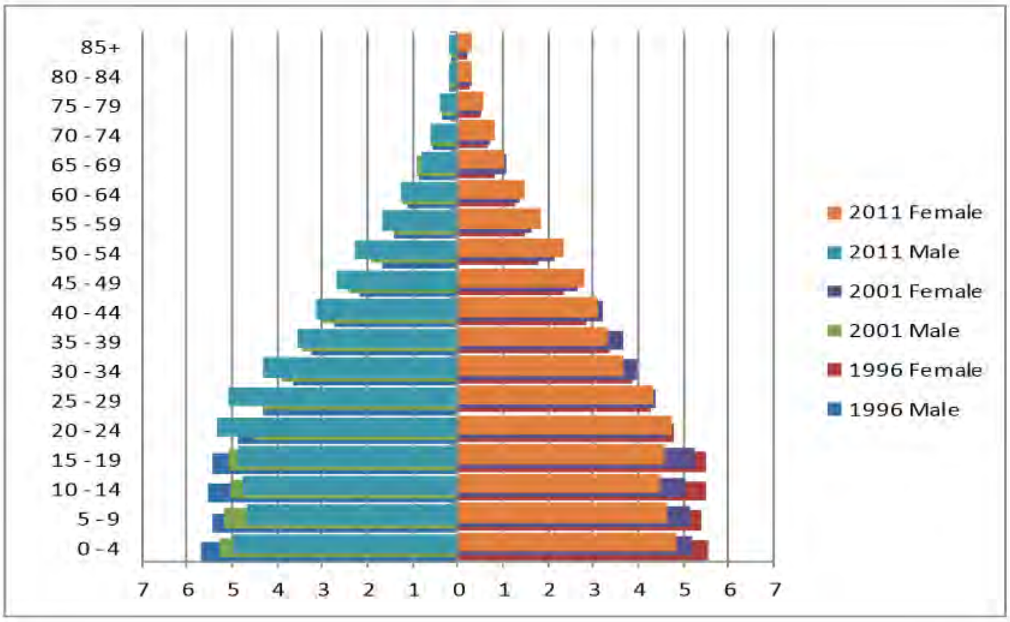

Figure 3.11: Age Distribution of the ZF Mgcawu DM (Statistics South Africa, 2011).

3.3.12.2 Economic Profile

The Northern Cape Province has the third highest per capita income of all nine provinces; however, income distribution is extremely skewed, with a high percentage of the population living in extreme poverty. Approximately 60 % of ZF Mgcawu DM's population has an income of between R 0 to R 800 per month. Approximately 7.7% of the population of the !Kheis Local Municipality has no income, whereas the majority of the population (i.e. 28.30 %) earns between the R 19 601 – R 38 200 income bracket, as shown in Figure 3.12 below.

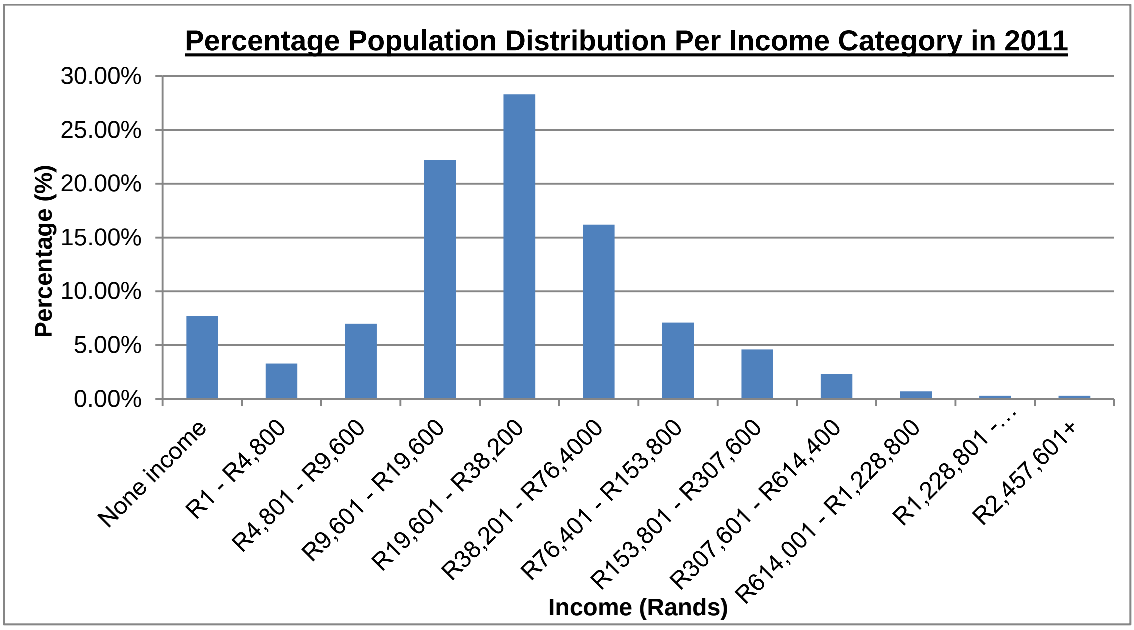

Figure 3.12: Income Distribution of the !Kheis Local Municipality in 2011 (Statistics South Africa, 2015).

The 2011 census indicates that 22 % and 34 % of the economically active population (between the ages of 15-34) in the ZF Mgcawu DM and the !Kheis Local Municipality, respectively, are unemployed. The !Kheis Local Municipality has the highest unemployment percentage of all the local municipalities falling within the ZF Mgcawu DM. Also, nearly a third of the population is economically inactive which suggests that individual and household incomes generated in the study area are being used to support a substantial amount of dependents. This in turn exacerbates the level of household vulnerability in the area.

The unemployment rate for the Kheis Local Municipality in 2001 was 20 % and in 2011 was 28 % (Statistics SA, 2015). The official unemployment rate of 10 % (based on the 2011 Census) has decreased by 6.1 % since the 2001 Census measurement of 16.1 % for the Kai !Garib Local Municipality. The economic sector is dominated by agriculture which provides 51.8 % of jobs, followed by the Community and Government Services sector with 15.9 %. The number of jobs generated by the agricultural sector needs to be interpreted within the context of the Kai !Garib Municipality. The vast majority of the land area occupied by the Kai !Garib Municipality consists of agricultural land, accordingly, it is unsurprising that agriculture would register as the major employer at municipal (i.e. regional) level.

However, the distribution of jobs within urban centers, like Kenhardt, does not necessarily follow this agriculturally dominated pattern. If the prevailing practice of predominantly male-oriented employment within the agricultural sector (specifically in terms of sheep farming) is assumed, the 51.8 % of jobs generated by the agricultural sector could in fact be heavily skewed towards men. This in turn is suggestive of a female dominated population which is heavily dependent on other economic sectors (i.e. non-agricultural sectors) for their income, and could very well imply that socio-economic impacts on urban centers, like Kenhardt, could be of more significance than farm-based impacts.

In terms of education, only 9.5 % of the total population of ZF Mgcawu DM has no formal schooling, while 13.5 % of the !Kheis Local Municipality's population is unschooled. Based on the 2011 Census, 3.1 % of the population of the !Kheis Local Municipality has no form of education, 55 % has some primary schooling, 7.5 % completed primary school, 5.7 % completed secondary school and 0.5 % has higher education, as shown in Figure 3.13 below.

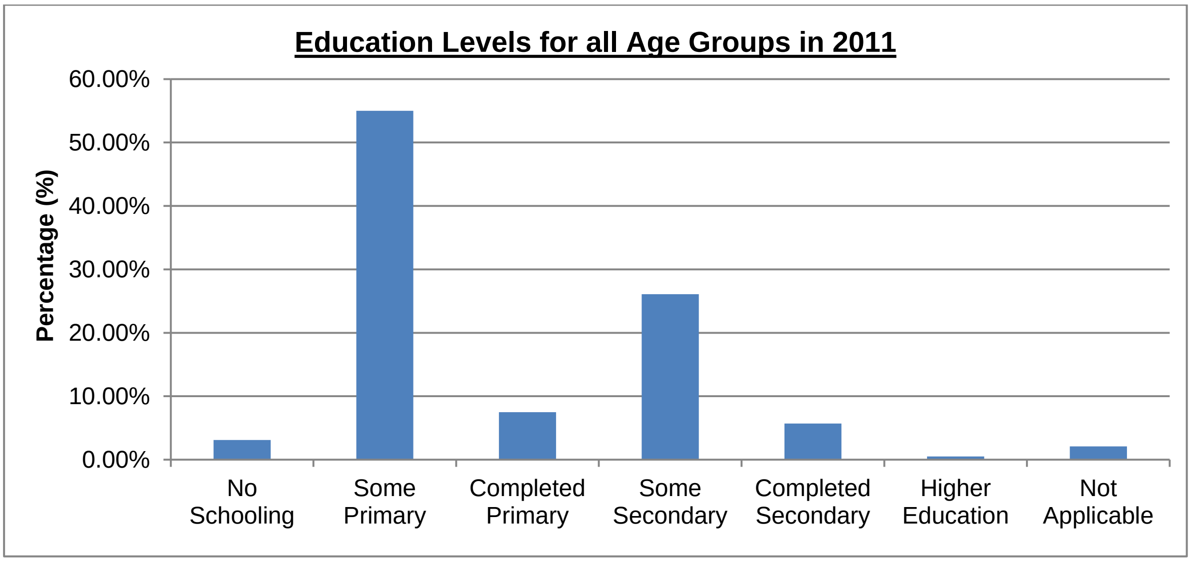

Figure 3.13: Education Levels of the !Kheis Local Municipality in 2011 (Statistics South Africa, 2015).

The economy of the ZF Mgcawu DM is dominated by mining and agriculture and accounts for up to 30 % of the Northern Cape's economy. Agriculture is the major industry in the district, contributing to job creation and economic growth. The region is characterised by livestock farming which occurs mainly on large farms that are managed for extensive production. The majority of these farms are privately owned. According to the !Kheis Local Municipality's IDP, the area is ideal for stock-farming, with the main focus being on sheep farming. The stock-farming industry also provides work to local people.

The ZF Mgcawu DM has a unique landscape that has the potential to contribute to and provide for a range of local and international tourist activities and destinations. The main attractions and destinations in the area are the Augrabies Falls National Park and the Kgalagadi Transfrontier Park. The presence of the Orange River is also a tourism asset providing several tourism opportunities. The natural appearance of the area also supports agricultural tourism. The ZF Mgcawu DM IDP indicates that tourism is one of the most important economic sectors in the Northern Cape as well as within the ZF Mgcawu DM boundaries. Tourism is a growing component of the economy of the Northern Cape and the IDP indicates that, after the agricultural sector, the local tourism industry should become the most important economic activity in the area within the next ten years. This is based on the current growth rate in both development and employment.

EIA REPORT

CHAPTER 4:

Approach to EIA Process and Public Participation

Scoping and **Environmental Impact Assessment** for the Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province

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4 APPROACH TO EIA PROCESS AND PUBLIC PARTICIPATION

This chapter presents the approach to the impact assessment phase of the EIA Process, for the proposed development and gives particular attention to the legal context and guidelines that apply to this EIA, the steps in the Public Participation component of the EIA (in accordance with Regulations 41, 42, 43 and 44 of GN R982), the schedule for the EIA Process, and the Terms of Reference (TOR) for the specialist studies that have been undertaken. The EIA Phase is shaped by the findings of the Scoping Process. For information from the Scoping Phase, including the approach to stakeholder engagement, identification of issues, overview of relevant legislation, and key principles and guidelines that provide the context for this EIA Process, refer to the finalised Scoping Report (CSIR, 2015).

The purpose of the EIA Phase is to:

- Address issues that have been identified through the Scoping Process;
- Assess alternatives to the proposed activity in a comparative manner;
- Assess all identified impacts and determine the significance of each impact; and
- Recommend actions to avoid/mitigate negative impacts and enhance benefits.

The EIA Phase consists of three parallel and overlapping processes:

- Central assessment process through which inputs are integrated and presented in an EIA Report that is submitted for approval to the DEA and other commenting authorities (Sections 4.1, 4.4, and 4.6);
- Undertaking of a PPP whereby findings of the EIA Phase are communicated and discussed with I&APs and responses are documented (Section 4.4);
- Undertaking of specialist studies that provide additional information/assessments required to address the issues raised in the Scoping Phase (Sections 4.8 and 4.9).

The EIA Process is a planning, design and decision making tool used to demonstrate to the responsible authority, DEA, and the project proponent, Scatec Solar, what the consequences of their choices will be in biophysical, social and economic terms. As such it identifies potential impacts (negative and positive) that the project may have on the environment. The EIA makes recommendations to mitigate negative impacts and enhance positive impacts associated with the proposed project.

4.1 Overview of Approach to Preparing the EIA Report and EMPr

The objectives of the EIA Phase are noted in Chapter 1 of this EIA Report. The results of the specialist studies and other relevant project information for the Kenhardt PV 3 project have been included in this Report (Chapters 7 to 15). Chapter 16 of this EIA Report includes a summary of the findings, the overall conclusions and the recommendations. The EIA Report is currently being released for a 30-day I&AP and authority review period, as outlined in Section 4.4. All registered I&APs on the project database have been notified in writing of the release of the EIA Report for review.

In the Scoping Report it was proposed to potentially hold a public meeting during the 30-day comment period for the EIA Report, if warranted, and if there was substantial public interest. However, due to the limited public input and/or interest in the proposed project, this was not deemed necessary. Comments raised during the review of the EIA Report, through written correspondence (emails, comments, forms), will be captured in a Comments and Responses Trail for inclusion in the EIA Reports that will be submitted to the DEA for decision-making in terms of Regulation 23 (1) (a) of the 2014 EIA Regulations. Comments raised will be responded to by the EIA team and/or the applicant. These responses will indicate how the issue has been dealt with in the

EIA Process. Should the comment received fall beyond the scope of this EIA, clear reasoning will be provided.

As previously noted, the EIA Report includes an EMPr (Part B of this EIA Report), which has been prepared in compliance with the relevant regulations (i.e. Appendix 4 of the 2014 EIA Regulations). This EMPr is based broadly on the environmental management philosophy presented in the ISO 14001 standard, which embodies an approach of continual improvement. Actions in the EMPr are drawn primarily from the management actions in the specialist studies for the construction and operational phases of the project. If the project components are decommissioned or re-developed, this will need to be done in accordance with the relevant environmental standards and clean-up/remediation requirements applicable at the time.

4.2 Legal Context for this EIA

Section 24(1) of the NEMA states:

- *"In order to give effect to the general objectives of integrated environmental management laid down in this Chapter, the potential impact on the environment of listed activities must be considered, investigated, assessed and reported to the competent authority charged by this Act with granting the relevant environmental authorization."*

The reference to "listed activities" in Section 24 of the NEMA relates to the regulations promulgated in GN R982, R983, R984 and R985 in Government Gazette 38282, dated 4 December 2014, which came into effect on 8 December 2014. The relevant Government Notices published in terms of the NEMA collectively comprise the NEMA EIA Regulations listed activities that require either a Basic Assessment, or Scoping and EIA (that is a "full EIA") be conducted. As noted in Chapter 1 of this EIA Report, the proposed project requires a full EIA, as it particularly includes, *inter alia*, the inclusion of Listed Activity Number 1 in GN R984:

- *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs within an urban area".*

All the listed activities potentially forming part of this proposed development and therefore requiring EA were included in the Application Form for EA that was prepared and submitted to the DEA on 30 September 2015 together with the Scoping Report. Refer to Appendix E of this EIA Report for the proof of submission of the Application Forms to the DEA (i.e. courier waybills). As noted in Chapter 1 of this EIA Report, the DEA acknowledged receipt of the Scoping Report and Application for EA on 26 October 2015 via email (as shown in Appendix I.2 of this EIA Report). DEA EIA Reference Number: 14/12/16/3/3/2/836 was assigned to the Kenhardt PV 3 project. A copy of the Application Form for the Kenhardt PV 3 project and the letter of acknowledgement from the DEA have been respectively included in Appendix H and Appendix I.2 of this EIA Report.

As noted in Chapter 1 of this EIA Report, the DEA accepted the finalised Scoping Report and Plan of Study for EIA on 8 December 2015 (as shown in Appendix I.4 of this EIA Report). As part of the acceptance of the finalised Scoping Report and Plan of Study for EIA, the DEA requested some clarification in terms of certain the listed activities included in the Application for EA and the finalised Scoping Report (as shown in Appendix H of this EIA Report). Table 4.1 shows the requirements from the DEA in terms of the applicable listed activities, as well as the corresponding responses from the EAP.

Table 4.1: Listed Activities in GN R982 and GN R983 that potentially form part of the proposed Kenhardt PV 3 project

DEA Requirement (as noted in the Acceptance of the Scoping Report and Plan of Study for EIA)	CSIR Response
Clarity must be provided regarding GN R983 Listed Activity 9 (i) or (ii) and GN R983 Listed Activity 10 (i) or (ii). An amended Application for EA must be submitted.	The proposed project will entail the construction of stormwater channels or pipelines only. However, water pipelines will no longer be required for the proposed project. It was noted in the Scoping Report that water pipelines may need to be constructed in order to transfer groundwater from existing boreholes to the proposed solar facility. During the Scoping Phase, the Project Applicant intended to make use of existing boreholes to source groundwater (if available and if suitable) for the solar panel cleaning process. It was further noted in the Scoping Report and Application for EA that the Geohydrological Assessment (undertaken during the EIA Phase) will confirm whether the groundwater is sufficient and suitable for use. However, the Geohydrological Assessment (Chapter 11 of this EIA Report) recommends that the groundwater is not suitable for use during the construction and operational phase. Therefore, water pipelines will not need to be constructed in order to transfer groundwater from existing boreholes to the proposed solar facility. As a result, water will therefore be sourced from the municipality. Approximately 5 to 10 tanks will be provided on site for the storage of municipal water during the construction and operational phase. The tanks will have a capacity of 10 000 liters each. As a result, Activity 9 (i) and (ii) of GN R983 is no longer applicable in terms of the construction of water pipelines. Furthermore, in terms of stormwater infrastructure, at this stage of the design it is understood that the stormwater infrastructure will cover an approximate length of 1000 m. However, the stormwater infrastructure will not have an internal diameter of more than 0.36 m, and it will not have a peak throughput of more than 120 l/s. Therefore Activity 9 (i) and (ii) of GN R983 is no longer applicable in terms of the construction of stormwater infrastructure. Therefore, Activity 9 (i) and (ii) of GN R983 will need to be removed from the Application for EA. An amended Application for EA will be submitted to the DEA together with the finalised EIA Report for decision-making. The same applies to Activity 10 (i) and (ii) of GN R983 in terms of infrastructure for the transportation of sewage and effluent. At this stage of the design it is understood that the sewage infrastructure will cover an approximate length less than 1000 m, and it will not have an internal diameter of more than 0.36 m, or a peak throughput of more than 120 l/s. Therefore Activity 10 (i) and (ii) of GN R983 is no longer

DEA Requirement (as noted in the Acceptance of the Scoping Report and Plan of Study for EIA)	**CSIR Response**
	applicable in terms of the construction of stormwater infrastructure. Notwithstanding the above, it is important to note that the impact of the construction and operation of the proposed project (inclusive of all infrastructural components) is assessed in the specialist studies, as included in Chapters 7 to 14 of this EIA Report. For example, the Ecological Impact Assessment (Chapter 7 of this EIA Report assesses the potential impact of proposed alteration of surface drainage patterns on account of construction activities leading to change in plant communities and general habitat structure within the site and immediately adjacent areas. This impact is rated with a low significance without mitigation measures and very low significance with the implementation of mitigation measures. The Ecological Impact Assessment also assesses the potential impact of the alteration of ecological processes due to the exclusion of certain fauna, which is inherent to the functional state of the land within the proposed PV facility. This operational phase direct impact is rated with a low significance, with the implementation of mitigation measures. The Visual, Heritage, Palaeontological, Geohydrological, Soils and Social Impact Assessment specialist studies also provide additional impact assessments relating to the construction and operation of the proposed facility.
The EIA Report must include the following: GN R983 Listed Activity 19: With regards to infilling and excavation of watercourses for the construction of the PV Solar Energy Facility, this Department requires the applicant to provide an indication of the preferred and alternative locations from which material the material used for infilling will be sourced and where excavated material will be stored and/or disposed of. In addition, the impacts associated with this must be adequately assessed in the EIA Report.	The proposed project may entail the excavation, removal and moving of possibly more than 5 m^3 of soil, sand, pebbles or rock from the nearby minor drainage lines/watercourses. The proposed project may also entail the infilling of more than 5 m^3 of material into the nearby minor drainage lines/watercourses. This infilling and excavation of the material will occur as a result of the construction of the internal gravel road, as well as the widening of the unnamed farm road to gain access to the site. The Ecological Impact Assessment undertaken as part of the EIA Process has identified major drainage lines on site (such as the Wolfkopseloop River and major drainage features that serve the Wolfkopseloop (i.e. tributaries)). The Ecological Impact Assessment has recommended a 32 m buffer around the major drainage lines. However, the Ecological Impact Assessment also identified various minor drainage lines that occur within the Kenhardt PV 3 area (which do not need to be avoided based on the findings of the Ecological Impact Assessment). Therefore, activities associated with the construction of the proposed project (as noted above, i.e. construction of the gravel road and the widening of the unnamed farm road to gain access to the site etc.) may result in infilling and excavation of material within the minor drainage lines.

DEA Requirement (as noted in the Acceptance of the Scoping Report and Plan of Study for EIA)	CSIR Response
	In terms of providing an indication of the preferred and alternative locations from which material the material used for infilling will be sourced and where excavated material will be stored and/or disposed of, refer to the site layout plan shown in Appendix J of this EIA Report, which explains that cut and fill areas and spoil heap locations and details will be confirmed at design stage. In terms of the locations where the excavated material will be stored and/or disposed of, this will be required for the widening of the access road, which is indicatively shown the preliminary site layout plan in Chapter 16 and Appendix J of this EIA Report. Notwithstanding the above, it is expected that the widening of the unnamed farm road will result in crossings of major and minor drainages lines on site. The details of these crossings will be determined during the detailed design phase.
It is noted that no activity under GN R985 is being applied for. However, should they at a later stage be found to be applicable, an amended application form as well as written comments must be obtained and submitted to this Department confirming their applicability to the proposed development. In addition, a graphical representation of the proposed development within the respective geographical areas must be provided.	The proposed project only triggers one listed activity within GN R985 (refer to the explanation below), however this is based on a distance of 100 m from a major drainage line, and none of the other geographical areas. Based on the sensitivity screening undertaken for the site, the proposed project area does not fall within any threatened ecosystems, National Protected Areas, National Protected Area Expansion Strategy Focus Areas or areas of conservation planning. The closest protected area is approximately 113 km away from the proposed project site. An Ecological Support Area (i.e. a buffer around the Hartbees River) is located approximately 14 km west of proposed project as part of the Namakwa District Biodiversity Sector Plan. Furthermore, there is no conservation plan for the !Kheis Local Municipality and the ZF Mgcawu District Municipality, hence Critical Biodiversity Areas are not present or defined. Therefore, most of the listed activities relating to specific geographic areas contained in GN R985 of the 2014 NEMA EIA Regulations do not apply to the proposed project at this stage. This is also confirmed in the Ecological Impact Assessment (Chapter 7 of this EIA Report), which states overall, the proposed project site is not located within any protected areas, or within 5 km of a protected area, or within 10 km of a World Heritage site. Furthermore, the proposed project site does not fall within a Critical Biodiversity Area or within any expansion area in terms of a conservation strategy for the Northern Cape.

The DEA also requested, as part of the acceptance of the finalised Scoping Report, that the EIA Report must provide an assessment of the impacts and mitigation measures for each of the listed activities applied for, and that the listed activities represented in the EIA Report and Application for EA must be the same and correct. As noted above, certain listed activities are no longer applicable to the proposed project and therefore need to be removed from the original Application for EA. On the other hand, Activity 56 (i) of GN R983 and Activity 18 (a) (ii) (ii) of GN R985, have become applicable to the proposed project (i.e. triggered by the proposed project, as a result of the design progression).

Activity 56 (i) of GN R983 and Activity 18 (a) (ii) (ii) of GN R985 are triggered by the proposed project as a result of the access road to site and the need for it to be widened. As noted in Chapter 2 of the EIA Report, in terms of access, the proposed project site can be accessed via an existing gravel road (an unnamed farm road) and the existing Transnet Service Road (private). Both access routes are considered and included in the proposed project. The Transnet Service Road and unnamed farm road are both 7-8 m wide, however in certain sections, the unnamed farm road is believed to be about 2-3 m wide. Discussions are being held with Transnet and the Project Applicant regarding the potential use of the Transnet Road and associated specific requirements. However, should the Transnet Service Road not be used for access, then the unnamed farm gravel road will be used. This farm road, however, will need to be widened by more than 6 m (where required). Both these impacts have been assessed in the EIA Phase, as explained below.

Therefore, in order to ensure that the listed activities presented in the EIA Report and the Application for EA are the same, an amended Application for EA will be submitted to the DEA together with the submission of the finalised EIA Report for decision-making. The listed activities that are triggered by the proposed project are indicated in Table 4.2. Table 4.2 also shows the sections in the EIA Report where the triggered listed activity is assessed.

Table 4.2: Listed Activities in GN R983, R984 and GN R985 that potentially form part of the proposed Kenhardt PV 3 project

Listed Activity Number	Listed Activity Description	Description of the project activity that potentially triggers the relevant listed activity	Reference to were the activity is assessed in the EIA Report
GN R983			
Activity 12 (x) and (xii)	The development of: (x) buildings exceeding 100 square metres in size; (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- a) within a watercourse; b) in front of a development setback; or c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding- (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; or (ee) where such development occurs within existing roads or road reserves.	The proposed solar PV facility will be constructed on the remaining extent of Onder Rugzeer Farm 168, approximately 80 km south of Upington and 30 km north-east of Kenhardt within the !Kheis Local Municipality, Northern Cape Province. Hence the proposed project will take place outside of an urban area. The proposed 75 MW Solar PV facility will entail the construction of building infrastructure and structures (such as the solar field, offices, workshop/warehouse, ablution facilities, operational and maintenance control centre, on-site substation, laydown area and security enclosures, as well as the widening of the access road etc.). As shown in Chapter 2 of this EIA Report, the offices, workshop/warehouse, operational and maintenance control centre, on-site substation building and inverter stations will exceed an area of 100 m^2. It is estimated that the total area required for the proposed building structures is 1500 m^2. The on-site substation will also cover an approximate area of 20 000 m^2. This constitutes buildings and infrastructure with a physical footprint of more than 100 m^2. It was noted in the Scoping Report that based on the preliminary sensitivity screening undertaken for the site, the buildings and infrastructure are expected occur within 32 m of the watercourses on site (i.e. the minor drainage lines). This has been confirmed in the Ecological Impact Assessment specialist study (included in Chapter 7 of this EIA Report), which identified major drainage lines on site (such as the Wolfkopseloop	As noted in the Ecological Impact Assessment (Chapter 7 of this EIA Report), the Wolfkopseloop is a drainage feature that lies to the north of the site and inundated on an intermittent basis (periods greater than a year), and forms the most significant surface feature in the vicinity. The Kenhardt PV 3 area forms part of the immediate catchment surrounding the Wolfkopseloop River. Major drainage features also serve the Wolfkopseloop. A buffer of 32 m has been applied to Wolfkopseloop drainage feature and the three tributaries that serve it, where it intersects with the project area. Wolfkopseloop drains into the Hartebees River, which in turn serves the Sout River and Orange River systems. The Rugseers River also flows through the remaining extent of Onder Rugzeer Farm 168. Other minor drainage features are noted within the subject site. The Ecological Impact Assessment (Chapter 7 of this EIA Report) also explains that minor drainage lines are of less significance, but should be given consideration, where they may intersect with the development footprint of the proposed solar PV facility. However, these morphological features do not have to be avoided. The impact of constructing buildings, structures and infrastructure associated with the Kenhardt PV 3 area are assessed in the Ecological Impact Assessment (Chapter 7 of this EIA Report).

Listed Activity Number	Listed Activity Description	Description of the project activity that potentially triggers the relevant listed activity	Reference to were the activity is assessed in the EIA Report
		River, Rugseers River and the major drainage features that serve these rivers (i.e. tributaries)). The Ecological Impact Assessment has recommended a 32 m buffer around the major drainage lines within the Kenhardt PV 3 area. No construction will occur within 32 m of the major drainage lines as recommended in the Ecological Impact Assessment. However, the assessment also identified various minor drainage lines that occur with the Kenhardt PV 3 area which do not need to be avoided. Therefore, infrastructure associated with the proposed project including the widening of the access road may occur within the minor drainage lines or within 32 m of the edge of the minor (and major) drainage lines.	
Activity 19 (i)	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from – (i) a watercourse; (ii) the seashore; or (iii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater, but excluding where such infilling, depositing, dredging, excavation, removal or moving- a) will occur behind a development setback; b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or c) falls within the ambit of activity 21 in this	The proposed project may entail the excavation, removal and moving of more than 5 m^3 of soil, sand, pebbles or rock from the nearby watercourses. The proposed project may also entail the infilling of more than 5 m^3 of material into the nearby watercourses. The Ecological Impact Assessment specialist study (included in Chapter 7 of this EIA Report), identified major drainage lines on site (such as the Wolfkopseloop River, Rugseers River and major drainage features that serve these rivers (i.e. tributaries)). The Ecological Impact Assessment has recommended a 32 m buffer around the major drainage lines within the Kenhardt PV 3 area. No construction will occur within 32 m of the major drainage lines as recommended in the Ecological Impact Assessment. However, the assessment also identified various minor drainage lines that occur with the Kenhardt PV 3 area which do not need to be avoided. Therefore, construction of	The impact of the proposed Kenhardt PV 3 solar facility is assessed in the Ecological Impact Assessment (Chapter 7 of this EIA Report).

Listed Activity Number	Listed Activity Description	Description of the project activity that potentially triggers the relevant listed activity	Reference to were the activity is assessed in the EIA Report
	Notice, in which case that activity applies.	the internal gravel roads and/or the construction of infrastructure within the minor drainage lines may require the removal of material from or the infilling of material into the minor drainage lines. The Ecological Impact Assessment also notes that despite the minor drainage lines not requiring avoidance, it would be best for the design of the proposed solar PV facility to note the presence of these minor features and avoid establishing structures such as transformers, buildings and other permanent and significant structures within them. If necessary, it would be best to incorporate the minor drainage lines into the solar arrays.	
Activity 24 (ii)	The development of – (ii) a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding – a) roads which are identified and included in activity 27 in Listing Notice 2 of 2014; or b) roads where the entire road falls within an urban area.	Existing roads (such as a private Transnet Service Road or an unnamed farm road) will be used to gain access to the preferred site. The Transnet Service Road can be accessed from the R27 and the farm road can be accessed from the R383 Regional Road also via the R27 National Road. An internal gravel road may be constructed from either the Transnet Service Road or the unnamed farm road to the proposed project site. The internal gravel road is not expected to exceed 6 m in width (it is expected be approximately 4 m wide). An approximately 2.5 m wide perimeter road will also be constructed within the fenced area of the plant. The length of the internal gravel road will be confirmed as the location, design and layout of the facility progresses. However, at this stage of the design it is estimate that the internal gravel road and the perimeter road will extend 2000 m in length. The proposed solar PV facility will be constructed on the remaining extent of Onder Rugzeer Farm 168, approximately 80 km south of	The impact of the construction of the proposed roads is assessed in the specialist studies, as included in Chapters 7 to 14 of this EIA Report.

Listed Activity Number	Listed Activity Description	Description of the project activity that potentially triggers the relevant listed activity	Reference to were the activity is assessed in the EIA Report
		Upington and 30 km north-east of Kenhardt within the !Kheis Local Municipality, Northern Cape Province. Hence the proposed project will take place outside of an urban area.	
Activity 28 (ii)	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture 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; excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.	The proposed project will take place on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt in the Northern Cape. It is understood that the land is currently used for agricultural purposes (mainly grazing). The proposed 75 MW solar PV facility (i.e. Kenhardt PV 3), which is considered to be a commercial/industrial development, will have an estimated footprint of approximately 250 ha (i.e. more than 1 ha). The Kenhardt PV 1, PV 2 and PV 3 proposed projects will have a collective footprint of approximately 750 ha.	The impact of the footprint of the proposed PV facility is assessed in the specialist studies, as included in Chapters 7 to 14 of this EIA Report. The Soils and Agricultural Potential Assessment (included in Chapter 12 of the EIA Report) also addresses the current use of the land and its potential for agricultural use.
Activity 56 (i)	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre: (i) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.	In terms of access, the proposed project site can be accessed via an existing gravel road (an unnamed farm road) and the existing Transnet Service Road (private). Both access routes will be considered and included in the proposed project. The R27 extends from Keimoes (in the north) to Vredendal in the south. The R27 is 6 m wide and falls within a 45 m road reserve. This National Road is designed for minimum daily traffic exceeding 1000 vehicle units. The Transnet Service Road can be accessed from the R27. The existing gravel road (an unnamed farm road) can be accessed from the R383 Regional Road also via the R27 National Road. The Transnet Service Road and unnamed farm road are both 7-8 m wide, however in certain sections, the unnamed farm road is believed to be about 2-3 m wide. Discussions are being held with Transnet and the Project Applicant regarding the potential use of the Transnet Road and associated specific	The impact of the footprint of the proposed PV facility is assessed in the specialist studies, as included in Chapters 7 to 14 of this EIA Report.

Listed Activity Number	Listed Activity Description	Description of the project activity that potentially triggers the relevant listed activity	Reference to were the activity is assessed in the EIA Report
		requirements. However, should the Transnet Service Road not be used for access, then the unnamed farm gravel road will be used. This farm road, however, will need to be widened by more than 6 m (where required). The proposed project will take place approximately 80 km south of Upington and 30 km north-east of Kenhardt within the !Kheis Local Municipality, Northern Cape Province. Hence the proposed project will take place outside of an urban area.	
GN R984			
Activity 1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs within an urban area.	The proposed project will entail the construction of a 75 MW Solar PV facility (i.e. facility for the generation of electricity from a renewable resource). The proposed project will be constructed on the remaining extent of Onder Rugzeer Farm 168, approximately 80 km south of Upington and 30 km north-east of Kenhardt within the !Kheis Local Municipality, Northern Cape Province. Hence the proposed project will take place outside of an urban area.	The impact of the footprint of the proposed PV facility is assessed in the specialist studies, as included in Chapters 7 to 14 of this EIA Report.
Activity 15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for: (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	The proposed 75 MW solar PV facility (i.e. Kenhardt PV 3) will have an estimated footprint of approximately 250 ha. The Kenhardt PV 1, PV 2 and PV 3 proposed projects will have a collective footprint of approximately 750 ha. As a result, more than 20 ha of indigenous vegetation could possibly be removed for the construction of the proposed Solar PV facility.	The impact of the footprint of the proposed PV facility on terrestrial ecology is assessed in the Ecological Impact Assessment (Chapter 7 of the EIA Report).
GN R985			
Activity 18 (a) (ii) and (ii)	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. In Free State, Limpopo, Mpumalanga and	In terms of access, the proposed project site can be accessed via an existing gravel road (an unnamed farm road) and the existing Transnet Service Road (private). Both access routes will	The impact of the footprint of the proposed PV facility on terrestrial ecology is assessed in the Ecological Impact Assessment (Chapter 7 of the EIA Report).

Listed Activity Number	Listed Activity Description	Description of the project activity that potentially triggers the relevant listed activity	Reference to were the activity is assessed in the EIA Report
	Northern Cape provinces: (ii) outside urban areas and 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.	be considered and included in the proposed project. The R27 extends from Keimoes (in the north) to Vredendal in the south. The R27 is 6 m wide and falls within a 45 m road reserve. This National Road is designed for minimum daily traffic exceeding 1000 vehicle units. The Transnet Service Road can be accessed from the R27. The existing gravel road (an unnamed farm road) can be accessed from the R383 Regional Road also via the R27 National Road. The Transnet Service Road and unnamed farm road are both 7-8 m wide, however in certain sections, the unnamed farm road is believed to be about 2-3 m wide. Discussions are being held with Transnet and the Project Applicant regarding the potential use of the Transnet Road and associated specific requirements. However, should the Transnet Service Road not be used for access, then the unnamed farm gravel road will be used. This farm road, however, will need to be widened by more than 6 m (where required). The Ecological Impact Assessment undertaken as part of the EIA Process has identified major drainage lines on site (such as the Wolfkopseloop River and major drainage features that serve the Wolfkopseloop (i.e. tributaries)). The Ecological Impact Assessment has recommended a 32 m buffer around the major drainage lines. However, the Ecological Impact Assessment also identified various minor drainage lines (which do not need to be avoided based on the findings of the Ecological Impact Assessment). Therefore, the proposed gravel road widening may occur within 100 m of the edge of the minor and major drainage lines.	

Listed Activity Number	Listed Activity Description	Description of the project activity that potentially triggers the relevant listed activity	Reference to were the activity is assessed in the EIA Report
		The proposed project will take place approximately 80 km south of Upington and 30 km north-east of Kenhardt within the !Kheis Local Municipality, Northern Cape Province. Hence the proposed project will take place outside of an urban area.	

Notes regarding the identification of potential listed activities:

- It is proposed that less than 30 m^3 of dangerous goods (such as petrol and diesel) will be temporarily stored on site during the construction phase. Furthermore, no infrastructure or structures are planned to be specifically constructed for the aforementioned temporary storage. Recommendations for the temporary storage of petrol and diesel on site during the construction phase have been provided in the EMPr (Part B of the EIA Report).
- The relevant listed activities applicable to the construction of the proposed transmission lines and associated electrical infrastructure at the Eskom Nieuwehoop Substation are included in the separate BA Reports and the Applications for EA for the BA Processes. As mentioned previously, the Applications for EA for the BA Processes have been lodged with the DEA (together with the submission of the EIA and BA Reports for comment), in order to comply with the timeframes stipulated in Regulation 19 (1) of GN R982.

4.3 Legislation and Guidelines Pertinent to this EIA

The scope and content of this EIA Report has been informed by the following legislation, guidelines and information series documents. It is important to note that the specialist studies included in Chapters 7 to 14 of this EIA Report also include a description of the relevant applicable legislation.

4.3.1 National Legislation

4.3.1.1 The Constitution of the Republic of South Africa (Act 108 of 1996)

The Constitution, which is the supreme law of the Republic of South Africa, provides the legal framework for legislation regulating environmental management in general, against the backdrop of the fundamental human rights. Section 24 of the Constitution states that:

- "Everyone has the right:
  - o to an environment that is not harmful to their health or well-being; and
  - o 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."

Section 24 of the Bill of Rights therefore guarantees the people of South Africa the right to an environment that is not detrimental to human health or well-being, and specifically imposes a duty on the State to promulgate legislation and take other steps that ensure that the right is upheld and that, among other things, ecological degradation and pollution are prevented.

In support of the above rights, the environmental management objectives of proposed project is to protect ecologically sensitive areas and support sustainable development and the use of natural resources, whilst promoting justifiable socio-economic development in the towns nearest to the project site.

4.3.1.2 NEMA and EIA Regulations published under Chapter 5 of the NEMA on 8 December 2014 (GN R982, GN R983, GN R984 and GN R985)

The NEMA sets out a number of principles (Chapter 1, Section 2) to give guidance to developers, private land owners, members of public and authorities. The proclamation of the NEMA gives expression to an overarching environmental law. Various mechanisms, such as cooperative environmental governance, compliance and non-compliance, enforcement, and regulating government and business impacts on the environment, underpin NEMA. NEMA, as the primary environmental legislation, is complemented by a number of sectoral laws governing marine living resources, mining, forestry, biodiversity, protected areas, pollution, air quality, waste and integrated coastal management. Principle number 3 determines that a development must be socially, environmentally and economically sustainable. Principle Number 4(a) states that all relevant factors must be considered, inter alia i) that the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied; ii) that pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied; vi) that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised; and viii) that negative impacts on the environment and on peoples' environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied.

4.3.1.3 National Environmental Management: Biodiversity Act (Act 10 of 2004)

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides for "the management and conservation of South Africa's biodiversity within the framework of the NEMA, the protection of species and ecosystems that warrant national protection, and the use of indigenous biological resources in a sustainable manner, amongst other provisions". The Act states that the state is the custodian of South Africa's biological diversity and is committed to respect, protect, promote and fulfil the constitutional rights of its citizens.

Furthermore, NEMBA states that the loss of biodiversity through habitat loss, degradation or fragmentation must be avoided, minimised or remedied. The loss of biodiversity includes inter alia the loss of threatened or protected species. Biodiversity offsets are a means of compensating for the loss of biodiversity after all measures to avoid, reduce or remedy biodiversity loss have been taken, but residual impacts still remain and these are predicted to be medium to high. Chapter 5 of NEMBA (Sections 73 to 75) regulates activities involving invasive species, and lists duty of care as follows:

- the land owner/land user must take steps to control and eradicate the invasive species and prevent their spread, which includes targeting offspring, propagating material and regrowth, in order to prevent the production of offspring, formation of seed, regeneration or re-establishment;
- take all required steps to prevent or minimise harm to biodiversity; and
- ensure that actions taken to control/eradicate invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment.

An amendment to the NEMBA has been promulgated, which lists 225 threatened ecosystems based on vegetation types present within these ecosystems. Should a project fall within a vegetation type or ecosystem that is listed, actions in terms of NEMBA are triggered. Based on the preliminary sensitivity screening undertaken for the proposed site, none of the threatened ecosystems occur within the study area. This has been confirmed as part of the Ecological Impact Assessment (Chapter 7 of this EIA Report).

4.3.1.4 The National Heritage Resources Act (Act 25 of 1999)

The National Heritage Resources Act (Act 25 of 1999) (NHRA) introduces an integrated and interactive system for the managements of national heritage resources (which include landscapes and natural features of cultural significance).

Parts of sections 35(4), 36(3) (a) and 38(1) (8) of the NHRA apply to the proposed project:

Archaeology, palaeontology and meteorites:
Section 35 (4) No person may, without a permit issued by the responsible heritage resources authority:

a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

c) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.

Burial grounds and graves:
Section 36 (3) (a) No person may, without a permit issued by South African Heritage Resources Agency (SAHRA) or a provincial heritage resources authority:

a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;
b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.

Heritage resources management:
38. (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorized as:

a) the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
b) the construction of a bridge or similar structure exceeding 50 m in length;
c) any development or other activity which will change the character of the site –
    (i) exceeding 5000 m^2 in extent, or
    (ii) involving three or more erven or subdivisions thereof; or
    (iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or
    (iv) the costs of which will exceed a sum set in terms of regulations by SAHRA, or a provincial resources authority;
d) the re-zoning of a site exceeding 10 000 m^2 in extent; or
e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

While landscapes with cultural significance do not have a dedicated Section in the NHRA, they are protected under the definition of the National Estate (Section 3). Section 3(2)(c) and (d) list “historical settlements and townscapes” and “landscapes and natural features of cultural significance” as part of the National Estate. Furthermore, Section 3(3) describes the reasons a place or object may have cultural heritage value. Section 38 (2a) of the NHRA states that if there is reason to believe that heritage resources will be affected then an impact assessment report must be submitted.

A Heritage Impact Assessment (including Archaeology and Cultural Landscape) and a desktop Palaeontological Impact Assessment has been undertaken as part of the EIA Phase of the proposed project. These relevant specialist studies are respectively included in Chapters 9 and 10 of this EIA Report.

Ngwao-Boswa Ya Kapa Bokoni (Heritage Northern Cape) and the SAHRA are required to provide comment on the proposed project in order to facilitate final decision-making by the DEA. To this end and to facilitate comment from the relevant heritage authorities, the proposed project was loaded onto the South African Heritage Resources Information System (SAHRIS) on 30 and 31 July 2015 (during the Project Initiation Phase). An application was created for each project and all necessary project information (including the BID, Letter 1, and Comment and Registration Form) was uploaded to the SAHRIS. The following Case Reference Numbers were allocated to the proposed projects:

- Kenhardt PV 1: 8204;
- Kenhardt PV 2: 8205;

- Kenhardt PV 3: 8206;
- Kenhardt PV 1 – Transmission Line: 8207;
- Kenhardt PV 2 – Transmission Line: 8208; and
- Kenhardt PV 3 – Transmission Line: 8209.

Comments were provided by SAHRA (dated 22 September 2015) and loaded onto SAHRIS in response to the review of the BID (as part of the Project Initiation Phase). These comments have been captured in Chapter 6 (Comments and Responses Trail) and Appendix G of this EIA Report. In line with best practice, the Scoping Report (which was made available to I&APs for comment) was also uploaded onto SAHRIS on 25 September 2015, during the 30-day review period. The status of the case files on SAHRIS is "studies pending". As noted previously, the Heritage Impact Assessment (including Archaeology and Cultural Landscape) and desktop Palaeontological Impact Assessment will be uploaded to SAHRIS for comment by the heritage authorities during the 30-day review of the EIA Report. These comments will then be addressed (where required) and included in the finalised EIA Report, for submission to the DEA for decision-making.

Once a final comment has been issued by the heritage authority, the recommendations should be included in the conditions of the EA (should it be granted). This will essentially give 'permission' from the heritage authorities to proceed. If any archaeological mitigation is required then this would need to be conducted by an appropriate specialist under a permit issued to that specialist by SAHRA. This permit has no bearing on the developer or development but is purely a way in which the heritage authority can be sure that the mitigation work will be carried out satisfactorily.

4.3.1.5 National Forests Act (Act 84 of 1998)

The National Forest Act (Act 84 of 1998) allows for the protection of certain tree species. The Minister has the power to declare a particular tree to be a protected tree. According to Section 12 (1) d (read with Sections (5) 1 and 62 (2) (c)) of the National Forest Act (Act 84 of 1998), a licence is required to remove, cut, disturb, damage or destroy any of the listed protected trees. The most recent list of protected tree species was published in November 2014. The Department of Agriculture, Forestry and Fisheries (DAFF) is authorised to issue licences for any removal, cutting, disturbance, damage to or destruction of any protected trees. The protected trees that commonly occur in this region are *Acacia erioloba* and *Boscia albitrunca*. The Ecological Impact Assessment (Chapter 7 of this EIA Report) established that none of the protected species in terms of the National Forest Act (Act 84 of 1998) were found on site during the survey. The Ecological Impact Assessment also notes that it is unlikely that an application for the "clearing of a natural forest", as defined within the National Forest Act (Act 84 of 1998), will be required for the Kenhardt PV 3 site.

4.3.1.6 Conservation of Agricultural Resources Act (Act 43 of 1983)

The objectives of the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) are to provide for the conservation of the natural agricultural resources of South Africa by the:

- maintenance of the production potential of land;
- combating and prevention of erosion and weakening or destruction of the water sources; and
- protection of the vegetation and the combating of weeds and invader plants.

The CARA states that no land user shall utilise the vegetation of wetlands (a watercourse or pans) in a manner that will cause its deterioration or damage. This includes cultivation, overgrazing, diverting water run-off and other developments that damage the water resource. The CARA includes regulations on alien invasive plants. According to the amended regulations (GN R280 of March 2001), declared weeds and invader plants are divided into three categories:

- Category 1 may not be grown and must be eradicated and controlled,
- Category 2 may only be grown in an area demarcated for commercial cultivation purposes and for which a permit has been issued, and must be controlled, and
- Category 3 plants may no longer be planted and existing plants may remain as long as their spread is prevented, except within the flood line of watercourses and wetlands. It is the legal

duty of the land user or land owner to control invasive alien plants occurring on the land under their control.

Should alien plant species occur within the study area; this will be managed in line with the EMPr. Rehabilitation after disturbance to agricultural land is also managed by CARA. The DAFF reviews and approves applications in terms of these Acts according to their Guidelines for the evaluation and review of applications pertaining to renewable energy on agricultural land, dated September 2011. The Ecological Impact Assessment (Chapter 7 of this EIA Report) provides a description of alien invasive vegetation likely to occur within the area, as well as recommendations for removal and management thereof.

The National DAFF (Land Use and Soil Management Directorate) have provided preliminary comment on the Scoping Report during the 30-day review period. These comments are included in Chapter 6 (Comments and Responses Trail) and Appendix G of this EIA Report.

4.3.1.7 National Water Act (Act 36 of 1998)

Any activities that take place within a water course or within 500 m of a wetland boundary require a Water Use Licence (WUL) under the Section 21 (c) and Section 21 (i) of the NWA. The Ecological Impact Assessment (Chapter 7 of this EIA Report) includes additional information regarding the need for a WUL. The Ecological Impact Assessment states that authorisation for changes in land use; up to 500 m from a defined water resource/wetland system will require an application for a WUL from the DWS. The Ecological Impact Assessment explains that a WUL will be required in respect of the proposed development under Section 21 (c) and (i) of the NWA, however such licence should not preclude the proposed development.

However, it is important to note that considerable efforts will be made to place the proposed solar field and project infrastructure outside of wetland areas and any sensitive surface hydrological features identified by the specialist. As noted above, a 32 m buffer has been recommended around the major drainage lines (i.e. the Wolfkopseloop) within the Kenhardt PV 3 area. No construction will occur within 32 m of the major drainage lines as recommended in the Ecological Impact Assessment. As noted previously, the preferred site for the proposed Kenhardt PV 3 project includes approximately 1341 ha of land, however the proposed solar facility and associated infrastructure requires a development area of approximately 250 ha only. The larger area has been proposed to allow for the avoidance of major environmental constraints through the final design of the facility (i.e. the location and layout of the 250 ha facility will, as far as possible, be sited outside of the sensitive areas identified by the specialists). Additional information regarding the siting of the proposed 250 ha facility and the Development Envelope is provided in Chapter 16 of this EIA Report.

The DWS will be consulted with during the EIA Process to confirm the need for a WUL, as well as to seek comment on the proposed project. It is important to note that the Regional DWS have provided preliminary comment on the Scoping Report during the 30-day review period. These comments are included and addressed in Chapter 6 (Comments and Responses Trail), and included in Appendix G of this EIA Report.

4.3.1.8 Astronomy Geographic Advantage (Act 21 of 2007)

The Astronomy Geographic Advantage (Act 21 of 2007) aims to provide for:

- the preservation and protection of areas within the Republic that are uniquely suited for optical and radio astronomy;
- intergovernmental co-operation and public consultation on matters concerning nationally significant astronomy advantage areas; and
- matters connected therewith.

The overall purpose of the Act is to preserve the geographic advantage areas that attract investment in astronomy. The entire Northern Cape Province, excluding the Sol Plaatjie Municipality, has been declared an astronomy advantage area. The South African MeerKAT radio telescope is currently being constructed about 90 km north-west of Carnarvon in the Northern Cape

Province. The MeerKAT radio telescope is a precursor to the Square Kilometre Array (SKA) telescope and will be integrated into the SKA Phase 1 (SKA South Africa, 2014).

The proposed Kenhardt PV 3 project is located approximately 30 km north-east of Kenhardt. Kenhardt is located approximately 220 km from Carnarvon. According to the SKA Project Office, the nearest SKA station has been identified as SKA Station ID 2362, at approximately 20 km from the proposed project. The SKA office will be contacted during the EIA Phase to confirm whether the proposed project in Kenhardt poses a risk to the SKA project. The SKA have been pre-identified as a key stakeholder and therefore included on the project database of I&APs (as shown in Appendix C of this EIA Report). As such, the SKA office was provided with a copy of the BID, Letter 1, and Comment and Registration Form during the Project Initiation Phase. Comments received from the SKA Project Office during the Project Initiation Phase are included in Appendix G and Chapter 6 of this EIA Report. In addition, the SKA Project Office was provided with a hard copy and CD copy of the Kenhardt PV 1, Kenhardt PV 2 and Kenhardt PV 3 Scoping Reports via courier on 30 September 2015 (Refer to Appendix E for proof of submission (i.e. courier waybills)).

The SKA will also be provided with a hard copy and CD copy of the Kenhardt PV 1, Kenhardt PV 2 and Kenhardt PV 3 EIA Reports, and the Kenhardt PV 1 – Transmission Line, Kenhardt PV 2 – Transmission Line and Kenhardt PV 3 – Transmission Line BA Reports.

According to the SKA, based on distance to the nearest SKA station, the location of the station, and the information currently available on the design of the PV installation, the proposed facility poses a medium to high risk of detrimental impact on the SKA. In line with this, Electro Magnetic Interference (EMI) and Radio Frequency Interference (RFI) studies have been undertaken and commissioned by the Project Applicant to determine appropriate mitigation and management measures to reduce the risk of a detrimental impact on the SKA project. This technical report, compiled by MESA Solutions (PTY) Ltd, is included in Appendix K of this EIA Report, with a summary provided in Chapter 15.

The CSIR consulted with the SKA Project Office during the 30-day review of the Scoping Reports and addendum in order to confirm if the SKA could provide any details regarding the requirements and scope for the requested EMI and RFI studies, as well as to confirm if the SKA has any further comments on the Scoping Reports and addendums. Refer to Appendix E of this EIA Report for the email correspondence sent by the CSIR to the SKA Project Office. The SKA Project Office confirmed that the comments received on 2 September 2015, in response to the review of the BID, are still valid and that no further comments were required during the Scoping Phase. The SKA Project Office further noted that comments will be provided on the EMI and RFI studies, as part of the EIA Report, during the EIA Phase. Refer to Appendix G and Chapter 6 of this EIA Report, which includes the comments raised by the SKA Project Office during the Scoping Report review phase.

4.3.1.9 Subdivision of Agricultural Land Act (Act 70 of 1970)

A change of land use (re-zoning) for the development on agricultural land needs to be approved in terms of the Subdivision of Agricultural Land Act (Act 70 of 1970) (SALA). This is required for long term lease, even if no subdivision is required. Additional information regarding this is provided in the Soils and Agricultural Potential Assessment specialist study (Chapter 12 of this EIA Report).

4.3.1.10 Development Facilitation Act (Act 67 of 1995)

The Development Facilitation Act (Act 67 of 1995) (DFA) sets out a number of key planning principles which have a bearing on assessing proposed developments in light of the national planning requirements. The planning principles most applicable to the study area include:

- Promoting the integration of the social, economic, institutional and physical aspects of land development;
- Promoting integrated land development in rural and urban areas in support of each other;
- Promoting the availability of residential and employment opportunities in close proximity to or integrated with each other;

- Optimising the use of existing resources including such resources relating to agriculture, land, minerals, bulk infrastructure, roads, transportation and social facilities;
- Contributing to the correction of the historically distorted spatial patterns of settlement in the Republic and to the optimum use of existing infrastructure in excess of current needs;
- Promoting the establishment of viable communities; and
- Promoting sustained protection of the environment.

4.3.1.11 Other Applicable Legislation

Other applicable national legislation that may apply to the proposed project include:

- Electricity Act (Act 41 of 1987);
- Electricity Regulations Amendments (August 2009);
- Energy Efficiency Strategy of the Republic of South Africa (Department of Minerals and Energy (DME) now operating as Department of Mineral Resources (DMR), March, 2005);
- Promotion of Administrative Justice Act (Act 2 of 2000);
- Civil Aviation Act (Act 13 of 2009) and Civil Aviation Regulations (CAR) of 1997;
- Civil Aviation Authority Act (Act 40 of 1998);
- White Paper on Renewable Energy (2003);
- Integrated Resource Plan for South Africa (2010);
- Occupational Health and Safety Act (Act 85 of 1993), as amended by Occupational Health and Safety Amendment (Act 181 of 1993);
- Fencing Act (Act 31 of 1963);
- National Environmental Management: Air Quality Act (Act 39 of 2004);
- National Environmental Management: Protected Areas Act (NEM:PA) (Act 31 of 2004);
- National Environmental Management: Waste Management Act (Act 59 of 2008); and
- National Road Traffic Act (Act 93 of 1996).

4.3.2 Provincial Legislation

4.3.2.1 Northern Cape Nature Conservation (Act 09 of 2009)

The Northern Cape Nature Conservation Act (Act 09 of, 2009) and in particular the Northern Cape Conservation: Schedule 2 – Specially Protected Species has reference to the proposed project. This Act aims at improving the sustainability in terms of balancing natural resource usage and protection or conservation thereof. It includes six schedules, as follows:

- Schedule 1 - Specially Protected species;
- Schedule 2 - Protected species;
- Schedule 3 - Common indigenous species;
- Schedule 4 - Damage causing animal species;
- Schedule 5 - Pet species; and
- Schedule 6 - Invasive Species.

With regards to protected flora, the Northern Cape Nature Conservation Act includes a list of protected flora. The plant species potentially present within the proposed project area has been identified as part of the Ecological Impact Assessment specialist study (Chapter 7 of this EIA Report). The Ecological Impact Assessment provides a list of species identified on site and the conservation significance in terms of the Northern Cape Nature Conservation Act (Act 09 of 2009). However, it has been recommended as part of the EMPr (Part B of the EIA Report), that a detailed plant search and rescue operation be conducted before the final design process and prior to the commencement of the construction phase. If any of the listed species are found, the relevant permits should be obtained by the Project Applicant prior to their relocation or destruction. In addition, the Provincial Department of Environment and Nature Conservation should be consulted on whether a permit is required for the clearance of indigenous vegetation on site. This has also been confirmed in the Ecological Impact Assessment (Chapter 7 of this EIA Report).

The Provincial Department of Environment and Nature Conservation have been pre-identified as a key stakeholder and therefore included on the project database (as shown in Appendix C of this EIA Report). As such, the Provincial Department of Environment and Nature Conservation were provided with a copy of the BID, Letter 1, and Comment and Registration Form during the Project Initiation Phase. In addition, the Provincial Department of Environment and Nature Conservation were provided with a hard copy and CD copy of the Kenhardt PV 1, Kenhardt PV 2 and Kenhardt PV 3 Scoping Reports via courier on 30 September 2015 (Refer to Appendix E for proof of submission (i.e. courier waybills)). The Department will also be provided with a hard copy and CD copy of the Kenhardt PV 1, Kenhardt PV 2 and Kenhardt PV 3 EIA Reports, and the Kenhardt PV 1 – Transmission Line, Kenhardt PV 2 – Transmission Line and Kenhardt PV 3 – Transmission Line BA Reports.

4.3.2.2 The Provincial Spatial Development Framework for the Northern Cape (Office of the Premier of the Northern Cape, 2012)

The Provincial Spatial Development Framework (PSDF) identified a Solar Corridor where solar projects will be given priority. According to the PSDF, this Solar Corridor "centres around Upington and extends from roughly Kakamas in the north to De Aar in the east" (Department of Co-operative Governance, Human Settlements and Traditional Affairs, 2012, Page 68). The proposed Kenhardt PV 3 project does not fall within this corridor.

4.3.3 Local Planning Legislation

4.3.3.1 ZF Mgcawu Spatial Development Framework (Siyanda DM 2012)

The Solar Corridor is seen as an initiative that 'should be pursued vigorously.' The corridor follows the main routes from Prieska to Upington and further along the N10. However, the Spatial Development Framework (SDF) map (Page 221) shows that the corridor also extended along the N14 west. There are also a number of solar energy projects outside these corridors. Proposal SB7 for Southern Bushmanland relates to solar projects: "Sensitively place solar projects within the Solar Corridor with due regard to the visual impact of these facilities and the siting principles in Section 6.3.7". Siting principles address wind farms rather than solar plants.

4.3.3.2 !Kheis Rural SDF (!Kheis Municipality 2014)

Natural scenic beauty of the municipality and production of solar energy are both seen as opportunities based on its existing bio-physical conditions. Tourism opportunities for this municipality potentially relevant to the proposed development include agricultural tourism, landscape tourism and game farms. Solar energy projects are suggested for the remote areas of the municipality although no indication is given where this should be (other than the Solar Corridor).

4.3.3.3 Kai !Garib SDF (Kai !Garib Municipality 2012)

Kenhardt and its surrounding rural area are seen as an agricultural region with a scenic environment and important cultural heritage. Dust pollution is seen as factor that "must be taken into consideration with future developments". Solar projects are mainly located along the Orange River and within the Solar Corridor, but there are projects south-west of Kenhardt indicated on the resources map.

4.3.3.4 Eskom Electrical Grid Infrastructure SEA

The DEA is undertaking an SEA for Electrical Grid Infrastructure (EGI) to assist Eskom with identifying priority corridors and to improve environmental regulatory processes inside the corridors in support of SIP 10. As part of the EGI SEA, five preliminary corridors were identified, namely the central, eastern, international, northern and western corridor. The preliminary corridors were later refined as part of the SEA process and final corridors have been put forward. Figure 4.1 below shows the preliminary and final corridors assessed as part of the EGI SEA.

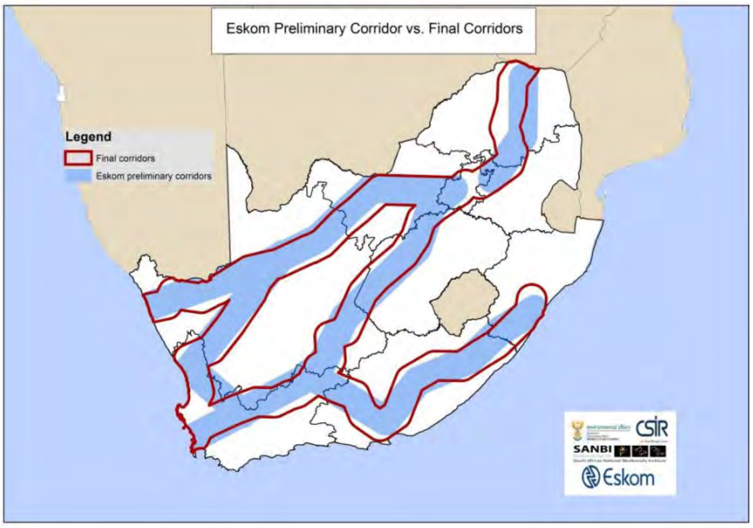

Figure 4.1: Eskom Preliminary and Final Corridors assessed as part of the EGI SEA (CSIR, 2015b)

During the Scoping Phase (as part of the review of the Scoping Report), the Provincial Department of Environment and Nature Conservation commented that the proposed development does not form part of the EGI SEA as it falls outside one of the corridors identified by Eskom (i.e. the Western Corridor. However based on the final corridors, as shown below in Figure 4.2, the proposed project does fall within the EGI SEA.

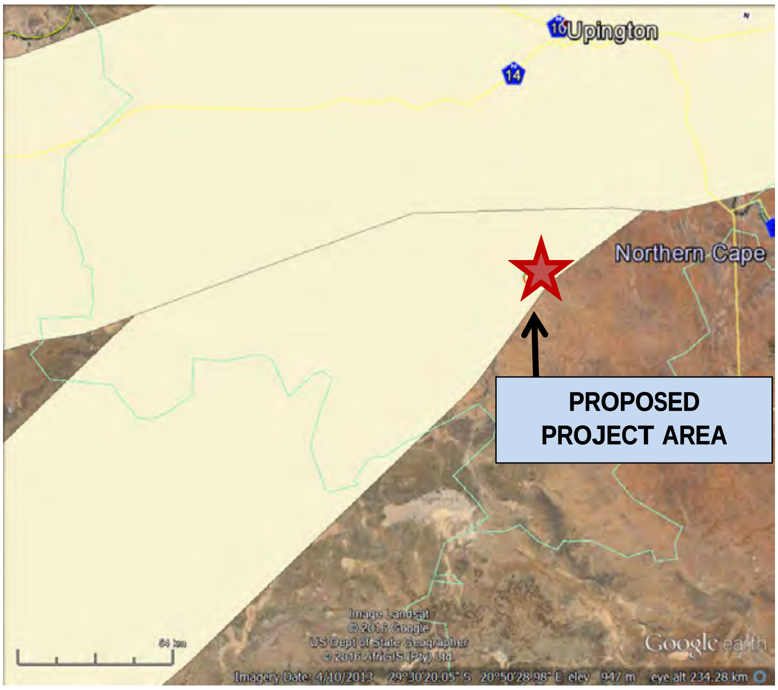

Figure 4.2: Eskom Final Corridor assessed as part of the EGI SEA and the Location of the proposed Kenhardt PV 1, PV 2 and PV 3 EIA projects and the Kenhardt PV 1 – Transmission Line, Kenhardt PV 2 – Transmission Line and Kenhardt PV 3 – Transmission Line BA Projects (CSIR, 2015b). Image Source: Google Earth, 2016

4.3.4 Guidelines, Frameworks and Protocols

- Public Participation Guideline, October 2012 (Government Gazette 35769);
- DEADP and DEA Guidelines published in terms of the NEMA EIA Regulations, in particular:
  - Guideline on Transitional Arrangements (DEADP, March 2013);
  - Guideline on Alternatives (DEADP, March 2013);
  - Guideline on Public Participation (DEADP, March 2013); and
  - Guideline on Need and Desirability (DEADP, March 2013);
- Information Document on Generic TOR for EAPs and Project Schedules (March 2013);
- Integrated Environmental Management Information Series (Booklets 0 to 23) (Department of Environmental Affairs and Tourism (DEAT), 2002 – 2005);
- Guidelines for Involving Specialists in the EIA Processes Series (DEADP; CSIR and Tony Barbour, 2005 – 2007);
- United Nations Framework Convention on Climate Change (1997); and
- Kyoto Protocol (which South Africa acceded to in 2002).

4.3.5 International Finance Corporation Performance Standards

In order to promote responsible environmental stewardship and socially responsible development, the proposed Kenhardt PV 3 project will, as far as practicable, incorporate the environmental and social policies of the International Finance Corporation (IFC). These policies provide a frame of reference for lending institutions to review of environmental and social risks of projects, particularly those undertaken in developing countries.

Through the Equator Principles, the IFC's standards are now recognised as international best practice in project finance. The IFC screening process categorises projects into A, B or C in order to indicate relative degrees of environmental and social risk. The categories are:

- Category A - Projects expected to have significant adverse social and/or environmental impacts that are diverse, irreversible, or unprecedented.
- Category B - Projects expected to have limited adverse social and/or environmental impacts that can be readily addressed through mitigation measures.
- Category C - Projects expected to have minimal or no adverse impacts, including certain financial intermediary projects.

Accordingly, projects such as the proposed Kenhardt PV 3 project are categorised as Category B projects. The EA Process for Category B projects examines the project's potential negative and positive environmental impacts and compares them with those of feasible alternatives (including the 'without project' scenario). As required for Category B projects a Scoping and EIA Process is being undertaken for the Kenhardt PV 3 project

As noted above, other Acts, standards and/or guidelines which may also be applicable have been reviewed in more detail as part of the specialist studies (Chapters 7 to 14 of this EIA Report).

4.4 Principles for Public Participation

The PPP for this EIA Process is being driven by a stakeholder engagement process that will include inputs from authorities, I&APs, technical specialists and the project proponent. Guideline 4 on "Public Participation in support of the EIA Regulations" published by DEAT in May 2006, states that public participation is one of the most important aspects of the EA Process. This stems from the requirement that people have a right to be informed about potential decisions that may affect them and that they must be afforded an opportunity to influence those decisions. Effective public participation also improves the ability of the Competent Authority (CA) to make informed decisions and results in improved decision-making as the view of all parties are considered.

An effective PPP could therefore result in stakeholders working together to produce better decisions than if they had worked independently.

- "Provides an opportunity for I&APs, EAPs and the CA to obtain clear, accurate and understandable information about the environmental impacts of the proposed activity or implications of a decision;
    - Provides I&APs with an opportunity to voice their support, concern and question regarding the project, application or decision;
    - Enables an applicant to incorporate the needs, preferences and values of affected parties into its application;
    - Provides opportunities for clearing up misunderstanding about technical issues, resolving disputes and reconciling conflicting interests;
    - Is an important aspect of securing transparency and accountability in decision-making; and
    - Contributes toward maintaining a health, vibrant democracy."

To the above, one can add the following universally recognised principles for public participation:

- Inclusive consultation that enables all sectors of society to participate in the consultation and assessment processes;
- Provision of accurate and easily accessible information in a language that is clear and sufficiently non-technical for I&APs to understand, and that is sufficient to enable meaningful participation;
- Active empowerment of grassroots people to understand concepts and information with a view to active and meaningful participation;
- Use of a variety of methods for information dissemination in order to improve accessibility, for example, by way of discussion documents, meetings, workshops, focus group discussions, and the printed and broadcast media;
- Affording I&APs sufficient time to study material, to exchange information, and to make contributions at various stages during the assessment process;
- Provision of opportunities for I&APs to provide their inputs via a range of methods, for example, via briefing sessions, public meetings, written submissions or direct contact with members of the EIA team.
- Public participation is a process and vehicle to provide sufficient and accessible information to I&APs in an objective manner to assist I&APs to identify issues of concern, to identify alternatives, to suggest opportunities to reduce potentially negative or enhance potentially positive impacts, and to verify that issues and/or inputs have been captured and addressed during the assessment process.

At the outset it is important to highlight two key aspects of public participation:

- There are practical and financial limitations to the involvement of all individuals within a PPP. Hence, public participation aims to generate issues that are representative of societal sectors, not each individual. Hence, the PPP will be designed to be inclusive of a broad range of sectors relevant to the proposed project.
- The PPP will aim to raise a diversity of perspectives and will not be designed to force consensus amongst I&APs. Indeed, diversity of opinion rather than consensus building is likely to enrich ultimate decision-making. Therefore, where possible, the PPP will aim to obtain an indication of trade-offs that all stakeholders (i.e. I&APs, technical specialists, the authorities and the development proponent) are willing to accept with regard to the ecological sustainability, social equity and economic growth associated with the project.

4.5 Public Participation Process

The key steps in the PPP for the EIA Phase are described below. This approach has been confirmed with the DEA through their review and acceptance of the Plan of Study for EIA (as shown in

Appendix I.4 of this EIA Report). The PPP for the Scoping Process is described in Chapter 4 of the finalised Scoping Report (CSIR, 2015).

As discussed in Chapter 1 of this EIA Report, an integrated PPP will be undertaken for the three Scoping and EIA projects (i.e. Kenhardt PV 1, Kenhardt PV 2, and Kenhardt PV 3), as well as the three BA projects (i.e. Kenhardt PV 1 – Transmission Line, Kenhardt PV 2 – Transmission Line, and Kenhardt PV 3 – Transmission Line). Separate Scoping, BA and EIA Reports have been compiled for each project and these have been made available for I&AP and authority review in an integrated manner. All advertisements, notification letters and emails etc. will serve to notify the public and organs of state of the joint availability of all reports for the abovementioned projects and will provide I&APs with an opportunity to comment on the reports. As previously noted, the BA Reports have been released with the EIA Reports in order to comply with the timeframes stipulated in the 2014 EIA Regulations. This process is outlined in Figure 4.3 of this chapter. As noted previously, this aforementioned integrated approach has been discussed with and approved by the DEA, as part of the pre-application meeting held on 17 September 2015 (Appendix I.1 of this EIA Report). This approach is proposed due to the close proximity of the sites (i.e. the proposed projects will take place within the same geographical area) and that proposed project will entail the same activity (i.e. generation of electricity with the use of solar PV panels).

It is important to note that in order to notify and inform the public of the proposed projects and invite I&APs to register on the project database, the project and EIA Process was advertised in one local newspaper (i.e. The Gemsbok) during the Project Initiation Phase on 29 July 2015. A copy of the advertisement placed is contained in Appendix D of this EIA Report.

Furthermore, Regulation 41 (2) (a) of the 2014 EIA Regulations require that a notice board providing information on the project and EIA Process is fixed at a place that is conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of the site where the application will be undertaken or any alternative site. To this end, an 841 mm x 594 mm notice board was placed at the locations shown in Table 4.3 on 3 August 2015 during the Project Initiation Phase. A copy of the notice boards and proof of placement thereof is included in Appendix F of this EIA Report.

Table 4.3: Site Notice Boards Placed for the Commencement of the BA, Scoping and EIA Processes (Kenhardt PV 1, Kenhardt PV 2, Kenhardt PV 3, Kenhardt PV 1 – Transmission Line, Kenhardt PV 2 – Transmission Line and Kenhardt PV 3 – Transmission Line)

Location	Co-ordinates	Language
Entrance to the Transnet Service Road, which serves as one of the access routes to the (preferred and alternative) project sites.	29° 19' 47.79" S and 21° 9' 15.53" E	Afrikaans
Entrance to the alternative access road (unnamed farm road), which serves as one of the access routes to the (preferred and alternative) project sites.	29°16' 21.13" S and 21°19' 15.17" E	English
Kenhardt Petrol Station	29° 20' 52.23" S and 21° 9' 7.97" E	Afrikaans
Kai !Garib Municipality Offices in Kenhardt	29° 20' 56.01" S and 21° 9' 7.69" E	English

The correspondence sent to I&APs during the Scoping Phase (including the submission of the finalised Scoping Reports to the DEA) is included in Appendix E of this EIA Report. Appendix G contains all the comments and correspondence received from I&APs during the Scoping Phase (i.e. during the Project Initiation Phase and 30-day review of the Scoping Reports). Appendices E and G will be respectively updated with correspondence sent to I&APs for the release of the EIA Reports, and any comments received from I&APs during the review of the EIA Report.

TASK 1: I&AP REVIEW OF THE EIA REPORT AND EMPR (Current Stage)

The first stage in the process will entail the release of the EIA Reports for a 30-day I&AP and stakeholder review period. As noted above, the BA Reports for each transmission line project will be released to I&APs for review at the same time as the EIA Reports. Relevant organs of state and I&APs will be informed of the review process in the following manner:

- Placement of one advertisement in The Gemsbok local newspaper to notify potential I&APs of the availability of the EIA Reports;
- A letter will be sent via registered mail and email to all registered I&APs and organs of state (where postal, physical and email addresses are available) on the database. The letter will include notification of the 30-day comment period for the EIA and BA Reports and it will include an Executive Summary of the EIA and BA Reports and a Comment and Registration Form;
- It was noted in the Scoping Reports that a public meeting could possibly be held during the review of the EIA and BA Reports, if warranted and if there is substantial public interest during the EIA Phase. However, due to the limited public input and/or interest in the proposed project, this was not deemed necessary. Telephonic consultations with key I&APs will take place, upon request; and
- Meeting(s) with key authorities involved in decision-making for this EIA (if required and requested).

The EIA and BA Reports will be made available and distributed through the following mechanisms to ensure access to information on the project and to communicate the outcome of specialist studies:

- Copies of the reports will be placed at the Kenhardt and Groblershoop local libraries for I&APs to access for viewing;
- Key authorities will be provided with either a hard copy and/or CD of the EIA Reports;
- The EIA Reports will be uploaded to the project website (i.e. http://www.csir.co.za/eia/ScatecSolarPV/); and
- Telephonic consultations will be held with key I&AP and organs of state groups, as necessary.

TASK 2: COMMENTS AND RESPONSES TRAIL

A key component of the EIA Process is documenting and responding to the comments received from I&APs and the authorities. The following comments on the EIA Reports will be documented:

- Written and emailed comments (e.g. letters and completed comment and registration forms);
- Comments made at focus group meetings (if required);
- Telephonic communication with CSIR project team; and
- One-on-one meetings with key authorities and/or I&APs (if required).

The comments received during the 30-day review of the EIA Reports will be compiled into a Comments and Responses Trail for inclusion in the finalised EIA Reports that will be submitted to the National DEA in terms of Regulation 23 (1) (a) for decision-making. The Comments and Responses Trail will indicate the nature of the comment, as well as when and who raised the comment. The comments received will be considered by the EIA team and appropriate responses provided by the relevant member of the team and/or specialist. The response provided will indicate how the comment received has been considered in the EIA Reports for submission to the National DEA and in the project design or EMPRs.

TASK 3: COMPILATION OF EIA REPORTS FOR SUBMISSION TO THE DEA

Following the 30-day commenting period of the EIA Reports and incorporation of the comments received into the reports, the EIA Reports (i.e. hard copies and electronic copies) will be submitted to the DEA for decision-making in line with Regulation 23 (1) (a) of the 2014 EIA Regulations. In line with best practice, I&APs on the project database will be notified via email (where email addresses are available) of the submission of the EIA Reports to the DEA for decision-making.

The EIA Reports that are submitted for decision-making will also include proof of the PPP that was undertaken to inform organs of state and I&APs of the availability of the EIA Reports for the 30 day review (during Task 1, as explained above). To ensure ongoing access to information, copies of the EIA Reports that are submitted for decision-making and the Comments and Response Trail (detailing comments received during the EIA Phase and responses thereto) will be placed on the project website (i.e. http://www.csir.co.za/eia/ScatecSolarPV/).

The DEA will have 107 days (from receipt of the EIA Reports) to either grant or refuse EA (in line with Regulation 24 (1) of the 2014 EIA Regulations).

TASK 4: EA AND APPEAL PERIOD

Subsequent to the decision-making phase, if an EA is granted by the DEA for the proposed projects, all registered I&APs and stakeholders on the project database will receive notification of the issuing of the EA and the appeal period. The 2014 EIA Regulations (i.e. Regulation 4 (1)) states that after the Competent Authority has a reached a decision, it must inform the Applicant of the decision, in writing, within 5 days of such decision. Regulation 4 (2) if the 2014 EIA Regulations stipulates that I&APs need to be informed of the EA and associated appeal period within 14 days of the date of the decision. All registered I&APs will be informed of the outcome of the EA and the appeal procedure and its respective timelines.

The following process will be followed for the distribution of the EA (should such authorisation be granted by the DEA) and notification of the appeal period:

- Placement of one advertisement in The Gemsbok local newspaper to notify I&APs of the EA and associated appeal process;
- A letter will be sent via registered mail and email to all registered I&APs and organs of state (where postal, physical and email addresses are available) on the database. The letter will include information on the appeal period, as well as details regarding where to obtain a copy of the EA;
- A copy of the EA will be uploaded to the project website (i.e. http://www.csir.co.za/eia/ScatecSolarPV/); and
- All I&APs on the project database will be notified of the outcome of the appeal period in writing.

4.6 Authority Consultation during the EIA Phase

Authority consultation is integrated into the PPP, with additional one-on-one meetings held with the lead authorities, where necessary. It is proposed that the Competent Authority (DEA) as well as other lead authorities will be consulted at various stages during the EIA Process. At this stage, the following authorities have been identified for the purpose of this EIA Process (additional authorities might be added to this list as the EIA Process proceeds):

- National DEA;
- Department of Environment and Nature Conservation of the Northern Cape Province;
- DWS of the Northern Cape Province;
- Department of Energy of the Northern Cape Province;
- Department of Mineral Resources of the Northern Cape Province;
- Eskom Holdings SOC Ltd;
- Transnet SOC Ltd;
- South African National Parks;
- Department of Social Development;
- National Energy Regulator of South Africa;
- National DAFF;
- DAFF of the Northern Cape Province;
- Department of Agriculture, Land Reform & Rural Development of the Northern Cape Province;
- Department of Public Works, Roads and Transport of the Northern Cape Province;
- Department of Labour;
- SKA;
- SAHRA;
- Ngwao Boswa Kapa Bokoni (Heritage Northern Cape);

- South African Civilian Aviation Authority;
- South African National Road Agency Limited;
- ZF Mgcawu District Municipality;
- Kai! Garib Local Municipality; and
- !Kheis Local Municipality.

The authority consultation process for the EIA Phase is outlined in Table 4.4 below.

Table 4.4: Authority Communication Schedule

STAGE IN EIA PHASE	FORM OF CONSULTATION
During the EIA Process	Site visit for authorities, if required.
During preparation of EIA Reports	Communication with the DEA on the outcome of Specialist Studies (if required).
On submission of EIA Reports for decision-making	Meetings with dedicated departments, if requested by the DEA, with jurisdiction over particular aspects of the project (e.g. Local Authority) and potentially including relevant specialists.

4.7 Schedule for the EIA

The proposed schedule for the EIA, based on the legislated EIA Process, is presented in Table 4.5. It should be noted that this schedule could be revised during the EIA Process, depending on factors such as the time required for decisions from authorities.

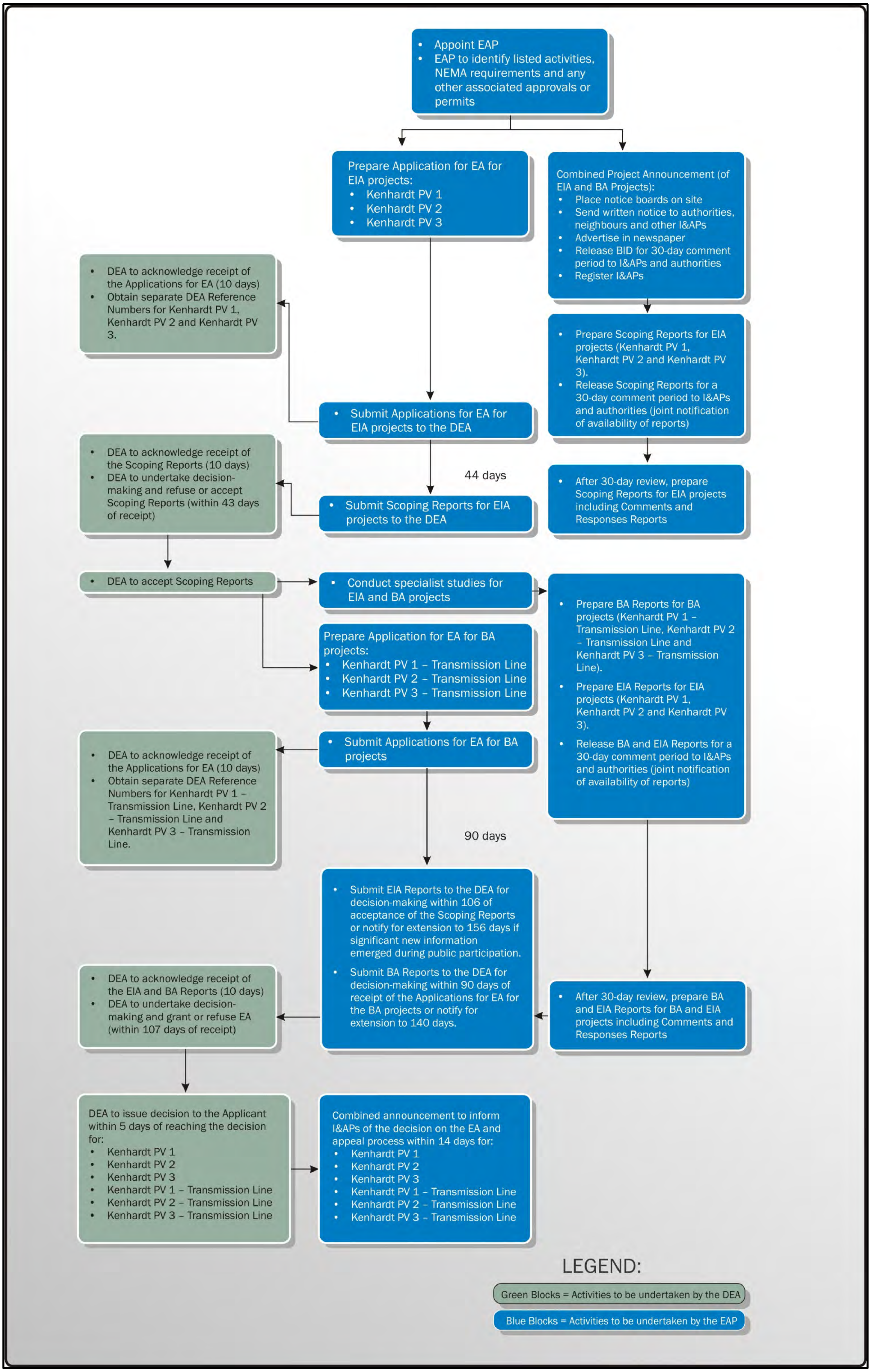

Figure 4.3: Joint PPP proposed for the Kenhardt PV EIA and BA Projects

Table 4.5: Schedule for the Proposed Projects (including the Scoping and EIA Projects and the BA Projects)

	July 2015				August 2015				Sept 2015				Oct 2015				Nov 2015				Dec 2015				Jan 2016				Feb 2016				March 2016				April 2016				May 2016				June 2016				July 2016				August 2016			
Task	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project Announcement: Placement of Newspaper Advert, Distribute Letter 1, and Placement of Site Notice Boards. Release BID for 30-day comment period.																																																								
Prepare Scoping Reports and Plan of Study for EIA (PSEIA).																																																								
Prepare and Submit EIA Applications for EA to the DEA for Kenhardt PV 1, Kenhardt PV 2, and Kenhardt PV 3.																																																								
Release of Scoping Reports for 30-day I&AP and Organ of State Review.																																																								
Release of Addendum to the Scoping Reports for 30-day I&AP and Organ of State Review.																																																								
Collate comments received and integrate into Scoping Reports.																																																								
Submission of Scoping Reports and PSEIA to DEA (within 44 days of receipt of the Applications for EA by the DEA).																																																								
DEA to Accept/Reject Scoping Reports or Refuse EA within 43 days of receipt of the Scoping Reports.																																																								
Compile EIA Reports and BA Reports (including specialist studies and EMPRs).																																																								
Prepare and Submit BA Applications for EA for Kenhardt PV 1 – Transmission Line, Kenhardt PV 2 – Transmission Line and Kenhardt PV 3 – Transmission Line.																																																								
Release of EIA Reports and BA Reports for a 30-day I&AP and Organ of State Review.																																																								
Collate comments received and integrate into EIA Reports and BA Reports.																																																								
Submission of EIA Reports and BA Reports to Competent Authority within 106 days of acceptance of the Scoping Reports by the DEA and within 90 days of receipt of the BA Applications for EIA by the DEA.																																																									
Competent Authority to Grant or Refuse EA (within 107 days of receipt of the EIA Reports and BA Reports).																																																								
Competent Authority to provide written feedback.																																																								
Notify I&APs of the EA decision.																																																								

**An additional 50 days can be added to this phase under exceptional circumstances.

	EAP Timeframes
	PPP Timeframes
	Competent Authority Timeframes
	DEA Shutdown Period (15 December to 5 January)

4.8 Approach to Impact Assessment and Specialist Studies

This section outlines the assessment methodology and legal context for specialist studies, as recommended by the DEA 2006 Guideline on Assessment of Impacts.

4.8.1 Generic TOR for the Assessment of Potential Impacts

The identification of potential impacts included impacts that may occur during the construction, operational and decommissioning phases of the development. The assessment of impacts is to include direct, indirect as well as cumulative impacts. In order to identify potential impacts (both positive and negative) it is important that the nature of the proposed projects is well understood so that the impacts associated with the projects can be assessed. The process of identification and assessment of impacts includes:

- Determining the current environmental conditions in sufficient detail so that there is a baseline against which impacts can be identified and measured;
- Determining future changes to the environment that will occur if the activity does not proceed;
- Develop an understanding of the activity in sufficient detail to understand its consequences; and
- The identification of significant impacts which are likely to occur if the activity is undertaken.

The impact assessment methodology has been aligned with the requirements for EIA Reports as stipulated in Appendix 3 (3) (j) of the 2014 EIA Regulations, which states the following:

- An EIA Report must contain the information that is necessary for the CA to consider and come to a decision on the application, and must include an assessment of each identified potentially significant impact and risk, including -
  - (i) cumulative impacts;
  - (ii) the nature, significance and consequences of the impact and risk;
  - (iii) the extent and duration of the impact and risk;
  - (iv) the probability of the impact and risk occurring;
  - (v) the degree to which the impact and risk can be reversed;
  - (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and
  - (vii) the degree to which the impact and risk can be mitigated.

As per the DEAT Guideline 5: Assessment of Alternatives and Impacts, the following methodology is applied to the predication and assessment of impacts and risks. Potential impacts and risks have been rated in terms of the direct, indirect and cumulative:

- **Direct impacts** are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.

- **Indirect impacts** of an activity are indirect or induced changes that may occur as a result of the activity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

- **Cumulative impacts** are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. The cumulative impacts have been assessed by identifying other solar energy project proposals and other applicable projects, such as construction and upgrade of electricity generation, and transmission or distribution facilities in the local area (i.e. within 20 km of the proposed Kenhardt PV 3 project) that have been approved (i.e. positive EA has been issued) or is currently underway. The proposed and existing electrical and solar developments that have been considered as part of the EIA Phase are provided in Table 4.6 below. The cumulative impacts will be assessed in terms of each proposed Kenhardt PV project as well. Cumulative effects associated with these similar types of projects include inter alia:

- Traffic generation;
- Avifaunal collisions and mortalities;
- Habitat destruction and fragmentation;
- Loss of agricultural land;
- Removal of vegetation;
- Increase in stormwater run-off and erosion;
- Increase in water requirements;
- Job creation;
- Increased interference to the SKA project;
- Social upliftment; and
- Upgrade of infrastructure and contribution of renewable energy into the National Grid.

Table 4.6: EIA Processes currently underway within 20 km of the proposed project

Project Name	Applicant	DEA Reference Number	Brief project description	Phase
Nieuwehoop 400/50 kV Substation loop in and loop out lines, Northern Cape Province.	Eskom Holdings SOC Limited	DEA Reference Number: 12/12/20/1166	Construction of the 400/50kv Nieuwehoop substation between the Garona and Aries substations, and 3km Loop In and Loop Out Lines.	The project received a positive EA on 21 February 2011. Site preparation for the construction of the Nieuwehoop Substation has commenced.
EIA, WULA and EMPr for the proposed Solar CSP Integration Project: Project 1 – Solar substation, 2 X 400 kV power lines from Aries to the solar substation and 400 kV power line from Nieuwehoop to the Solar substation.	Eskom Holdings SOC Limited	DEA Reference Number: 12/12/20/2606 NEAS Reference Number: DEA/EIA/0000785/2011	The proposed Solar Park Integration Project entails the construction of a substation at the Upington Solar Park, 400 kV transmission lines to the east and south of Upington to feed the electricity into Eskom's National Grid as well as the construction of a number of 132 kV power lines inter-linking the IPP solar plants with the Eskom Grid and distributing the power generated to Upington.	The project received a positive EA on 14 February 2014.
Proposed construction of Gemsbok PV1 75 MW Solar PV facility on the remaining extent of Portion 3 of the Farm Gemsbok Bult 120, Kenhardt, Northern Cape.	Mulilo Renewable Project Developments (Pty) Ltd	DEA Reference Number: 14/12/16/3/3/2/710	Mulilo Renewable Project Developments (Pty) Ltd intends to develop a 75 MW Solar PV power generation project on the farm Gemsbok Bult (Remaining Extent of Portion 3 of Farm 120).	These projects are being undertaken in parallel (i.e. joint PPP) and are collectively referred to as the Nieuwehoop Solar Development. The Final EIA Reports have been submitted to the DEA for decision-making. The projects have received positive EA.
Proposed construction of Gemsbok PV2 75 MW Solar PV facility on the remaining extent of Portion 3 of the Farm Gemsbok Bult 120, Kenhardt, Northern Cape.	Mulilo Renewable Project Developments (Pty) Ltd	DEA Reference Number: 14/12/16/3/3/2/711	Mulilo Renewable Project Developments (Pty) Ltd intends to develop a 75 MW Solar PV power generation project on the farm Gemsbok Bult (Remaining Extent of Portion 3 of Farm 120).	
Proposed construction of Boven PV1 75 MW Solar PV facility on the remaining extent of the Farm Boven Rugzeer 169, Kenhardt, Northern Cape.	Mulilo Renewable Project Developments (Pty) Ltd	DEA Reference Number: 14/12/16/3/3/2/712	Mulilo Renewable Project Developments (Pty) Ltd intends to develop a 75 MW Solar PV power generation project on the farm Boven Rugzeer (Remaining Extent of Farm 169).	
Proposed development of a 75 MW Solar PV Facility (Kenhardt PV 1) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape.	Scatec Solar	DEA Reference Number: 14/12/16/3/3/2/837	Scatec Solar intends to develop a 75 MW Solar PV power generation project on the remaining extent of Onder Rugzeer Farm 168.	These projects are being undertaken in parallel (i.e. joint PPP). The Scoping Reports and addendums were released for a 30-day comment period. The finalised Scoping Reports were submitted to the DEA for decision-making in November 2015 and were accepted by the
Proposed development of a 75 MW Solar PV Facility (Kenhardt PV 2) on the remaining extent of Onder Rugzeer Farm 168, north-east of	Scatec Solar	DEA Reference Number: 14/12/16/3/3/2/838	Scatec Solar intends to develop a 75 MW Solar PV power generation project on the remaining extent of Onder Rugzeer Farm 168.	

Project Name	Applicant	DEA Reference Number	Brief project description	Phase
Kenhardt, Northern Cape.				DEA in December 2016 (refer to Appendix I.4 for the acceptance letter). The EIA Reports are currently being released for a 30-day comment period together with the BA Reports.
Proposed development of a 132 kV Transmission Line to connect to the proposed 75 MW Solar PV Facility (Kenhardt PV 1) on the remaining extent of Onder Rugzeer Farm 168 and the remaining extent of Portion 3 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape.	Scatec Solar	To be confirmed	Scatec Solar intends to develop a 132 KV transmission line extending from the proposed 75 MW Solar PV facility (Kenhardt PV 1) to the Eskom Nieuwehoop substation on the remaining extent of Portion 3 of Gemsbok Bult Farm 120.	These projects are being undertaken in parallel with Kenhardt PV 1, Kenhardt PV 2 and Kenhardt PV 3 (i.e. joint PPP). The BA Reports are currently being released for a 30-day comment period together with the EIA Reports.
Proposed development of a Transmission Line to connect to the proposed 75 MW Solar PV Facility (Kenhardt PV 2) on the remaining extent of Onder Rugzeer Farm 168, and the remaining extent of Portion 3 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape.	Scatec Solar	To be confirmed	Scatec Solar intends to develop a transmission line extending from the proposed 75 MW Solar PV facility (Kenhardt PV 2) to the Eskom Nieuwehoop substation on the remaining extent of Portion 3 of Gemsbok Bult Farm 120.	
Proposed development of a Transmission Line to connect to the proposed 75 MW Solar PV Facility (Kenhardt PV 3) on the remaining extent of Onder Rugzeer Farm 168, and the remaining extent of Portion 3 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape.	Scatec Solar	To be confirmed	Scatec Solar intends to develop a transmission line extending from the proposed 75 MW Solar PV facility (Kenhardt PV 3) to the Eskom Nieuwehoop substation on the remaining extent of Portion 3 of Gemsbok Bult Farm 120.	
Proposed construction of the Mulilo Solar Development consisting of seven 75 MW PV OR Concentrated PV Solar Energy Facilities and associated infrastructure near Kenhardt,	Mulilo Renewable Project Developments (Pty) Ltd	• DEA Reference Number: 14/12/16/3/3/2/841 • DEA Reference Number: 14/12/16/3/3/2/842	Mulilo Renewable Project Developments (Pty) Ltd proposes to construct and operate seven PV or Concentrated PV Solar Facilities with a generating capacity of 75 MW each, on Portions 3 and 8 of Gemsbok Bult Farm 120 and the Remaining extent of Boven Rugzeer Farm 169, located 30 km north-	These projects are being undertaken in parallel (i.e. joint PPP). The BID was released to I&APs and authorities for a 30-day comment period in September 2015. The finalised

Project Name	Applicant	DEA Reference Number	Brief project description	Phase
Northern Cape		• DEA Reference Number: 14/12/16/3/3/2/843 • DEA Reference Number: 14/12/16/3/3/2/844 • DEA Reference Number: 14/12/16/3/3/2/845 • DEA Reference Number: 14/12/16/3/3/2/846 • DEA Reference Number: 14/12/16/3/3/2/847	east of Kenhardt. Two of the projects will be located on Portion 3-, two projects on Portion 8 of Gemsbok Bult Farm 120 and three projects on the Remaining Extent of Boven Rugzeer Farm 169. Each 75 MW Solar PV facility proposed will cover an approximate area of 200 ha with a collective footprint of approximately 1 400 ha and a combined power generation capacity of 525 MW. The proposed projects will entail the construction of the solar field, buildings, electrical infrastructure, internal access roads, and associated infrastructure and structures.	Scoping Reports were submitted to DEA for decision-making in December 2015 and were accepted in February 2016.

In addition to the above, the impact assessment methodology includes the following aspects:

- **Spatial extent** – The size of the area that will be affected by the impact/risk:
  - Site specific;
  - Local (<10 km from site);
  - Regional (<100 km of site);
  - National; or
  - International (e.g. Greenhouse Gas emissions or migrant birds).

- **Consequence** – The anticipated consequence of the risk/impact:
  - Extreme (extreme alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they permanently cease);
  - Severe (severe alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease);
  - Substantial (substantial alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease);
  - Moderate (notable alteration of natural systems, patterns or processes, i.e. where the environment continues to function but in a modified manner); or
  - Slight (negligible alteration of natural systems, patterns or processes, i.e. where no natural systems/environmental functions, patterns, or processes are affected).

- **Duration** – The timeframe during which the impact/risk will be experienced:
  - Very short term (instantaneous);
  - Short term (less than 1 year);
  - Medium term (1 to 10 years);
  - Long term (the impact will cease after the operational life of the activity (i.e. the impact or risk will occur for the project duration)); or
  - Permanent (mitigation will not occur in such a way or in such a time span that the impact can be considered transient (i.e. the impact will occur beyond the project decommissioning)).

- **Reversibility of the Impacts** - the extent to which the impacts/risks are reversible assuming that the project has reached the end of its life cycle (decommissioning phase) will be:
  - Yes: High reversibility of impacts (impact is highly reversible at end of project life);
  - Partially: Moderate reversibility of impacts; or
  - No: Impacts are non-reversible (impact is permanent).

- **Irreplaceability of Receiving Environment/Resource Loss caused by impacts/risks** – the degree to which the impact causes irreplaceable loss of resources assuming that the project has reached the end of its life cycle (decommissioning phase) will be:
  - High irreplaceability of resources (project will destroy unique resources that cannot be replaced);
  - Moderate irreplaceability of resources;
  - Low irreplaceability of resources; or
  - Resources are replaceable (the affected resource is easy to replace/rehabilitate).

Using the criteria above, the impacts will further be assessed in terms of the following:

- **Probability** – The probability of the impact/risk occurring:
  - Very likely;
  - Likely;
  - Unlikely;
  - Very unlikely; and
  - Extremely unlikely.

To determine the significance of the identified impact/risk, the consequence is multiplied by probability (as shown in Figure 4.4). This approach incorporates internationally recognised methods from the IPCC (2014) assessment of the effects of climate change and is based on an interpretation of existing information in relation to the proposed activity. The significance is then rated qualitatively as follows against a predefined set of criteria (i.e. probability and consequence) as indicated in Figure 4.4:

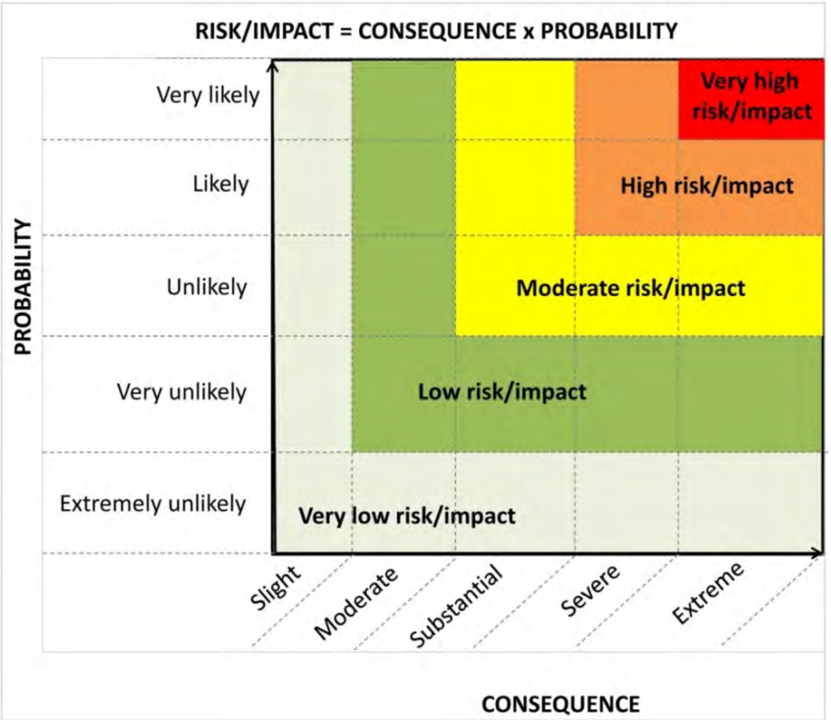

Figure 4.4: Guide to assessing risk/impact significance as a result of consequence and probability.

- **Significance** – Will the impact cause a notable alteration of the environment?
  - Very low (the risk/impact may result in very minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);
  - Low (the risk/impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);
  - Moderate (the risk/impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated);
  - High (the risk/impact will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making); and
  - Very high (the risk/impact will result in very major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making (i.e. the project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating)).

  With the implementation of mitigation measures, the residual impacts/risks will be ranked as follows in terms of significance (based on Figure 4.4):

  - Very low = 5;
  - Low = 4;
  - Moderate = 3;

- High = 2; and
- Very high = 1.

- **Status** - Whether the impact/risk on the overall environment will be:
  - Positive - environment overall will benefit from the impact/risk;
  - Negative - environment overall will be adversely affected by the impact/risk; or
  - Neutral - environment overall not be affected.

- **Confidence** – The degree of confidence in predictions based on available information and specialist knowledge:
  - Low;
  - Medium; or
  - High.

Impacts have been collated into the EMPr (Part B of the EIA Report) and these include the following:

- Quantifiable standards for measuring and monitoring mitigatory measures and enhancements will be set. This includes a programme for monitoring and reviewing the recommendations to ensure their ongoing effectiveness.
- Identifying negative impacts and prescribing mitigation measures to avoid or reduce negative impacts. Where no mitigatory measures are possible this is stated.
- Positive impacts and augmentation measures have been identified to potentially enhance positive impacts where possible.

Other aspects to be taken into consideration in the assessment of impact significance are:

- Impacts are evaluated for the construction and operation phases of the development. The assessment of impacts for the decommissioning phase is brief, as there is limited understanding at this stage of what this might entail. The relevant rehabilitation guidelines and legal requirements applicable at the time will need to be applied;
- Impacts have been evaluated with and without mitigation in order to determine the effectiveness of mitigation measures on reducing the significance of a particular impact;
- The impact evaluation has, where possible, taken into consideration the cumulative effects associated with this and other facilities/projects which are either developed or in the process of being developed in the local area (as described above and in Table 4.6); and
- The impact assessment attempts to quantify the magnitude of potential impacts (direct and cumulative effects) and outline the rationale used. Where appropriate, national standards are to be used as a measure of the level of impact.

Table 4.7 is used by specialists for the rating of impacts.

Table 4.7: Example of Table for Assessment of Impacts

Aspect/Impact Pathway	Nature of impact	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility	Irreplaceability	Mitigation Measures	Significance of Impact/Risk = Consequence x Probability		Ranking of Impact/ Risk	Confidence Level
										Without Mitigation	***With Mitigation***		
CONSTRUCTION PHASE (EXAMPLE)													
Clearing of 150 ha of vegetation	Loss of Habitat and Species	Negative	Site Specific	Long term	Substantial	Very Likely	Yes	Moderate	Undertake Plant Search and Rescue prior to the commencement of construction	Moderate	Low	4	Medium
	Susceptibility of soil erosion on exposed surfaces	Negative	Site Specific	Medium term	Moderate	Likely	Yes	Moderate	Implement an Erosion Management Plan throughout the construction Phase	Moderate	Low	5	High

4.9 TOR for the Specialist Studies

The TOR for the specialist studies essentially consist of the generic assessment requirements and the specific issues identified for each discipline. The TOR has been updated to include minor relevant comments received from I&APs and authorities during the 30-day review of the Scoping Reports and Addendums.

The following specialist studies have been identified based on the issues identified to date, as well as potential impacts associated with the project. The TOR for each specialist study is discussed below (as noted in the Plan of Study for EIA). However, it should be noted that the detailed scope and methodology of the specialist studies are included in each relevant study (included in Chapters 7 to 15 of this EIA Report). The specialist studies and associated specialists are shown in Table 4.8 below.

Table 4.8: Specialist Studies and Associated Specialists

NAME	ORGANISATION	ROLE/STUDY TO BE UNDERTAKEN
Simon Bundy	Sustainable Development Projects cc	Ecological Impact Assessment (including Terrestrial Ecology, Aquatic Ecology and Avifauna)
Henry Holland	Private	Visual Impact Assessment
Dr. Jayson Orton	ASHA Consulting (Pty) Ltd	Heritage Impact Assessment (Archaeology and Cultural Landscape)
Dr. John Almond	Natura Viva cc	Desktop Palaeontological Impact Assessment
Julian Conrad	GEOSS	Geohydrological Assessment
Johann Lanz	Private	Soils and Agricultural Potential Assessment
Rudolph du Toit	CSIR	Social Impact Assessment
Dr. P. S. van der Merwe and Dr. A. J. Otto	MESA Solutions (PTY) Ltd	EMI and RFI Studies

It should be noted that the Social Impact Assessment specialist study was subject to a peer review process by an external reviewer (Ms. Liza van der Merwe, a private consultant), as requested by the DEA.

In terms of air quality, during the pre-construction phase the site will need to be cleared of vegetation, although the clearing of vegetation will only occur where roads, the on-site substation, foundations etc. need to be constructed, and the rest of the site will only be brush cut. The areas where the vegetation is cleared will expose bare soil to wind and as a result, dust will likely be generated from the movement of construction vehicles on the site. The generation of dust is expected to be short term and only last for the duration of the construction period. Standard dust control interventions used in civil construction projects will be applied in order to minimise dust generation. These interventions and relevant management actions have been incorporated into the EMPr for the proposed project (Part B of the EIA Report). It must also be borne in mind that dust reduces the effectiveness of the PV panels and therefore it is in the operator's best interests to minimise the dust from the project site during the project lifetime.

In terms of waste and noise emissions, appropriate waste and noise management actions will be incorporated into the EMPr (Part B of the EIA Report).

In terms of traffic, the traffic volumes contributed by the construction and operation phases of the facility on the existing traffic volumes are considered acceptable. To this end, a Traffic Impact

Statement has been prepared by the EAP, which provides recommendations for inclusion in the EMPr (Part B of the EIA Report). The same approach was followed by the CSIR for the proposed Nieuwehoop Solar EIA (Phase 1) Project which has received positive EA.

Furthermore, the issues that have been addressed in the specialist studies are detailed in each specialist report included in Chapters 7 to 15 of this EIA Report.

4.9.1 Ecological Impact Assessment (including Terrestrial Ecology, Aquatic Ecology and Avifauna)

The Ecological Impact Assessment was undertaken with the following broad TOR:

- Identification of baseline ecological parameters, based upon the floral and faunal state of the preferred site;
- Consideration of ecological drivers upon the proposed sites;
- Consideration of possible changes in drivers as well as direct impacts that would arise as a consequence of the establishment of the proposed facility;
- Identification of significance of such change and integration into impact evaluation methods.
- Consideration of mitigation or avoidance measures that may be employed to obviate negative impacts that are identified in the evaluation processes; and
- Final consideration of planning and layout, as well as operations, will be undertaken to assist with the employment of the abovementioned mitigation measures.

Overall, the study includes the following tasks:

- Review detailed information relating to the project description and precisely define the environmental risks to the terrestrial and aquatic environment (including avifauna) and consequences for ecology.
- Draw on desktop information sources, the knowledge of local experts, information published in the scientific press and information derived from relevant EIAs and similar specialist studies previously conducted within the surrounding area.
- Compile a baseline description of the terrestrial and aquatic ecology (including avifauna) of the study area, and provide an overview of the entire study area in terms of ecological significance and sensitivity. The description will include the major habitat forms within the study sites, giving due consideration to terrestrial ecology (flora), terrestrial ecology (fauna) and freshwater ecosystems/wetlands. The desktop review will be undertaken using spatial data, SANBI conservation data, as well as other related information.
- Provide specific ecological data in respect of the floral, faunal and aquatic components of the site using ground-truthing methods, with an emphasis on those areas considered to be of “high” and possibly, “moderate” sensitivity (based on the desktop study).
- Based on the desktop study, undertake field work and spot sampling across the site to record relevant data and to compile an overview of the habitat under review.
- Collate all data collected during the field work and undertake a statistical review using methodologies that allows for comparison of biological data.
- Consider wetlands (endoreic pans) and associated water resources within the site in terms of significance within the catchment, habitat value and significance and delineation of extent through preliminary on site evaluation and the use of aerial imagery interpretation (where these arise).
- Undertake a faunal investigation on site based on the points identified during the preliminary aerial photographic interpretation.
- Incorporate relevant information from other specialist reports/findings if required.
- Provide a detailed terrestrial and aquatic ecological sensitivity map of the site, including mapping of disturbance and transformation on site.
- Identify and rate potential direct, indirect and cumulative impacts on the terrestrial and aquatic ecology, communities and ecological processes within the site during the construction, operation and decommissioning phases of the project. Study the cumulative impacts of the

project by considering the impacts proposed solar facilities, together with the impact of the proposed project.
- Provide input to the EMPr, including mitigation and monitoring requirements to ensure that the impacts on the terrestrial and aquatic ecology are limited.
- Compile an assessment report qualifying the risks and potential impacts on terrestrial and aquatic ecology in the study area and impact evaluations.
- Determine if a WUL is required and if so, determine the requirements thereof.

4.9.2 Visual Impact Assessment

The assessment follows the guidelines for Visual Impact Assessments provided by the Provincial Government of the Western Cape (PGWC) and CSIR (Oberholzer, 2005), and the Landscape Institute of the UK (GLVIA, 2002). Land Planning guides, Spatial Development Frameworks, and IPDs and other documentation relevant to the region have been referenced as part of the study.

The overall objectives of the Visual Impact Assessment specialist study are to identify and investigate potential visual impacts associated with the development of a large solar energy facility and its infrastructure near Kenhardt in the Northern Cape. The Visual Impact Assessment includes the following tasks:

- Describe, in sufficient detail, the existing landscape and visual conditions of the surrounding region to form a baseline against which impacts can be measured and compared;
- Identify potential visual impacts that may occur during construction, operational and decommissioning phases of the development, as well as future potential impacts that may occur if the plant is not developed (the "no go" option), both positive and negative impacts;
- Assess the severity and significance of the potential impacts in terms of direct, indirect and cumulative impacts;
- Provide recommendations with regards to potential monitoring programmes;
- Determine mitigation and/or management measures which could be implemented to reduce the effect of negative impacts, or enhance the effect of positive impacts, as far as possible; and
- Incorporate and address issues and concerns raised during the Scoping Phase of the EIA where they are relevant to the specialist's area of expertise.

The Visual Impact Assessment has been undertaken in the following manner:

- Desktop Review and Analysis
    - Undertake a desktop review to inform the assessment process in terms of documentation (e.g. municipal and regional planning policy, spatial development frameworks, legislation, national and international examples of similar developments) and availability of data (sensitive landscapes and visual receptors, spatial data for visibility analyses and landscape assessment). This also provides a basis for evaluating the confidence levels for the overall assessment.
    - Use a GIS and available spatial data during the desktop review to determine areas of scenic interest (Nature Reserves, sites of cultural importance, heritage sites), potential sensitive receptors (viewpoints, residences), preliminary zone of visual influence, and principal representative viewpoints.

- Field Survey
    - Undertake a field survey and make use of the results of the desktop analysis to provide the following:
        - Photographic record of landscape elements within the study area;
        - Photographic record of the visual baseline for views from principal viewpoints;
        - The actual zone of visual influence by determining the effect of vegetation, buildings and topography on visibility in the study area;
        - Identification of sensitive receptors (viewers and landscape elements that will be affected by the proposed development); and
        - State of the current nightscape of the region.

- Landscape Baseline
    - Develop a Landscape Baseline and incorporate results from the desktop review and field survey to provide a description of the existing character and condition of the landscape. Landscape character reflects various factors such as geology, topography, land cover/use and human settlements that combine in particular ways to form the landscape. These factors have been described, as well as the ways they combine to create unique landscape types within the study area. The landscape condition refers to the current state of the landscape in terms of human impact. The value attached to the landscape by local residents and other sensitive receptors has been determined where possible.

- Visual Baseline
    - Information gathered during the field survey on the influence of vegetation and topography on the potential visibility of the development provides a basis for determining the actual Zone of Visual Influence of the development, and the practical extents of the area for which the visibility analyses will be done. Cumulative viewsheds have been calculated for various components of the development, where possible. The viewsheds are used to determine the potential visibility of the various sites and elements, as well as to identify and classify visual receptors (viewers and principal representative viewpoints) in terms of their sensitivity to changes in the quality of their views.

- Impact Assessment, Mitigation and Report Writing
    - Identify and assess potential direct, indirect and cumulative visual impacts for the construction, operational and decommissioning phases of the project. Study the cumulative impacts of the project by considering the impacts of proposed solar facilities, together with the impact of the proposed project.
    - Compile a Visual Impact Assessment report that will focus on measures to reduce negative aspects, compensatory measures to offset negative aspects, and enhancement of positive aspects. Indicators for monitoring the efficacy of mitigation measures are suggested (for inclusion in the EMPr).

4.9.3 Heritage Impact Assessment (Archaeology and Cultural Landscape)

The following broad TOR has been specified for the Heritage Impact Assessment (including Archaeology and Cultural Landscape):

- Prepare and undertake a desktop study on the fossil heritage, archaeology, and heritage sites within the proposed project area.
- Undertake a detailed field examination of the archaeological sites and heritage features within or in the region of the development area.
- Describe the type and location of known archaeological sites and in the study area, and characterize all heritage items that may be affected by the proposed project.
- Describe the baseline environment and determine the status quo in relation to the specialist study.
- Record sites of archaeological relevance (photos, maps, aerial or satellite images, GPS co-ordinates, and stratigraphic columns).
- Evaluate the potential for occurrence of archaeological features within the study area.
- Identify if any permits are required from the relevant Heritage Authority, in terms of the NHRA, for the proposed project activities.
- Identify and rate potential direct, indirect and cumulative impacts of the proposed project on the archaeological heritage for the construction, operational and decommissioning phases of the project. Study the cumulative impacts of the project by considering the impacts of proposed solar facilities, together with the impact of the proposed project.

- Compile a report providing a review of archaeological heritage within the study area based on desktop study and new data from fieldwork and analysis.
- Provide recommendations and suggest appropriate mitigation measures (if required), for the recording, sampling and dating of any archaeological sites that could potentially be destroyed as a result of the proposed project.
- Provide recommendations and suggestions regarding archaeological heritage management on site, including conservation measures to ensure that the impacts are limited.
- Provide input to the EMPr, including mitigation measures and monitoring requirements to ensure that the impacts on the archaeology are limited.

4.9.4 Desktop Palaeontological Impact Assessment

Based on the low palaeontological sensitivity of the area a desktop Palaeontology Impact Assessment has been conducted. The Palaeontology Impact Assessment identifies possible palaeontological sites or features by making use of desktop sources. The study assesses the significance of such sites, describes the possible impact of the proposed project on these sites and provides recommendations for mitigation or monitoring measures where applicable. The desktop study is conducted in accordance with the requirements of the NHRA.

4.9.5 Geohydrological Assessment

The following broad TOR has been specified for the Geohydrological Assessment:

- Conduct a desktop study and review relevant literature pertaining to the site, and project plan. Obtain borehole data from the National Groundwater Archive (NGA) and plan for the field investigation.
- Complete the field work (hydrocensus) at the sites. The objectives of the field works are to:
  - Locate the NGA boreholes and complete a borehole assessment;
  - Locate boreholes not yet recorded on the NGA and complete assessments; and
  - Collect anecdotal information from the land owners in the area as well as from discussions with the DWS geohydrologists.
- Analyze all the data and assess the impacts relating to the sites. Identify and rate potential direct, indirect and cumulative impacts of the proposed project (in terms of geohydrology) for the construction, operational and decommissioning phases of the project. Study the cumulative impacts of the project by considering the impacts of proposed solar facilities, together with the impact of the proposed project.
- Compile a report providing the results and findings of the investigation, potential risks, any potential mitigation measures, monitoring requirements as well as relevant recommendations.
- Provide input to the EMPr, including mitigation measures and monitoring requirements to ensure that the impacts on the geohydrology are limited.
- Document the results in a report presenting the findings of the investigation, potential risks, any potential mitigation measures, monitoring requirements as well as relevant recommendations.

4.9.6 Soil and Agricultural Potential Assessment

The specialist study includes the following:

- Detailed assessment of soil conditions:
  - The EIA Phase assessment included a field investigation of soils and agricultural conditions across the site. This field investigation was aimed at ground proofing the existing land type information and understanding the specific soil and agricultural conditions and their variation on site.

- Assessment of erosion and erosion potential on site:
    - The field investigation included a visual assessment of erosion and erosion potential on site, taking into account the proposed development layout.

- Assessment of the impacts of specific construction activities and layout on loss of topsoil:
    - The EIA Phase will include an assessment of the specifics of construction activities and the proposed development layout on potential loss of topsoil, and the availability of topsoil for rehabilitation.

- Assessment of specific on-site agricultural activities
    - The EIA Phase will gather more detail on agricultural activity on the site and identify any locally important soil and agricultural issues. This will be done through interviews with farmers and agricultural role players in the area.

The report fulfils the TOR for an agricultural study as set out in the National Department of Agriculture's document, Regulations for the evaluation and review of applications pertaining to renewable energy on agricultural land, dated September 2011, with an appropriate level of detail for the agricultural suitability and soil variation on site (which may therefore be less than the standardised level of detail stipulated in the above regulations).

The above requirements together with requirements for a specialist report may be summarised as:

- Identify and assess all potential impacts (direct, indirect and cumulative) and economic consequences of the proposed development on soils and agricultural potential.
- Describe and map soil types (soil forms) and characteristics (soil depth, soil colour, limiting factors, and clay content of the top and sub soil layers).
- Map soil survey points.
- Describe the topography of the site.
- Summarise available water sources for agriculture.
- Describe historical and current land use, agricultural infrastructure, as well as possible alternative land use options.
- Describe the erosion, vegetation and degradation status of the land.
- Determine and map, if there is variation, the agricultural potential across the site.
- Determine and map the agricultural sensitivity to development across the site.
- Provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for all identified impacts.

4.9.7 Social Impact Assessment

The Social Impact Assessment includes:

- A review of existing information, and collecting and reviewing baseline social information etc.
- Conducting interviews with key affected parties, including local communities, local landowners, key government officials (local and regional) etc.
- An identification and assessment of key social issues and potential impacts (negative and positive) associated with the construction, operational and decommissioning phases of the project.
- An identification of potential mitigation and enhancement measures.
- A specialist report which includes an assessment of the potential social impacts associated with the proposed project.
- An outline of mitigatory measures and additional management or monitoring guidelines.
- Provide input to the EMPr, including mitigation and monitoring requirements to ensure that negative social impacts are limited.

4.9.8 EMI and RFI Studies

- **Background to the Need for the EMI and RFI Studies:**

As noted above, the Astronomy Geographic Advantage (Act 21 of 2007) aims is to provide for the preservation and protection of areas within the Republic that are uniquely suited for optical and radio astronomy; to provide for intergovernmental co-operation and public consultation on matters concerning nationally significant astronomy advantage areas; and to provide for matters connected therewith.
The proposed project site falls within 20 km of a SKA station (SKA Station ID 2362), and according to the SKA Project Office, based on distance to the nearest SKA station, the location of the station, and the information currently available on the design of the proposed PV installation, the proposed facility poses a medium to high risk of detrimental impact on the SKA.

The SKA also recommended (as shown in Appendix G of this EIA Report) that any transmitters that are to be established at the site for the purposes of voice and data communication will be required to comply with the relevant Astronomy Geographic Advantage Act (Act 21 of 2007) (AGA Act) Regulations (currently out for public comment) concerning the restriction of use of the radio frequency spectrum that applies in the study area. Furthermore, the SKA Project Office recommended that further EMI and RFI studies be undertaken. In line with this, the Project Applicant has commissioned these studies and has appointed MESA Solutions (PTY) Ltd to conduct the RFI and EMI studies to determine the level of mitigation shielding required in order to comply with the SKA Regulations. The technical report is included in Appendix K of this EIA Report, with a summary provided in Chapter 15. This technical report aims to inform the potential impact that the proposed project will have on the SKA project and to determine suitable mitigation measures to manage the risk (if any) posed to the SKA project by the development of this project.

As noted above, the South African MeerKAT radio telescope, which is a precursor to the SKA telescope, is currently being constructed about 90 km north-west of Carnarvon in the Northern Cape Province. The telescope receivers of the SKA are sensitive and there is a risk that the infrastructure associated with the proposed Solar PV projects will desensitise the telescope receivers causing interference and/or loss of data. This interference is generally referred to as RFI.

As additionally noted above, the purpose of the AGA Act is to preserve the geographic advantage areas that attract investment in astronomy. The AGA Act also notes that declared astronomy advantage areas are to be protected and properly maintained in terms of RFI. The Kenhardt PV 1, Kenhardt PV 2 and Kenhardt PV 3 projects fall within the Karoo Central Astronomy Advantage areas, which are protected against unnecessary EMI under the AGA Act.

In general, the dominating EMI produced by PV facilities are mainly in the form of switching noise from power electronics in the inverters or conditioning units, as well as clock signals from microprocessor control boards.

- **Scope of Work for the EMI and RFI Studies:**

A desktop analysis was undertaken to determine technology risks of the three proposed Solar PV facilities, as well as the identification of potential interference sources. A basic review and overview of the design of the proposed Solar PV facilities was undertaken, with the inclusion of mitigation recommendations to limit excessive RFI produced by the proposed facilities.

The detailed scope of work is included in the technical report (Appendix K of the EIA Report). It is important to note that the findings from EMI and RFI assessment will be taken into account by the SKA Project Office during their own propagation analysis. The EMI and RFI assessment is therefore not meant to supersede any investigation done by SKA. If the specified emission limits are exceeded, the type of components used in the proposed PV facilities and the proposed manner of connection will be reviewed to potentially alleviate the emission limits. Potential mitigation measures to reduce emission levels will be recommended as part of the final design.

The EMI and RFI studies include a cumulative assessment including all three proposed PV plants, as well as the proposed Nieuwehoop Solar Phase 1 and Phase 2 Development.

4.10 Key Milestones of the EIA Process

Key Milestones activities	Proposed Timeframe
Pre-Application Meeting with the DEA	17 September 2015
I&AP, Stakeholder and Authority Review of the Scoping Reports: 30 days	September 2015 – October 2015
I&AP, Stakeholder and Authority Review of the Addendums to the Scoping Reports: 30 days	October 2015 – November 2015
Submit Scoping Reports to the DEA for Decision-making.	November 2015
Review of the Scoping Reports by the DEA (i.e. accept or refuse EA): 43 days since receipt of the Scoping Reports.	November 2015 – December 2015
I&AP, Stakeholder and Authority Review of the EIA Reports: 30 days	February 2016 – March 2016 (Current Stage)
Submit EIA Reports to the DEA for Decision-making.	April 2016
Review of the EIA Reports by the DEA (i.e. grant or refuse EA): 107 days since receipt of the EIA Reports.	April 2016 – July 2016
Next steps: 5 days for notification to applicant	

EIA REPORT

CHAPTER 5:

Project Alternatives

Scoping and **Environmental Impact Assessment** for the Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province

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5 APPROACH TO THE ASSESSMENT OF ALTERNATIVES

This chapter discusses the alternatives, as well as the selection process of the preferred alternatives that have been considered and assessed as part of the EIA Phase. The 2014 EIA Regulations (GN R982) define "alternatives", in relation to a proposed activity, "as different means of meeting the general purpose and requirements of the activity, which may include alternatives to the:

- property on which or location where the activity is proposed to be undertaken;
- type of activity to be undertaken;
- design or layout of the activity;
- technology to be used in the activity; or
- operational aspects of the activity; and
- includes the option of not implementing the activity".

The following objectives apply to the consideration of alternatives during the Scoping Phase (as indicated in Appendix 2 of the 2014 EIA Regulations):

- To identify and confirm the preferred activity and technology alternative through an impact and risk assessment and ranking process; and
- To identify and confirm the preferred site, through a detailed site selection process, which includes an impact and risk assessment process inclusive 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.

The Scoping Report therefore provided a full description of the process followed to reach the proposed preferred activity, site and location within the site, including details of all the alternatives considered and the outcome of the site selection matrix. For additional information regarding the alternatives that were considered during the Scoping Phase, refer to the finalised Scoping Report (CSIR, 2015).

Sections 24(4) (b) (i) and 24(4A) of the NEMA require an EIA to include investigation and assessment of impacts associated with alternatives to the proposed project. In addition, Section 24O (1)(b)(iv) also requires that the Competent Authority, when considering an application for EA, takes into account "where appropriate, any feasible and reasonable alternatives to the activity which is the subject of the application and any feasible and reasonable modifications or changes to the activity that may minimise harm to the environment".

Therefore, the assessment of alternatives should, as a minimum, include the following:

- The consideration of the no-go alternative as a baseline scenario;
- A comparison of the reasonable and feasible alternatives; and
- Providing a methodology for the elimination of an alternative.

5.1 Assessment of Alternatives

5.1.1 No-go Alternative

The no-go alternative assumes that the proposed project will not go ahead i.e. it is the option of not constructing the proposed Kenhardt PV 3 project. This alternative would result in no environmental impacts on the site or surrounding local area. It provides the baseline against which other alternatives are compared and will be considered throughout the report. The following implications will occur if the "no-go" alternative is implemented:

- No benefits will be derived from the implementation of an additional land-use;
- No additional power will be generated or supplied through means of renewable energy resources by this project at this location. The proposed 75 MW facility is predicted to generate approximately 200 GW/h per year which could power 20 000 households;
- The "no go" alternative will not contribute to and assist the government in achieving its proposed renewable energy target of 17 800 MW by 2030;
- Additional power to the local grid will need to be provided via the Eskom grid, with approximately 90% coal-based power generation with associated high levels of CO_2 emissions and water consumption;
- Electricity generation will remain constant (i.e. no additional renewable energy generation will occur on the proposed site) and the local economy will not be diversified;
- Local communities will continue their dependence on agriculture production and government subsidies. The local municipality's vulnerability to economic downturns will increase because of limited access to capital;
- There will be no opportunity for additional employment in an area where job creation is identified as a key priority. Between 90 and 150 skilled and 400 and 460 unskilled employment opportunities are expected be created during the construction phase. Approximately 20 skilled and 40 unskilled employment opportunities will be created over the 20 year lifespan of the proposed facility;
- There will be lost opportunity for skills transfer and education/training of local communities;
- The positive socio-economic impacts likely to result from the project such as increased local spending and the creation of local employment opportunities will not be realised; and
- The local economic benefits associated with the REIPPPP will not be realised, and socio-economic contribution payments into the local community trust will not be realised.

Converse to the above, the following benefits could occur if the "no-go" alternative is implemented:

- There will be no development of solar energy facilities at the proposed location;
- Only the agricultural land use will remain;
- No threatened vegetation will be removed or disturbed during the development of these facilities;
- No change to the current landscape will occur;
- No additional transmission lines and additional electrical infrastructure will be constructed; and
- No additional water use during the construction phase and the cleaning of panels during the operational phase.

It is important to take into account that the country is facing serious power and water shortages due to its heavy dependency on fossil fuels such as coal. There is therefore a need for additional electricity generation options to be developed throughout the country. As discussed in Chapter 1 of this EIA Report, the purpose of the proposed Kenhardt PV 3 project is to feed electricity generated by a renewable energy resource into the national electricity grid. Many other socio-economic and environmental benefits will result from the development of this project such as development of renewable energy resources in the country and contribution to the increase of energy security, employment creation and local economic development (as noted above).

Hence, while the "no-go" alternative will not result in any negative environmental impacts; it will also not result in any positive community development or socio-economic benefits. It will also not assist government in addressing climate change, reaching its set targets for renewable energy, nor will it assist in supplying the increasing electricity demand within the country. <u>Hence the "no-go" alternative is not a preferred alternative.</u>

5.1.2 Land-use Alternatives

5.1.2.1 Agriculture

At present the proposed site is zoned for agricultural land-use, and is mainly used for livestock grazing. As noted in Chapter 3 of this EIA Report, agricultural potential is uniformly low across the preferred and alternative sites and the choice of placement of the proposed facility on the farm therefore has minimal influence on the significance of agricultural impacts. No agriculturally sensitive areas occur within the site. Hence, agricultural land use is not a preferred alternative. A Soils and Agricultural Potential Assessment has been conducted as part of the EIA Phase (Chapter 12 of this EIA Report) in order to assess the potential impacts of the proposed development on soils and agricultural potential. As indicated in the Soils and Agricultural Potential Assessment, none of the potential impacts identified have been rated with a high significance with the implementation of mitigation measures. It is important to re-iterate that the economic benefits to the farmer associated with the proposed Solar PV Facility are likely to be more significant than that of the current agricultural activities on site and these two land uses (agriculture and renewable energy generation) can potentially both be undertaken on site. This aspect is also addressed in the Soils and Agricultural Potential Assessment (Chapter 12 of this EIA Report). **Hence, the sole use of the land for agriculture is not a preferred alternative.**

5.1.2.2 Renewable Energy Alternatives

Where the "activity" is the generation of electricity, possible reasonable and feasible land-use alternatives for the proposed properties include Biomass, Hydro Energy and Wind Energy. However, based on the preliminary investigations undertaken by the Project Applicant, no other renewable energy technologies are deemed to be appropriate for the site. The unsuitability of other renewable energy developments for the site is discussed below.

- **Biomass Energy**

The proposed project site lacks any abundant or sustainable supply of biomass. According to the South African Renewable Energy Resource Database (SARERD), the project site is identified as having no cumulative biomass energy potential (as shown in Figure 5.1). Certain areas within the KwaZulu-Natal province, for example, have a good biomass energy potential ranging between 101 GJ/ha/year and 500 GJ/ha/year (as shown in Figure 5.1). However, based on the SARERD, the implementation of a Biomass Facility at the proposed site in the Northern Cape is therefore considered to be an **unfeasible and unreasonable** alternative to the implementation of the proposed solar PV energy facility.

- **Hydro Energy**

The proposed project site lacks any large inland water bodies, which precludes the possibility of renewable energy from small/large scale hydro generation. In terms of micro hydro power potential, the SARERD has classified the proposed project site as "Not Suitable" (as shown in Figure 5.2). The SARERD classifies certain areas within the Western Cape and the Drakensberg as having an excellent micro hydro power potential. However, based on the SARERD, the implementation of a Hydro Energy Facility at the proposed site is therefore also considered to be an **unfeasible and unreasonable** alternative to the implementation of the proposed solar PV energy facility.

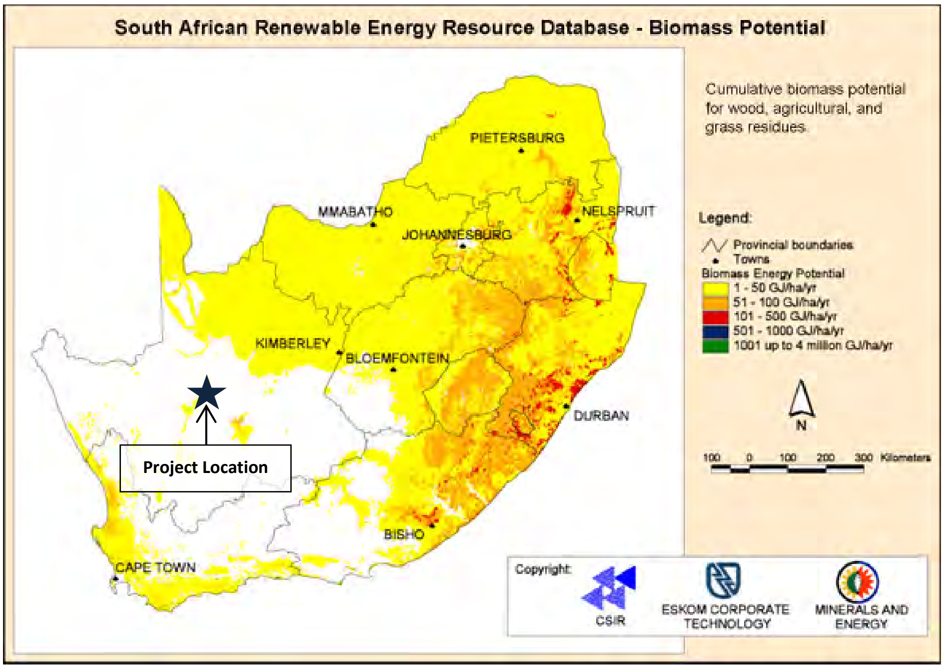

Figure 5.1: Biomass Potential (Source: SARERD)

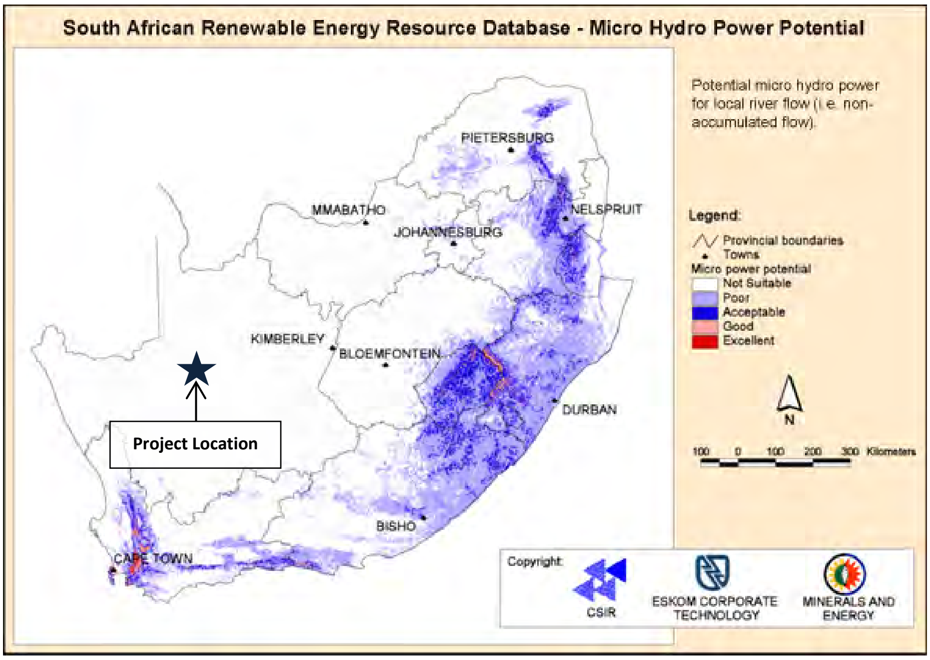

Figure 5.2: Micro Hydro Power Potential (Source: SARERD)

- **Wind Energy**

Wind energy is considered to be the most feasible alternative to solar energy when compared to biomass and hydro energy; however the site specific requirements of wind energy facilities make it a less feasible alternative when compared to solar PV. In order to ensure that a wind energy facility is successful, a reliable wind resource is required. A wind resource is defined in terms of average wind speed, turbulence, and direction. Measurements provided by the Wind Atlas of South Africa (WASA) indicate that the mean wind speed is the highest at the coastal regions of South Africa (as shown in Figure 5.3), making wind energy an **unfeasible or unreasonable alternative** for the proposed project area in the Northern Cape province when compared to the availability of solar radiation resources.

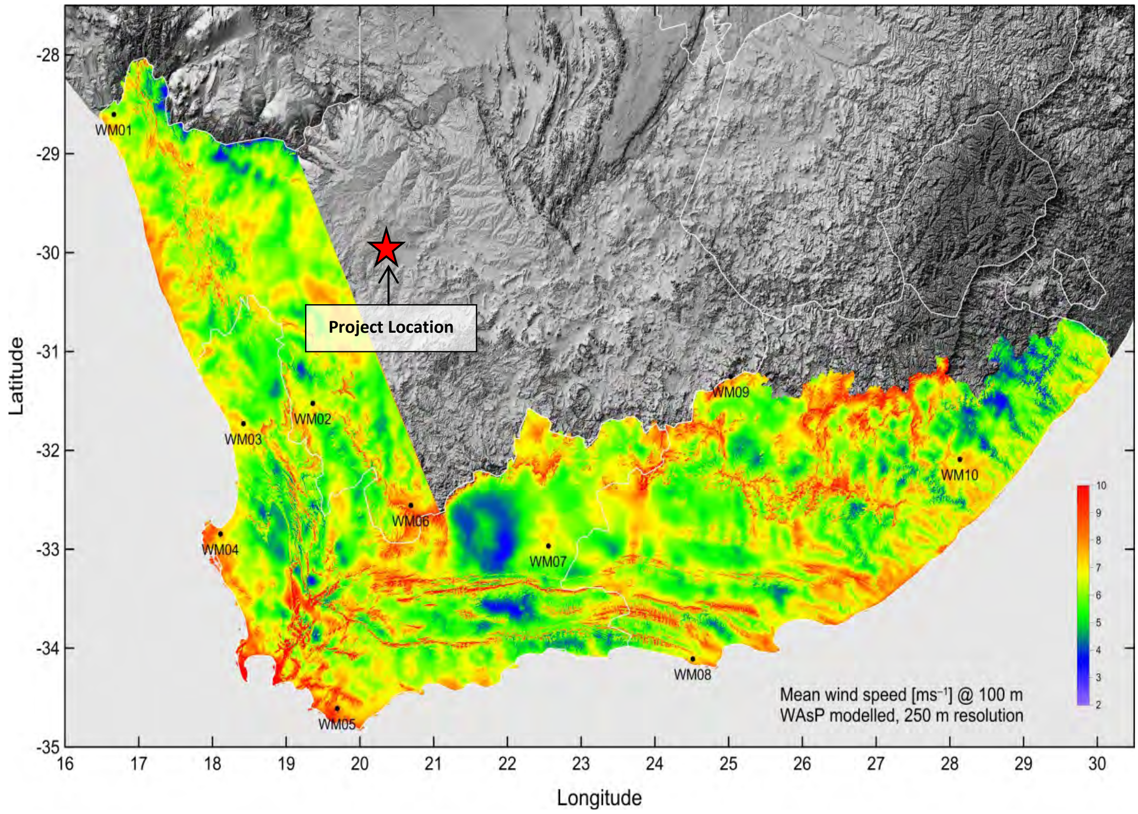

Figure 5.3: Representation of Mean Wind Speed (ms-1 at 100 m) (Source: WASA, 2014)

- **Solar Energy**
  - *National Level Considerations: Solar Radiation*

The north-western part of South Africa has the highest Global Horizontal Irradiation[1] (GHI), relevant to PV installations (Figure 5.4) and Direct Normal Irradiance[2] (DNI), relevant to CPV and tracking PV installations (Figure 5.5). Therefore, this section of South Africa is deemed the most suitable for the construction and operation of solar energy facilities as opposed to other areas and provinces within South Africa. For example, coastal regions within KwaZulu-Natal, Eastern Cape and Western Cape mainly have a solar radiation between 1500 kWh/m^2 and 1700 kWh/m^2 per annum, which is not completely feasible for the proposed projects. On the other hand, the Northern Cape (the area with the predominant pink shading in Figure 5.4) has a solar radiation of 2300 kWh/m^2 per annum, which is the highest level. Various developers have received several approvals for PV facilities on farms in the Northern Cape, which shows and justifies the suitability of this area for this type of development. **Therefore, the area proposed for Kenhardt PV 3 project is deemed the most suitable for the construction and operation of solar energy facilities.**

[1] Global Horizontal Irradiance is the total amount of shortwave radiation received from above by a surface horizontal to the ground

[2] Direct Normal Irradiance is the amount of solar radiation received per unit area by a surface that is always held perpendicular (or normal) to the rays that come in a straight line from the direction of the sun at its current position in the sky.

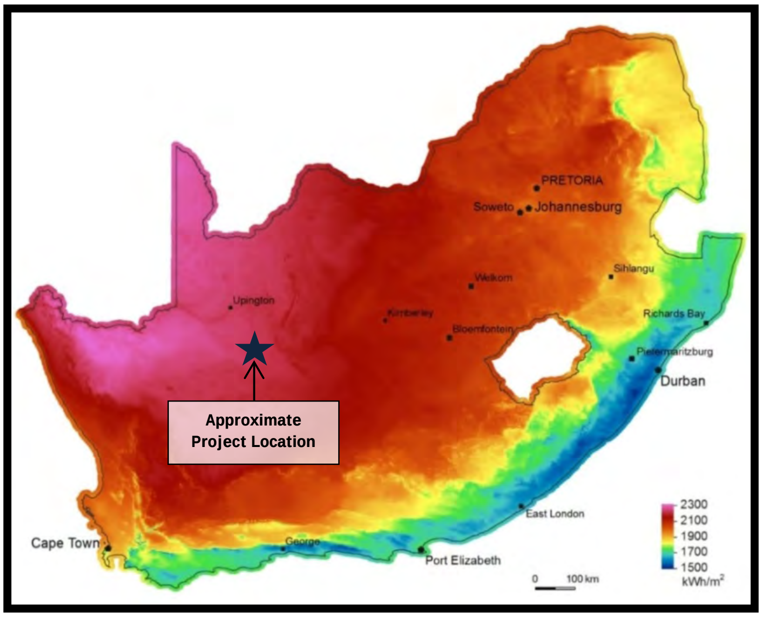

Figure 5.4: Solar Resource Availability in South Africa (Source: SolarGIS map© 2013 GeoModel Solar).

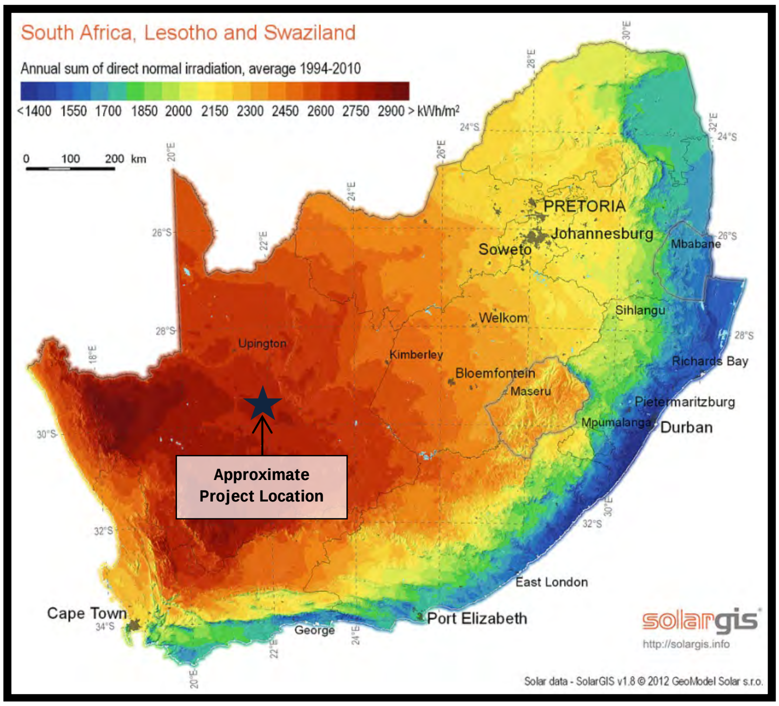

Figure 5.5: Direct Normal Irradiation of South Africa (Source: SolarGIS map© 2014 GeoModel Solar).

- *REIPPPP and SEA for Wind and Solar PV in South Africa*

The Integrated Resource Plan for South Africa for the period 2010 to 2030 (referred to as "IRP2010") and the IRP Updated Report (2013) proposes to secure 17 800 MW of renewable energy capacity by 2030. The DOE subsequently has entered into a bidding process for the procurement of 3725 MW of renewable energy from IPPs by 2016 and beyond to enable the Department to meet this target. On 18 August 2015, an additional procurement target of 6300 MW to be generated from renewable energy sources was added to the REIPPPP for the years 2021 - 2025, as published in

Government Gazette 39111. The additional target allocated for wind energy, solar PV energy, and solar CSP energy is 3040 MW, 2200 MW, and 600 MW respectively.

In order to submit a bid, the proponent is required to have obtained an EA in terms of the EIA Regulations as well as several additional authorisations or consents. It has been determined that even though the current processes will enable renewable energy to be fed into the national grid, the REIPPPP does have certain inefficiencies. As noted in Chapter 1 of this EIA Report, to this end, the National DEA, in discussion with the DOE, has been mandated by MinMec to undertake a SEA[3] to identify the areas in South Africa that are of strategic importance for Wind and Solar PV development. The Wind and Solar PV SEA is in support of the Strategic Infrastructure Plan (SIP) 8, which focuses on the promotion of green energy in South Africa. The SEA aims to identify strategic geographical areas best suited for the roll-out of large scale wind and solar PV energy projects, referred to as REDZs. Through the identification of the REDZs, the key objective of the SEA is to enable strategic planning for the development of large scale wind and solar PV energy facilities in a manner that avoids or minimises significant negative impact on the environment while being commercially attractive and yielding the highest possible social and economic benefit to the country – for example through strategic investment to lower the cost and reduce timeframes of grid access[4]. Following the completion of the SEA, the proposed REDZs, shown in Figure 5.6, will be submitted for Cabinet approval for the rollout of solar PV energy in the Northern Cape, Eastern Cape, Western Cape and Free State provinces.

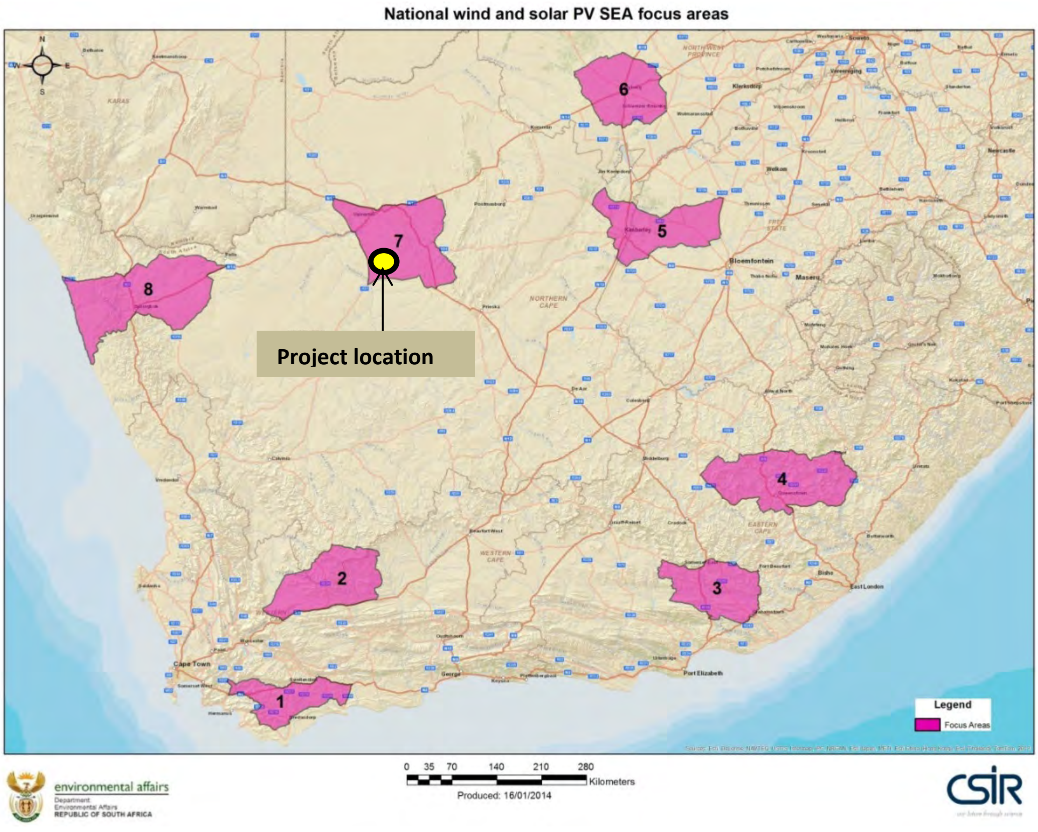

Figure 5.6: Renewable Energy Development Areas identified in the Strategic Environmental Assessment (the proposed project falls within the REDZ 7 (Upington)) REDZ 1: Overberg; REDZ 2: Kromberg; REDZ 3: Cookhouse; REDZ 4: Stormberg; REDZ5: Kimberley; REDZ 6: Vryburg; REDZ 7: Upington; REDZ 8: Springbok).

[3] Information on this process can be obtained at:
http://www.csir.co.za/nationalwindsolarsea/background.html

[4] More information on the SEA can be read at https://redzs.csir.co.za/

As previously noted, the proposed solar facility currently falls within the REDZ 7. The proposed project is therefore in line with the criteria of the SEA and located in an area of strategic importance for Solar PV development. It should be noted that even if a project falls within a REDZ, the proposed development still requires site specific assessments as per the site protocol (still in development and not yet promulgated) in order to determine the potential impacts of a project at a local and site specific level.

Therefore, the implementation of a solar energy facility at the proposed project site is more favourable and feasible than other alternative energy facilities (i.e. for generating 20 MW or more from a renewable resource). Therefore in terms of project and location compatibility, the proposed solar facility is considered to be the most feasible renewable energy land use alternative. Since these alternative land-uses were deemed unsuitable for the area, these technologies have not been further assessed during the EIA Phase. Only solar energy has been assessed as part of the EIA Phase. Furthermore, it is important to note that solar energy development (i.e. not wind energy, hydro power and biomass) is the Project Applicant's core business area and focus. The experience that the Project Applicant has within the solar energy development industry will positively benefit the proposed project.

Furthermore, from an impact and risk assessment perspective, the implementation of a solar PV project on the remaining extent of Onder Rugzeer Farm 168 will result in fewer risks and low significance impacts in comparison to the implementation of wind energy, hydro power and biomass. The risks and impacts are described in Table 5.1 below.

Table 5.1: Evaluation of Potential Risks and Impacts for Renewable Energy Alternatives

Type of Renewable Energy	Potential Impacts and Risks
Biomass Energy	▪ Based on the SARERD, the project site has no cumulative biomass energy potential. Therefore, a biomass facility will be unfeasible at the proposed project site. If a biomass facility was to be constructed instead of a solar facility, it will create significant negative socio-economic implications as it would not be feasible in terms of operations. It will most likely use valuable municipal resources without contributing to the local economy in a beneficial manner. A biomass facility is also likely to result in unnecessary pollution due to waste generation (especially waste water generated during the operational phase of the biomass facility), traffic impacts and air emissions as a result of operations. A biomass facility is likely to create traffic impacts as the material required for the plant (i.e. biomass) would need to be transported to the site on a regular basis during the relevant seasons.
Hydro Energy	▪ Based on the SARERD, the project site is not suitable in terms of hydro energy potential. Hydro power is also not noted as a renewable energy source in terms of the municipal IDP. As with biomass, a hydro power facility will be unfeasible and not possible at the proposed project site. If a hydro power was to be constructed instead of a solar facility, it will create significant negative socio-economic implications as it would not be feasible in terms of operations.
Wind Energy	▪ Wind energy facilities require that wind turbines are spaced a significant distance from one another. Due to the fact that there is only a certain amount of land available for development, the implementation of a wind energy facility would not make optimum use of that land which is available. ▪ The total development area required for the implementation of a wind energy project is much higher than that required with a solar energy facility, resulting in additional potential environmental impacts (such as soil erosion, impacts on nearby watercourses and impact on the geohydrology). ▪ A wind facility would generate additional noise during the operational phase as compared to a solar energy facility. ▪ The average wind speeds or wind resources at the proposed sites are not favourable for the development of a wind energy facility at the sites.
Solar Energy	▪ The solar resources available across the proposed project site are better and

Type of Renewable Energy	Potential Impacts and Risks
	represent a higher yield than the biomass, hydro or wind resources available across the same site. ▪ The proposed solar facility currently falls within the REDZ 7, which is an area of strategic importance for large scale Solar PV development (as discussed above and in Chapter 1 of this EIA Report). ▪ There is a possibility that the proposed solar energy facility will still provide an opportunity for the current land use (i.e. grazing) to continue during operations. Additional information regarding the agricultural potential of the site is provided in Chapter 12 of this EIA Report. ▪ Additional potential impacts relating to the proposed Kenhardt PV 3 project are noted in the relevant specialist studies that are included Chapters 7 to 14 of this EIA Report.

Table 5.2 also presents a summary and an evaluation matrix for the possible land-use alternatives with regards to resource suitability and availability, strategic alignment, and potential risks and impacts.

Table 5.2: Summary of Evaluation of Potential Risks and Impacts for Renewable Energy Alternatives

Type of Renewable Energy Alternative	Are suitable resources available at the proposed project site?	Is there Strategic Alignment?	Main Potential Impacts and Risks	Is this the preferred Alternative?
Biomass Energy	▪ No – not suitable	▪ No	▪ Significant Waste Generation ▪ Air Emissions	▪ No
Hydro Energy	▪ No – not suitable	▪ No	▪ Not suitable	▪ No
Wind Energy	▪ No	▪ No	▪ Visual ▪ Noise Generation ▪ Bird and bat collisions	▪ No
Solar Energy	▪ Yes - 2100 - 2300 kWh/m^2	▪ Yes – REDZ 7	▪ Visual ▪ Impacts on heritage resources ▪ Impacts on avifauna, aquatic ecology and terrestrial ecology ▪ Additional impacts are included in the specialist studies (Chapters 7 to 14 of this EIA Report)	▪ Yes – REDZ 7

5.1.3 Site Alternatives

As noted above, the Scoping Report included information regarding how the preferred site was determined through a site selection process. Within this context, it was assumed that the "site" referred to in the 2014 EIA Regulations is the farm or land portions on which proposed location alternatives were considered for the proposed project (discussed in Section 5.1.4 below).

As discussed in Chapter 1 of this EIA Report, as well as Section 5.1.2 above, the preferred and alternative sites within the Northern Cape were selected based on national level considerations (high solar radiation in the Northern Cape, as opposed to other provinces within South Africa) and the fact that the proposed sites currently fall within the REDZ 7. On a site specific (local) level, the site was deemed suitable due to all the site selection factors (such as land availability, distance to the national grid, site accessibility, topography, fire risk, current land use and landowner willingness) being favourable. The site selection criteria considered by the Applicant are discussed in detail below.

5.1.3.1 Site Specific Considerations

On a local (site specific) level, the site selection process took into account the following factors shown in Table 5.3.

Table 5.3: Site selection factors and suitability of the site

FACTOR	SUITABILITY OF THE PREFERRED SITE
Land Availability	The remaining extent of Onder Rugzeer Farm 168 is of a suitable size for the proposed project. The land available to develop at the preferred site for Kenhardt PV 3 extends approximately 1341 ha (not 1000 ha as originally noted in the finalised Scoping Report, as explained in Chapter 1 of this EIA Report), however only an estimated 250 ha will be required for the proposed project (i.e. Kenhardt PV 3).
Irradiation Levels	2100 - 2300 kWh/m^2 (as shown in Figure 5.4)
Distance to the Grid	An Environmental Authorisation for the construction of the 400/50 50 kV Eskom Nieuwehoop Substation was granted to Eskom Holdings SOC Limited on 21 February 2011 by the DEA (Reference Number: 12/12/20/1166). Site preparation and construction of the substation has commenced and is currently underway. An Environmental Authorisation (DEA Reference Number: 12/12/20/2606; NEAS Reference Number: DEA/EIA/0000785/2011), dated 14 February 2014, was also granted to Eskom Holdings SOC Limited to construct, *inter alia*, the following within the existing development footprint of the Nieuwehoop Substation: - 2 x 400 kV transformer feeder bay; - A 400 / 132 kV transformer; - 132 kV busbar; - 400 / 132 kV 500 MVA x 3 transformers; and - 8 x 132 kV feeder bays and associated lines. The proposed project will be located approximately 3 km from the Eskom Nieuwehoop Substation.
Site Accessibility	The proposed project site can be accessed via an existing gravel road and the existing Transnet Service Road (private). The existing gravel road can be accessed from the R383 Regional Road via the R27 National Road. The R27 extends from Keimoes (in the north) to Vredendal in the south. The Transnet Service Road can be accessed from the R27. Internal gravel roads will be constructed as part of the proposed project (as discussed in Chapter 2 of the EIA Report).
Topography	Slope ≤2% (Level to very gentle slope).
Fire Risk	Main vegetation type is Bushman arid grassland, low fire risk.
Current Land Use	Agriculture - Grazing
Landowner Willingness	The landowner has signed consent for the use of the land for the proposed projects. This is considered an important aspect of the proposed project in terms of its viability (i.e. this will limit potential appeals during the decision-making process, as the landowner is willing and supportive of the proposed projects being undertaken on the farm).

Furthermore, from an impact and risk assessment perspective, the implementation of a solar PV project on the remaining extent of Onder Rugzeer Farm 168 will result in fewer risks in comparison to its implementation at the alternate sites (that were considered during the Scoping Phase) within the Northern Cape (i.e. regions with similar irradiation levels). The following risks and impacts will be likely in this case:

- There is no guarantee that suitable land will be available for development of a solar PV facility. Site geotechnical conditions, topography, fire potential and ready access to a site might not be suitable, thus resulting in negative environmental implications and reduced financial viability.
- There is no guarantee that the current land use of alternative sites (that were considered during the Scoping Phase) will be flexible in terms of development potential, for example the agricultural potential for alternative sites might be higher and of greater significance.
- There is no guarantee of the willingness of other landowners to allow the implementation of a solar facility on their land and if the landowners strongly object, then the project will not be feasible.
- There is no guarantee that other sites within the Northern Cape will be located close to existing or proposed electrical infrastructure to enable connection to the national grid. The further away a project is from the grid, the higher the potential for significant environmental and economic impacts.

As previously noted, the proposed Kenhardt PV 3 facility is one part of a bigger project by Scatec Solar to develop three Solar PV Facilities in total. The main determining points for Scatec Solar was to find suitable, developable land in one contiguous block to optimise design, minimise costs, and minimise sprawling development and impact footprints. In addition, the proximity to the Eskom Nieuwehoop Substation was a major determinant for identifying suitable sites for the proposed development.

Given the site selection requirements associated with solar energy facilities and the suitability of the land available on the remaining extent of Onder Rugzeer Farm 168, no other site alternatives have been considered in the EIA Phase.

5.1.4 Location Alternatives

Figure 5.7 shows the location alternatives that were initially considered by the Applicant during the Scoping Phase for all three PV facilities, as well as the preferred sites (that are assessed as part of the EIA). Figure 5.7 also shows the electrical infrastructure corridor (within which the transmission lines will be constructed to support each Solar PV project), which is being assessed as part of separate BA Processes.The alternative site (assessed during the Scoping Phase) and the preferred site are suitable in terms of size requirements, i.e. larger than 250 ha which is required for the proposed Kenhardt PV 3 facility and still falls within the boundaries of the remaining extent of Onder Rugzeer Farm 168 which, as discussed above, has been deemed a suitable site for the proposed development.

As shown in Figure 5.7 and discussed in Chapter 1 of this EIA Report, the current project proposal is one of three PV projects proposed on site. As noted above, the proximity of the two site locations (preferred and alternative) for the Kenhardt PV 3 project to the Nieuwehoop Substation (currently being constructed) was the main consideration in terms of technical and economic feasibility of what the preferred site is. Based on the desktop assessment undertaken to identify the sensitivities on site, both site localities (i.e. the alternative site that was assessed at the Scoping Phase and the preferred site) are expected to be fairly homogenous in terms of environmental features on site. The sensitive environmental features found within the preferred site, as described in the specialist studies (Chapters 7 to 14 of this EIA Report) and discussed in the conclusions chapter of this EIA Report (Chapter 16) are able to be avoided by the location, layout and design of the project. A preliminary site layout is provided in Chapter 16 and Appendix J of this EIA Report, which avoids all the environmental sensitivities identified on site. Chapter 3 of this EIA Report also provides high-level input from the specialists in terms of a description of the alternative site that was considered during the Scoping Phase (i.e. Kenhardt PV 3b).

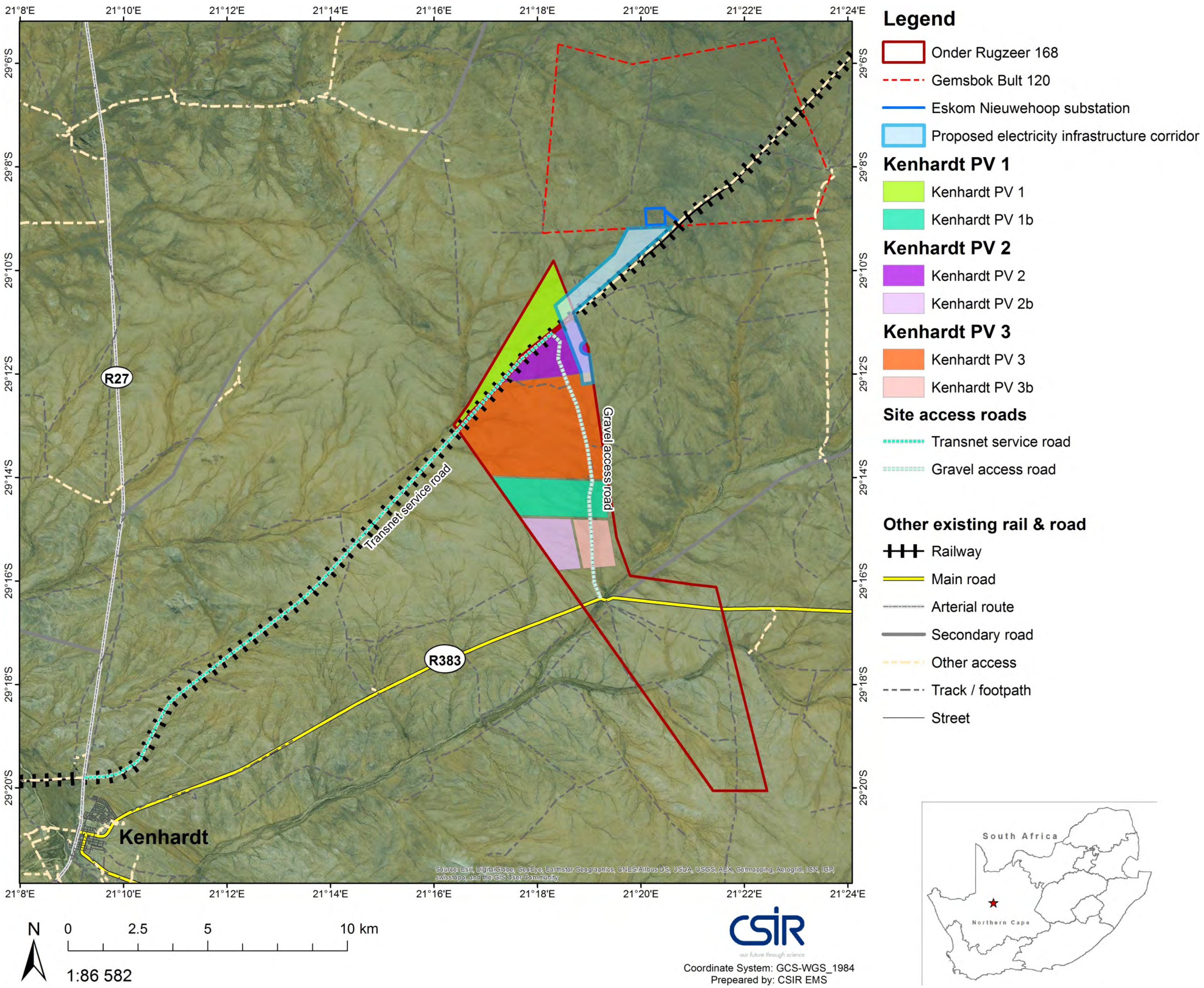

Figure 5.7: Scatec Solar Kenhardt PV 1, Kenhardt PV 2, and Kenhardt PV 3 projects as well as the alternative PV sites (that were considered during the Scoping Phase) and the electricity infrastructure corridor for the proposed transmission lines (which is being assessed separately as part of the BA Processes).

Therefore, the preferred site (i.e. Kenhardt PV 3) is favoured for the proposed project based on the following:

- The alternative Kenhardt PV 3b site (that was assessed during the Scoping Phase) is located too far south from the Eskom Nieuwehoop Substation, which therefore significantly reduces the financial viability of the proposed project as additional costs are required for longer transmission lines. Longer power lines may also result in additional environmental impacts. Therefore, the closer the site is to the Eskom Nieuwehoop Substation will reduce potential economic and environmental impacts, and improve the feasibility of the proposed project.
- The alternative site (that was assessed during the Scoping Phase) is located closer to the landowner's residence, therefore it would be better to locate the proposed PV facility a greater distance from the farm house (i.e. at the preferred site) to enable a certain level of privacy.
- The alternative site (that was assessed during the Scoping Phase) lies closer to the main public road (i.e. R383), resulting in safety concerns, higher visual intrusion on the sense of place and increased risk of theft during the construction and operational phases.

As noted above, the preferred site includes approximately 1341 ha of land. The proposed project only requires approximately 250 ha of land; therefore there is scope to avoid major environmental constraints through the final design of the facility. During the EIA Phase, the specialists have identified sensitive features on the preferred site. As a result, the final siting of the proposed Kenhardt PV 3 facility on the preferred site is discussed in Chapter 16 of this EIA Report, whereby the sensitive features identified are avoided by the proposed layout, together with specialist recommendations.

As noted in Chapter 1 of this EIA Report, the 2014 EIA Regulations (Appendix 3 of the GN R982) have certain requirements in terms of the selection of the preferred site location for the proposed activity. Table 5.4 below indicates the requirements of the 2014 EIA Regulations in terms of the process leading to the preferred site and location alternatives. Table 5.4 also includes a response from the EAP showing how the requirements of the 2014 EIA Regulations have been addressed in this report.

Table 5.4: Requirements for the consideration of Alternatives in the EIA Phase

	Section of the EIA Regulations	Requirements for an EIA Report in terms of Appendix 3 of the 2014 NEMA EIA Regulations (GN R982)	Response from EAP
1.	Appendix 3 – (2)	The objective of the EIA Process is to, through a consultative process:	Refer to responses below.
2.	Appendix 3 – (2) (c)	▪ identify the location of the <u>development footprint within the preferred site</u> based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment.	As noted in the preceding chapters of this EIA Report, the preferred site for the proposed Kenhardt PV 3 project extends approximately 1341 ha. However, the proposed solar facility and associated infrastructure requires a development area of approximately 250 ha only. To assess the worst case scenario, the larger area was considered and assessed by the specialists in order to ensure that any development constraints or environmental sensitivities can be avoided in the final siting and location of the proposed facility. This is discussed further in Chapter 16 of this EIA Report, which includes an environmental sensitivity map that was produced based on the input obtained from the various specialist studies (mainly the Ecological Impact Assessment and Heritage Impact Assessment). The significant environmental features identified by the relevant specialists have been mapped and overlain by the Kenhardt PV 3 area (of approximately 1341 ha). The buffers and exclusion areas that need to be applied to the sensitive areas (as identified in the

	Section of the EIA Regulations	Requirements for an EIA Report in terms of Appendix 3 of the 2014 NEMA EIA Regulations (GN R982)	Response from EAP
			specialist studies) have also been mapped and overlain by the Kenhardt PV 3 area (of approximately 1341 ha). The remaining areas outside of the sensitive areas and buffers are then regarded as the areas available for development (i.e. the Development Envelope). Therefore, a suitable layout within the Development Envelope for the 250 ha site has been determined (as discussed in Chapter 16 of this EIA Report), ensuring that the areas that have a high environmental sensitivity will be avoided by the proposed siting of the proposed PV facility. A single suitable location for the proposed 250 ha site has been identified based on the sensitivity mapping and the Development Envelope. Therefore, the overall impact of the proposed project on the sensitive features is expected to be low. Chapter 16 of this report includes a detailed discussion on the Development Envelope of the project. As noted above, a worst case scenario was adopted by the specialists in terms of the area of assessment. The specialist studies included in Chapters 7 to 14 of this EIA Report therefore include an impact assessment process (inclusive of cumulative impacts) and by default, a ranking process of the identified development footprint (i.e. the Development Envelope) focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment.
3.	Appendix 3 – (2) (d)	▪ determine the nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and the degree to which these impacts (a) can be reversed; (b) may cause irreplaceable loss of resources, and (c) can be avoided, managed or mitigated.	The specialist studies included in Chapters 7 to 14 of this EIA Report include a description and assessment of the nature, significance, consequence, extent, duration and probability of the identified impacts for the preferred alternatives. The specialist studies also include the assessment of the reversibility and irreplaceability of the potential identified impacts, as well as the degree to which the identified impacts can be avoided, managed or mitigated.
4.	Appendix 3 – (2) (e)	▪ identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment.	Refer to the Development Envelope and sensitivity mapping approach described in Point 2 above.
5.	Appendix 3 – (2) (f)	▪ identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity.	The specialist studies included in Chapters 7 to 14 of this EIA Report include a description, identification and assessment of identified impacts that the proposed Solar PV facility will impose on the preferred location of the proposed plant.
6.	Appendix 3 – (2) (g)	▪ identify suitable measures to avoid, manage or mitigate identified impacts.	The specialist studies included in Chapters 7 to 14 of this EIA Report include an identification of suitable measures to avoid, manage or mitigate identified impacts.
7.	Appendix 3 – (2) (h)	▪ identify residual risks that need to be managed and monitored.	The specialist studies included in Chapters 7 to 14 of this EIA Report include an identification of residual risks that need to be managed and

	Section of the EIA Regulations	Requirements for an EIA Report in terms of Appendix 3 of the 2014 NEMA EIA Regulations (GN R982)	Response from EAP
			monitored.
8.	Appendix 3 - (3)(h)	A full description of the process followed to reach the proposed development footprint within the approved site, including - ▪ (i) details of the development footprint alternatives considered; ▪ (iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; ▪ (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; ▪ (ix) if no alternative development locations for the activity were investigated, the motivation for not considering such; and ▪ (x) a concluding statement indicating the preferred alternative development location within the approved site.	Refer to the Development Envelope and sensitivity mapping approach described in Point 2 above.
9.	Appendix 3 – (3) (l)	An environmental impact statement which contains (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.	Refer to the Development Envelope and sensitivity mapping approach described in Point 2 above.
10.	Appendix 3 – (3) (n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment.	Refer to the Development Envelope and sensitivity mapping approach described in Point 2 above.

5.1.5 Technology Alternatives

5.1.5.1 Solar Panel Types

Only the PV solar panel type is considered in the EIA Phase. Due to the scarcity of water in the proposed project area and the large volume of water required for CSP, this technology is not deemed feasible or sustainable and will not be considered further. This is the main difference between PV and CSP technology that led to the selection of PV as the preferred solar panel technology. Furthermore, CPV technology therefore requires a larger development footprint to obtain the same energy output as PV technology, and it requires active solar tracking to be effective. CSP technology also reflects and concentrates sunlight to heat a substance which generates energy, whereas PV technology absorbs sunlight to generate energy. CSP technology therefore has a high reflectivity (i.e. a higher visual impact) than PV technology. Furthermore, as noted above, in Government Gazette 39111 published on 18 August 2015, no additional procurement target was allocated for CPV. This means that the need and desirability of CSP is not as evident and justified compared to PV. Based on these factors, only the PV solar panel technology type has been considered in the EIA Phase.

5.1.5.2 Mounting System

Solar panels can be mounted in various ways to ensure maximum exposure of the PV panels to sunlight. The main mounting systems that will be considered as part of the design are:

- Single axis tracking systems;
- Fixed axis tracking systems;
- Dual axis tracking systems; and
- Fixed Tilt Mounting Structure.

The above mounting systems have been considered during the EIA Phase. Additional information regarding the mounting system is provided in Chapter 2 of this EIA Report.

5.1.6 Layout Alternatives

As noted above, the Rochdale Envelope Approach[5] was applied to determine the preferred Development Envelope for the proposed PV facility. The Rochdale Envelope approach is named after two legal cases relating to a proposed business park in Rochdale in the United Kingdom. These cases considered applications for outline planning consent in the context of preparing an EIA. The goal of the Rochdale Envelope approach is to allow for an EIA to be undertaken, based on the 'worst case scenario', whereby the Competent Authority granting the EA will then decide whether, based on this 'worst case scenario', the environmental impacts are acceptable.

This approach is very useful since normally an EIA is undertaken prior to the technical assessment of the site which would consider the exact placement of, for example, the solar panels and associated infrastructure. The main principle behind this approach is that, should the development fall within the parameters set within this "envelope", as determined by the EIA Process, the placement of the different components could be determined at a later stage provided that the components fall within the parameters of the envelope. This approach therefore allows for flexibility to the developer during the detailed design phase in terms of engineering, design and construction parameters.

As part of the EIA, a larger 1341 ha area was assessed by the specialists and considered during this EIA. The determination of the buildable area for the project is discussed above, as well as in Chapters 1 and 2. The Development Envelope has been determined for the project based on the environmental sensitivities present on the site, which is discussed further in Chapter 16 of this EIA Report. Based on the findings of the specialist studies, an environmental sensitivity map has been produced (and included in Chapter 16 and Appendix J of this EIA Report). This map shows the sensitivities on site (terrestrial, aquatic, and sensitive heritage features) within the larger 1341 ha buildable area that was assessed. Based on this map, the preferred location for the 250 ha Kenhardt PV 3 facility (i.e. Development Envelope), avoids the sensitive features that were identified by the specialists within the original 1341 ha buildable area. Based on the boundaries of the Development Envelope and the constraints of the environmental sensitivities, a site layout has also been preliminary determined for this project (Appendix J of this EIA Report). It is important to note that should the layout change subsequent to the issuing of an EA (should such authorisation be granted), any alternative layout or revisions to the layout occurring within the boundaries of the Development Envelope would not be regarded as a change to the scope of work or the findings of the impact assessments undertaken during the EIA Phase. This is based on the understanding that the specialists have assessed the larger area and have identified sensitivities, which have been avoided in the siting of the proposed infrastructure. The Development Envelope is considered to be a "box" in which the project components can be constructed at whichever location without requiring an additional assessment or change in impact significance. Any changes to the layout within the boundaries of the Development Envelope following the issuing of the EA (should it be granted) will therefore be considered to be non-substantive.

Therefore, the findings of the specialist studies have been used to inform the layout of the proposed facility within the preferred site, Kenhardt PV 3. As noted above, the specialist studies conducted during the EIA Phase have identified the various environmental sensitivities present on site that should be avoided, which were taken into account in the layout of the PV facility.

[5] Infrastructure Planning Commission (IPC), Using the 'Rochdale Envelope'. February 2011

5.2 Assessment of Potential Impacts (Scoping Level)

During the Scoping Phase, an assessment was undertaken by the CSIR to determine the nature, significance, consequence, extent, duration and probability of the potential impacts and risks identified for each of the location alternatives identified (i.e. Kenhardt PV 3b). Refer to the finalised Scoping Report for the methodology adopted and the findings of the assessment.

The high-level Scoping Phase assessment concluded that the preferred site for the project on the Remaining Extent of the Onder Rugzeer Farm 168 is the **Kenhardt PV 3** site. The preferred site was selected for assessment in the EIA Phase due to the proximity to the Eskom Nieuwehoop Substation and the reduction in overall infrastructure cost to connect to the substation via the preferred site compared to the alternative site.

5.3 Concluding Statement of Preferred Alternatives

Based on the aspects considered in this chapter, the following concluding statement has been provided in terms of the preferred alternatives that have been considered in the EIA Phase:

- **Development of the Kenhardt PV 3 project, using Horizontal Single Axis Tracking, Fixed Axis Tracking, Dual Axis Tracking, OR Fixed Tilt Mounting Structures on the preferred site, close to the Eskom Nieuwehoop substation, and the preferred location, the Remaining Extent of Onder Rugzeer Farm 168. The final layout of the facility has been informed by specialist studies during the EIA Phase to avoid environmental sensitivities as far as possible.**

In summary, the following alternatives have been taken forward into the EIA Phase:

- **No-go Alternative:**
  - The no-go alternative assumes that the proposed project will not go ahead i.e. it is the option of not constructing the proposed Kenhardt PV 3 facility. This alternative would result in no environmental impacts on the site or surrounding local area, as a result of the facility. It provides a baseline against which other alternatives can be compared and considered during the EIA Phase.

- **Land Use Alternative:**
  - No other renewable energy technologies were deemed to be appropriate for the site and therefore these technologies will not be further assessed during the EIA Phase. The implementation of a solar energy facility at the proposed project site is more favourable than other alternative energy facilities due to the following:
    - The solar resources available across the proposed project site are better and represent a higher yield than the biomass, hydro or wind resources available across the same site;
    - Wind energy facilities require that wind turbines are spaced a significant distance from one another. The implementation of a wind energy facility would not make optimum use of the land which is available; and
    - The proposed solar facility currently falls within the REDZ 7 which has been identified by the DEA SEA as being of strategic importance for Solar PV development (as discussed in Chapter 1 and Chapter 2 of this EIA Report).

- **Preferred Site and Site Location:**
  - The preferred site for the project is the Remaining Extent of the Onder Rugzeer Farm 168 and the Kenhardt PV 3 site; and
  - The available development areas of each of the above locations exceed 250 ha, which is the approximate area required for each solar PV project.

- **Technology Alternatives:**
  - Applicable and relevant technology options are described in Chapter 2 of this EIA Report, such as those relating to the mounting system.

- **Layout Alternatives:**
  - Layout alternatives for the project were determined following the input from the various specialists by establishing the Development Footprint. The studies identified various environmental sensitivities present on the preferred sites that should be avoided, which have been taken into account during the determination of the layout of the PV facility. Additional information regarding the development envelope and the layout of the facility is provided in Chapter 16 of this EIA Report.
  - The use of the existing Transnet Service Road or the unnamed farm road also is also discussed in Chapter 2 of this EIA Report. Both access roads have been considered and included in the project description. The access road that will be selected during construction is dependent on the discussions between the Project Applicant and Transnet.

EIA REPORT

CHAPTER 6:

Comments and Responses Trail

Scoping and **Environmental Impact Assessment** for the Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province

contents

figures

6 ISSUES AND RESPONSES TRAIL

It is important to note that no comments were raised by stakeholders, I&APs or Organs of State following the submission of the finalised Scoping Report to the DEA for decision-making (in November 2015) and prior to the release of this EIA Report for a 30-day review period. This chapter therefore presents the comments that were raised by stakeholders, I&APs and Organs of State during the preceding **Scoping Phase**, and how these comments have been addressed in this EIA Phase. As such, the responses to some of the comments raised have been updated, where required.

6.1 Identification of Issues

An important element of the EIA Process is to evaluate the issues raised through the interactions with authorities, the public, the specialists on the EIA team and the project proponent. In accordance with the philosophy of Integrated Environmental Management, it is important to focus the EIA on the key issues, such as those issues that are considered critical for decision-making on the EA.

To assist in the identification of key issues, a decision-making process is applied to the issues raised, based on the following criteria (Refer to Figure 6.1):

- Whether or not the issue falls within the scope and responsibility of the proposed Kenhardt PV 3 project;
- Whether or not sufficient information is available to respond to the issue raised without further specialist investigation.

As noted in the finalised Scoping Report, issues were sourced by the EIA team from the following Scoping interactions:

- **Newspaper Advertisement** - In order to inform the public of the proposed project and invite members of the public to register as I&APs, and to inform the EIA consultant about specific issues or interests in the proposed project, the project and EIA Process was advertised in one local newspaper (i.e. The Gemsbok) on 29 July 2015 during the Scoping Phase. A copy of the newspaper advertisement is included in Appendix D of this EIA Report.
- **Email** - Issues were sent to the CSIR via email correspondence during the Project Initiation Phase (in response to the review of the BID) and during the 30-day review of the Scoping Report. As mentioned above, no comments were received since the submission of the finalised Scoping Report to the DEA.
- **Comment Form** - issues submitted to the CSIR via the Comment and Registration Form that was provided with Letter 1 (dated 30 July 2015) and the BID mailed to I&APs, and with Letter 2 (dated 25 September 2015) mailed to I&APs (which included an Executive Summary of the Scoping Report).

All comments received during the 30-day review of the BID, prior to the release of the Scoping Report for I&AP review, and during the 30-day review of the Scoping Report are included in the Comments Trail below, as well as in Appendix G of this EIA Report. Section 6.2 below provides a summary of the comments received prior to the 30-day review of the Scoping Report and they have been grouped according to the following categories (the number in brackets indicates the number of issues raised):

- EIA Process and Public Participation (5)
- Project Description and Impact on Existing Infrastructure (7)

Section 6.3 below provides a summary of the comments received during to the 30-day review of the Scoping Report, which been grouped according to the following categories (the number in brackets indicates the number of issues raised):

- Heritage Impacts (1)
- General, EIA Process, Scoping Report and Public Participation (21)
- Project Description and Impact on Existing Infrastructure (9)
- Impact on Aquatic/Freshwater Resources (6)
- Impact on Terrestrial Ecology (Fauna and Flora) (8)
- Impact on Avifauna (2)
- Recommendations for the EMPr (1)

It must be noted that the comments raised by I&APs, stakeholders or Organs of State during the 30-day review of this EIA Report will also be included in this Comments and Responses Trail and suitable responses will be provided by the EIA Team, prior to submission of the finalised EIA Report to the DEA for decision-making. This complies with the requirement of Appendix 3 (3) (s) (ii) of the 2014 NEMA EIA Regulations which requires an undertaking under oath or affirmation by the EAP in relation to the inclusion of comments and inputs from stakeholders and I&APs.

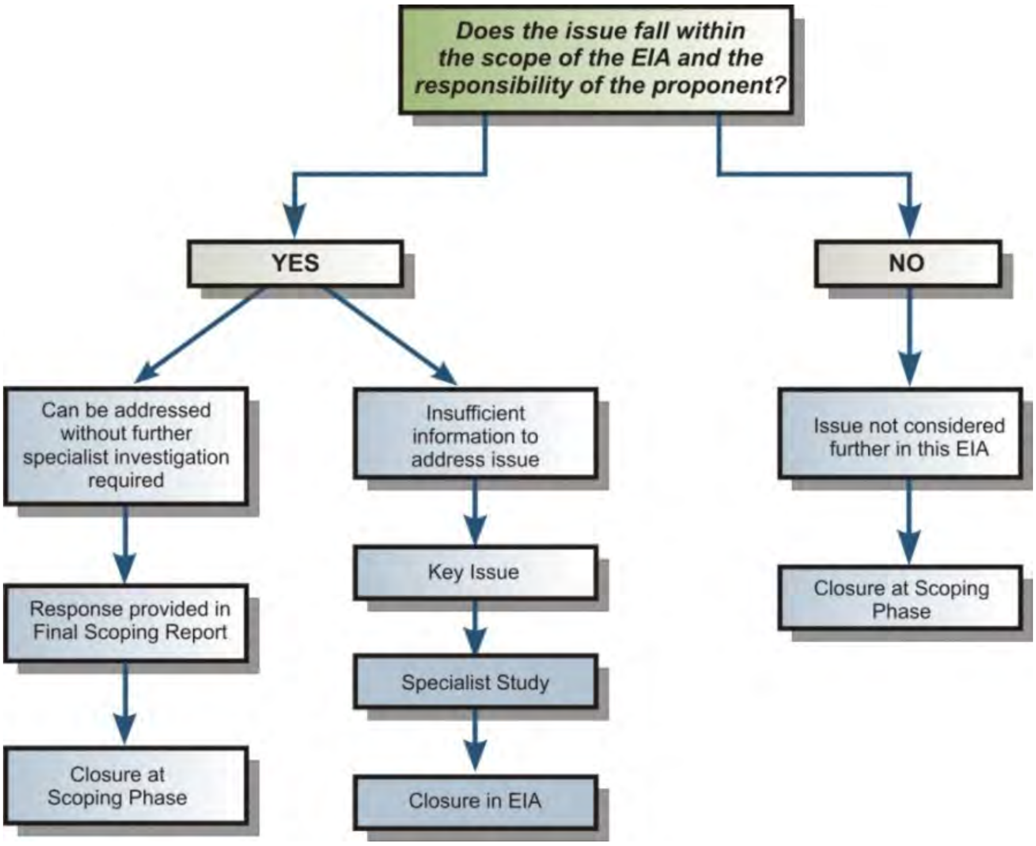

Figure 6.1: Decision-making framework for identifying key issues for the EIA

6.2 Issues and Responses Trail (Prior to the 30-day Review of the Scoping Report)

The tables below summarise the issues raised prior to the release of the Scoping Report for I&AP review, together with a response from the EIA team. Copies of the comments received are included in Appendix G of this EIA Report.

1. EIA Process and Public Participation

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
1.1	Kindly register me as an I&AP for the proposed development with CSIR Reference: EMS0102/SCATEC/2015.	Samantha De la Fontaine, District Ecologist, Northern Cape Department of Environment and Nature Conservation	29 July 2015, Email	**CSIR:** Comment noted. Samantha De la Fontaine has been added to the project I&AP database. Refer to Appendix C of this EIA Report for a copy of the current database of I&APs.
1.2	Attached please find the completed comment and registration form.	Karen Low, Environmental Manager, Mulilo Renewable Project Developments	29 July 2015, Email and Comment and Registration Form	**CSIR:** Comment noted. Mulilo Renewable Project Developments was identified as an I&AP and thus pre-included on the project database of I&APs and Organs of State at the outset of the Scoping and EIA Process. Refer to Appendix C of this EIA Report for a copy of the current database of I&APs.
1.3	Your company is currently conducting an Environmental Impact Assessment for the Proposed Development of Three Solar Photovoltaic Facilities and Associated Electrical Infrastructure North East of Kenhardt. Please could you forward me the BID for this application and register me as a Interested & Affected party?	Melanie Miles, Content Researcher, Leads 2 Business	3 August 2015, Email	**CSIR:** Comment noted. Melanie Miles has been added to the project I&AP database. Refer to Appendix C of this EIA Report for a copy of the current database of I&APs. A copy of the BID was also provided to Melanie Miles via email.
1.4	Your notice received with regards to Basic Assessment; Scoping and Environmental Impact Assessment for the Proposed Development of the three Solar Photovoltaic Facilities and Associated Electrical Infrastructure; North-East of Kenhardt; Northern Cape is of reference. DWS requires you to forward hard copies of the above mentioned project to either of the following address: *Physical Address:*	Melinda Mei, Senior Administration Clerk, Water Quality Management: Lower Orange Water Management Area, Department of Water and Sanitation	4 August 2015, Email	**CSIR:** Comment noted. The Department of Water and Sanitation was identified as a key stakeholder and thus pre-included on the project database of I&APs and Organs of State at the outset of the Scoping and EIA Process. Refer to Appendix C of this EIA Report for a copy of the current database of I&APs. Hard copies of the BID, including Letter 1 and a Comment and Registration Form, were sent to Mashudu Randwedzi and Melinda Mei of the Department of Water and Sanitation via registered post on 30 July 2015, at the following postal address: Private

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
	Department Of Water and Sanitation Louisvale Road Upington 8801 OR *Postal Address:* Department Of Water and Sanitation Private Bag X 5912 Upington 8800			Bag X5912; Upington; 8800. The BID, Letter 1 and the Comment and Registration Form were also sent to these representatives of the Department of Water and Sanitation via email on 29 July 2015. Refer to Appendix E of this EIA Report for the registered mailing receipts and email delivery.
1.5	I want to register for the facility because I support the project.	John de Bruin, Henrohn Security	25 August 2015, Email	**CSIR:** Comment noted. John de Bruin has been added to the project I&AP database. Refer to Appendix C of this EIA Report for a copy of the current database of I&APs. A telephonic discussion was also held with John de Bruin on 21 August 2015.

2. Project Description and Impact on Existing Infrastructure

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
2.1	The following immediate concerns are: ▪ Possible glare from the solar panels which may influence the Train Drivers and staff travel on the TFR service road. Future concerns: ▪ During construction, planned access routes to the facilities that might influence TFR (Dust on High Voltage Electrical Equipment). ▪ The location of the High Voltage transmission lines. ▪ Level crossing requirements (High risk of accidents). ▪ During maintenance same issues as above.	Gilbert Nortier, Depot Engineering Manager, Transnet Freight Rail	19 August 2015, Email	**CSIR and Scatec Solar:** ▪ Comment noted. The aspect of glare from the solar panels has been addressed in Chapter 2 of this EIA Report. It is important to note that the anticipated glare produced by the solar PV panels will not exceed the Standard Industry Norm generally accepted throughout South Africa. If a single axis tracker mounting system is employed, it will require PV arrays to be laid out in a North – South orientation, allowing the system to then track in an east – west orientation (as noted in Chapter 2 of this EIA Report). The single axis tracker mounting system will also minimize glare drastically to the North and South of the proposed PV facility. Furthermore, as noted in Chapter 2 of this EIA Report, the glass used in the manufacture of PV panels is designed to

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
				maximize the absorption of light (to improve the energy efficiency of the panels) and minimize reflection and glare. PV panels are less reflective than water and it is therefore not anticipated to influence train drivers and users of the TFR Service Road. Scatec Solar also conducted research regarding the risk of glint and glare affecting train drivers and motorists on the railway and road near the Kenhardt projects, and established that overall this risk is understood to be very low due to the following: o The very low reflectivity of solar PV glass (particularly with anti-reflective coatings) where it is observed to be lower than grass and water. o The tracking of arrays and thus the incidence angle of the modules with the sunlight causing any reflected light to be reflected towards the sky and thus not towards the train and road. o The Project Applicant also operates three other solar PV plants in South Africa, near railways (approximately 100 m away) and these have not had any reported effects on train drivers or motorists. ▪ As noted in Chapters 1 and 2 of this EIA Report, existing roads (such as a private Transnet Service Road or an unnamed farm road) will be used to gain access to the preferred site. The Transnet Service Road can be accessed from the R27 and the farm road can be accessed from the R383 Regional Road also via the R27 National Road. Discussions have been initiated and held between Transnet Freight Rail and the Project Applicant to discuss the requirements for use of the Transnet Service Road. Dust may be generated during the construction phase, however it is expected to be of a short-term duration and insignificant. However, mitigation measures relating to potential dust impacts have been included in the EMPr (Part B of the EIA Report), as applicable. ▪ As noted in Chapters 1 and 2 of this EIA Report, the proposed transmission line will extend between the

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
				proposed Solar Facility and the Eskom Nieuwehoop Substation. Transmission lines will be constructed for each solar PV facility and have been assessed separately as part of the BA Process. ▪ Recommendations and mitigation measures to reduce the risk of accidents as a result of the nearby ore railway line have been generally included in the EMPr (Part B of the EIA Report). Transnet will be provided with an opportunity to comment on the EIA Reports and EMPr during the EIA Phase which will be considered (as applicable) prior to submission to the Competent Authority, the DEA, for decision-making.
2.2	This letter is in response to your email request, to provide an assessment on the potential development of three solar PV electricity generation facilities in the Northern Cape Province and the risk they may pose on the Square Kilometre Array Project. A high level risk assessment has been conducted at the South African SKA Project Office to determine the potential impact of such facilities on the Square Kilometre Array. This letter serves to confirm the outcomes of the risk assessment, and proposals for any future investigations associated with this facility. ▪ The location of the proposed facility has been provided in the background information document compiled by CSIR; ▪ The nearest SKA station has been identified as SKA Station ID 2362, at approximately 20 km from the proposed installation; ▪ Based on distance to the nearest SKA station, and the information currently available on the detailed design of the PV installations, these facilities poses a medium to high risk of detrimental impact on the SKA; ▪ Any transmitters that are to be established, or have been established, at the site for the	Dr. Adrian Tiplady Head: Strategy, SKA South Africa	2 September 2015, Letter via email	**CSIR and Scatec Solar:** ▪ Comment noted. The distance of the proposed project to the nearest SKA station has been included in Chapter 4 of this EIA Report. ▪ Comment noted. Scatec Solar has complied with the requirements from the SKA Project Office. A technical EMI and RFI study has been commissioned by Scatec Solar. As noted in Chapter 4 of this EIA Report, Scatec Solar appointed MESA Solutions (PTY) Ltd to undertake the Cumulative Topographical Analysis of Proposed PV Projects in AGA Area, which is included in Appendix K of this EIA Report, with a summary provided in Chapter 15. The SKA Project Office will review the findings of this study and provide feedback during the EIA Phase.

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	purposes of voice and data communication will be required to comply with the relevant AGA regulations concerning the restriction of use of the radio frequency spectrum that applies in the area concerned; ▪ As a result of the medium to high risk associated with the PV facilities, The SKA project office recommends that further EMI and RFI detailed studies be conducted as significant mitigation measures would be required to lower the risk of detrimental impact to an acceptable level. The South African SKA Project Office would like to be kept informed of progress with this project, and reserves the right to further risk assessments at a later stage. This technical advice is provided by the South African SKA Project Office on the basis of the protection requirements of the SKA in South Africa, and does not constitute legal approval of the renewable energy projects in terms of the Astronomy Geographic Advantage Act, the Management Authority, and its regulations or declarations.			
2.3	Thank you for your letter dated 29 July 2015, send to Mr van der Walt. Please note that this solar development will not impact on a national road, therefore SANRAL has no jurisdiction and have no further comment with regard to the Solar Facility. ▪ Should any service, e.g. power line and/or water pipe will be situated within 60m from the national road or will cross the national road application should be made to SANRAL for approval in terms of the National Roads Act.	René de Kock, Statutory Control, SANRAL	4 September 2015, Email	**CSIR:** Comment noted. Based on the conceptual design, it is not anticipated that any service infrastructure will be located within 60 m of the national road, or crossing the national road. It is duly noted that if the aforementioned is required, application will be lodged with the SANRAL by the Applicant.

6.3 Issues and Responses Trail (During the 30-day Review of the Scoping Report and Addendum)

The tables below summarise the issues raised during the review of the Scoping Report by I&APs, together with a response from the EIA team. Copies of the comments received are included in Appendix G of this EIA Report.

1. Heritage Impacts

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
1.1	Letter In terms of Section of the National Heritage Resources Act (Act 25 of 1999) Attention: Scatec Solar SA 163 (PTY) Ltd Scatec Solar SA 163 (PTY) Ltd is proposing to develop three 75 Megawatt (MW) Solar Photovoltaic (PV) power generation facilities and associated electrical infrastructure (132 kV transmission lines for each 75 MW facility) on the remaining extent of Onder Rugzeer Farm 168 and the connection points to the substation on the remaining extent of Portion 3 of Gemsbok Bult Farm 120. A separate full Scoping and EIA Process will be undertaken for each proposed 75 MW Solar PV facility. A separate BA Process will be undertaken for each transmission line. An integrated Public Participation Process will be undertaken for the proposed projects. Separate Applications for Environmental Authorisation will be submitted for each proposed 75 MW Solar PV facility and transmission line. Separate BA, Scoping and EIA Reports will be compiled for each project. This specific application will entail the construction of the proposed 75 MW facility and will be referred to as Kenhardt PV3. The proposed project will take place approximately 80 km south of Upington and 30 km north-east of Kenhardt within the Northern Cape Province.	Ragna Redelstorff, Heritage Officer, SAHRA	22 September 2015, Letter via SAHRIS	**CSIR:** This comment was received from the SAHRA in response to the review of the BID during the Project Initiation Phase, which was issued via the on-line SAHRIS on 22 September 2015. Unfortunately, an on-line notification email was not received from SAHRIS; hence this comment was only viewed by the EAP subsequent to the finalisation and printing of the Scoping Report for release to I&APs for a 30-day comment period on 23 September 2015 (via email, registered mail and/or courier). Notwithstanding the above, the Scoping Report was also uploaded to the SAHRIS on 25 September 2015 for comment. No further comments have been received from the SAHRA and it is assumed that the comments dated 22 September 2015 (as included in Appendix G of this EIA Report) are still valid. As noted in Chapters 1 and 4 of this EIA Report, a Heritage Impact Assessment (Archaeology and Cultural Landscape) has been undertaken during the EIA Phase (i.e. prior to the commencement of construction of the Kenhardt PV 3 project (subject to the issuing of an EA)). This specialist assessment was conducted by Dr. Jayson Orton of ASHA Consulting (PTY) Ltd, who is a registered member of the Association of Southern African Professional Archaeologists. The re-formatted version of the Heritage Impact Assessment is included in Chapter 9 of this EIA Report, which is currently being made available to registered I&APs and the public for a 30-day comment period. The EIA Report, as well as a stand-along Heritage Impact Assessment will be uploaded to the SAHRIS at the commencement of the 30-day comment period.

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
	The proposed project entails the construction of a solar photovoltaic (PV) facility and associated infrastructure on the remaining extent of the Farm Onder Rugzeer No 168 and connection points to the substation on the remaining extent of Portion 3 of the Farm Gemsbok Bult No 120, located approximately 30 km northeast of Kenhardt, Northern Cape Province. This project is part of a larger project comprising a total of three solar facilities (called Kenhardt PV1, 2 and 3). In terms of the National Heritage Resources Act, no 25 of 1999, heritage resources, including archaeological or palaeontological sites over 100 years old, graves older than 60 years, structures older than 60 years are protected. They may not be disturbed without a permit from the relevant heritage resources authority. This means that prior to development it is incumbent on the developer to ensure that a Heritage Impact Assessment is done. This must include the archaeological component (Phase 1) and any other applicable heritage components. Appropriate (Phase 2) mitigation, which involves recording, sampling and dating sites that are to be destroyed, must be done as required. The quickest process to follow for the archaeological component is to contract an accredited specialist (see the web site of the Association of Southern African Professional Archaeologists www.asapa.org.za) to provide a Phase 1 Archaeological Impact Assessment Report. This must be done before any large development takes place. The Phase 1 Impact Assessment Report will identify the archaeological sites and assess their significance. It should also make recommendations (as indicated in section 38) about the process to be followed. For			The Heritage Impact Assessment (Archaeology and Cultural Landscape) has identified and assessed the significance of archaeological sites that are located within the proposed project area. The specialist assessment also indicates the relevant permit requirements, including if a permit is required from the Ngwao-Boswa Jwa Kapa Bokone (i.e. the Northern Cape Provincial Heritage Resources Authority) for the potential disturbance of any heritage features on site. The specialist study provides recommendations and suggests appropriate mitigation measures (if required), for the recording, sampling and dating of any archaeological sites that could potentially be destroyed as a result of the proposed project. As further noted in Chapters 1 and 4 of this EIA Report, based on the low palaeontological sensitivity of the area, a Palaeontological Heritage Desktop Assessment has been undertaken as part of the EIA Phase (i.e. prior to the commencement of construction of the Kenhardt PV 3 project (subject to the issuing of an EA)). This specialist assessment was conducted by Dr. John Almond of Natura Viva cc. The Desktop Palaeontological Impact Assessment assesses the significance of potential impacts of the proposed project on palaeontological resources. The Palaeontological Heritage Desktop Assessment includes recommendations for inclusion in the EMPr (Part B of the EIA Report). The desktop assessment is included in Chapter 10 of this EIA Report, which also is currently being made available to registered I&APs and the public for a 30-day comment period, as well as uploaded to the SAHRIS. As noted in the Heritage Impact Assessment (Chapter 9 of this EIA Report), there are no buildings or structures within the proposed project footprint that need to be demolished for the establishment of the Kenhardt PV 3 project.

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
	example, there may need to be a mitigation phase (Phase 2) where the specialist will collect or excavate material and date the site. At the end of the process the heritage authority may give permission for destruction of the sites. The PalaeoSensitivity Map on SAHRIS (http://www.sahra.org.za/sahris/map/palaeo) indicates moderate palaeontological sensitivity for the proposed area. Therefore, the SAHRA Archaeology, Palaeontology and Meteorites Unit requires a desktop Palaeontological Impact Assessment to be undertaken to assess whether or not the development will impact upon palaeontological resources - or at least a letter of exemption from a Palaeontologist is needed to indicate that this is unnecessary. If the area is deemed sensitive, a full Phase 1 Palaeontological Impact Assessment will be required and if necessary a Phase 2 rescue operation might be necessary. Any other heritage resources that may be impacted such as built structures over 60 years old, sites of cultural significance associated with oral histories, burial grounds and graves, graves of victims of conflict, and cultural landscapes or viewscapes must also be assessed. Should you have any further queries, please contact the designated official using the case number quoted above in the case header.			

2. General, EIA Process, Scoping Report and Public Participation

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
2.1	Your notice received with regards to Basic Assessment; Scoping and Environmental Impact Assessment for the Proposed Development of the three Solar Photovoltaic Facilities and Associated Electrical Infrastructure; North-East of Kenhardt; Northern Cape is of reference. DWS requires you to forward hard copies of the above mentioned project to either of the following address: Physical Address: Department Of Water and Sanitation Louisvale Road Upington 8801 OR Postal Address: Department Of Water and Sanitation Private Bag X 5912 Upington 8800 Your co-operation and assistance is highly appreciated.	Melinda Mei, Senior Administration Clerk, Water Quality Management: Lower Orange Proto-CMA, Department of Water and Sanitation	29 September 2015, Email	**CSIR:** As noted in Section 6.2 above, the Department of Water and Sanitation was identified as a key stakeholder and thus pre-included on the project database of I&APs and Organs of State at the outset of the Scoping and EIA Process. Refer to Appendix C of this EIA Report for a copy of the current database of I&APs. Hard copies and CD copies of the EIA Report for the Kenhardt PV 1, Kenhardt PV 2, and Kenhardt PV 3 projects, including Letter 2, a Comment and Registration Form and Executive Summaries, were sent to Ms. Melinda Mei of the Department of Water and Sanitation via courier on 30 September 2015, at the following physical address: Louisvale Road, Upington, 8801. Letter 2, the Executive Summaries of the Scoping Reports, and the Comment and Registration Form were also sent to representatives of the Department of Water and Sanitation via email on 23 September 2015. Refer to Appendix E of this EIA Report for the courier waybills and email delivery. Follow up responses were sent by the CSIR to Ms. Melinda Mei on 22 October 2015 and 30 October 2015 informing the Department of Water and Sanitation of the provision of hard copies and CD copies of the Scoping Reports. Refer to Appendix E of this EIA Report for a copy of this email response.
2.2	Regarding our telephonic conversation on the 06th October 2015, The Department of Environment and Nature Conservation is still waiting for the DEA Ref number of the following project Description: Scoping and Environmental Impact Assessment for the proposed Development of a 75MW Solar Photovoltaic Facility (KENHARDT PV 1) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province.	Luzane Tools-Bernado, EIA: Administration, Northern Cape Department of Nature Conservation	12 October 2015, Email	**CSIR:** A response was sent to Ms. Luzane Tools-Bernado on 14 October 2015 via email confirming that, at that point in time, the DEA Reference Numbers had not yet been received. Refer to Appendix E of this EIA Report for a copy of this email response. The DEA Reference Numbers were only received from the DEA, together with an acknowledgement of receipt of the Applications for EA and Scoping Reports, on 26 October 2015 via email, as shown in Appendix I.2 of this EIA Report. The following reference numbers have been assigned to the proposed projects:

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
	Please do send the DEA Ref Number as we need to Acknowledge the document.			▪ Kenhardt PV 1 – DEA EIA Reference: 14/12/16/3/3/2/837; ▪ Kenhardt PV 2 – DEA EIA Reference: 14/12/16/3/3/2/838; and ▪ Kenhardt PV 3 – DEA EIA Reference: 14/12/16/3/3/2/836. A further response was sent to Ms. Luzane Tools-Bernado on 27 October 2015 via email informing her of the receipt of the DEA Reference Numbers. Refer to Appendix E of this EIA Report for a copy of this email response. Ms. Luzane Tools-Bernado acknowledged receipt of the DEA Reference Numbers on 28 October 2015 via email (as shown in Appendix G of this EIA Report).
2.3	Can you please send me the registration form to register my company as an I&AP under your database and I'm asking Mr Abed that in future I want to be informed and attend the meetings for the developments you bring to us. For enquiry please send me emails, or contact me: 072 056 2833 or 071 984 6106.	Gloria Matlakala, !Kheis Municipality	26 October 2015, Email	**CSIR:** Ms. Gloria Matlakala has been included on the project database of I&APs as requested. Refer to Appendix C of this EIA Report for a copy of the current database of I&APs. In addition, a copy of the Comment and Registration Form was sent to Ms. Gloria Matlakala on 30 October 2015. Refer to Appendix E of this EIA Report for a copy of this email response.
2.4	Thank you very much to update me on the above mentioned correspondence.	Gloria Matlakala, !Kheis Municipality	30 October 2015, Email	**CSIR:** Comment noted.
2.5	The draft Scoping Report (SR) dated October 2015 and received by this Department on 02 October 2015, and the acknowledgement letter of the SR issued by this Department on 23 October 2015 refer. This Department has the following comments on the abovementioned application: Please ensure that all relevant listed activities are applied for, are specific and that it can be linked to the development activity or infrastructure as described in the project description.	Coenrad Agenbach, National DEA, Deputy Director: Strategic Infrastructure Developments	2 November 2015, Letter (dated 29 October 2015) sent via email	**CSIR:** The relevant listed activities that are understood to be applicable and relevant to the proposed project have been included in the Application for EA that was submitted to the DEA via courier on 30 September 2015, together with the Scoping Report. The original Application for EA for the Kenhardt PV 3 project is included in Appendix H of this EIA Report, with proof of submission (i.e. courier waybills) and DEA's acknowledgement of receipt included in Appendix E and Appendix I.2 respectively. Considering that the proposed project is in the conceptual design phase, some of the project specific information is not available at the EIA Phase. Therefore, as noted in Chapter 4, a precautionary approach was followed when identifying listed activities (for inclusion in the Application for EA and to be

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
				assessed as part of the Scoping and EIA Process), i.e. if the activity potentially forms part of the project, it is included as a listed activity in the Application for EA. However, the final project description will be shaped by the findings of the EIA Process, and certain activities may be added or removed. As mentioned in Chapter 4 of this EIA Report, it is understood that in terms of Listed Activity 9 of GN R983, the proposed project will entail the construction of stormwater channels or pipelines. Water pipelines will no longer be required for the transfer groundwater from existing boreholes to the proposed solar facility. During the Scoping Phase, the Project Applicant intended to make use of existing boreholes to source groundwater (if available and if suitable) for the solar panel cleaning process. It was further noted in the Scoping Report and Application for EA that the Geohydrological Assessment (undertaken during the EIA Phase) will confirm whether the groundwater is sufficient and suitable for use. However, the Geohydrological Assessment (Chapter 11 of this EIA Report) recommends that the groundwater is not suitable for use during the construction and operational phases. Therefore, water pipelines will not need to be constructed in order to transfer groundwater from existing boreholes to the proposed solar facility. As a result, water will therefore be sourced from the municipality. Therefore Activity 9 (i) and (ii) of GN R983 is no longer applicable in terms of the construction of water pipelines. Furthermore, in terms of stormwater infrastructure, at this stage of the design it is understood that the stormwater infrastructure will cover an approximate length of 1000 m. However, the stormwater infrastructure will not have an internal diameter of more than 0.36 m, and it will not have a peak throughput of more than 120 l/s. Therefore Activity 9 (i) and (ii) of GN R983 is no longer applicable in terms of the construction of stormwater infrastructure.

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				The same applies to Activity 10 (i) and (ii) of GN R983 in terms of infrastructure for the transportation of sewage and effluent. At this stage of the design it is understood that the sewage infrastructure will cover an approximate length less than 1000 m, and it will not have an internal diameter of more than 0.36 m, or a peak throughput of more than 120 l/s. Therefore Activity 10 (i) and (ii) of GN R983 is no longer applicable in terms of the construction of stormwater infrastructure. Therefore, Activity 9 (i) and (ii) and Activity 10 (i) and (ii) of GN R983 will need to be removed from the Application for EA. An amended Application for EA will be submitted to the DEA together with the finalised EIA Report for decision-making. On the other hand, Activity 56 (i) of GN R983 and Activity 18 (a) (ii) (ii) of GN R985, have become applicable to the proposed project (i.e. triggered by the proposed project, as a result of the design progression and the need to widen the access road leading to the site). An amended Application for EA will be submitted to the DEA together with the finalised EIA Report for decision-making. The description of the applicability of the listed activities included in the Application for EA and noted in Chapter 4 of this EIA Report have provided as much detail possible at this stage of the design and EIA Process. The listed activities are linked to the proposed structures and infrastructure as described in Chapter 2 of this EIA Report.
2.6	If the activities applied for in the application form differ from those mentioned in the final SR, an amended application form must be submitted. Please note that the Department's application form template has been amended and can be downloaded from the following link: http://www.environment.gov.za/documents/forms.	Coenrad Agenbach, National DEA, Deputy Director: Strategic Infrastructure Developments	2 November 2015, Letter (dated 29 October 2015) sent via email	**CSIR:** Comment noted. Refer to the response to Comment 2.5 above. An amended Application for EA will be submitted to the DEA together with the submission of the finalised EIA Report for decision-making, using the DEA's templates as recommended.
2.7	Please ensure that all issues raised and comments received during the circulation of the SR from	Coenrad Agenbach, National DEA, Deputy	2 November 2015, Letter	**CSIR:** Comment noted. The issues raised and comments received from I&APs and organs of state during the Project Initiation

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
	registered I&APs and organs of state which have jurisdiction (including this Department's Biodiversity Section) in respect of the proposed activity are adequately addressed in the Final SR. Proof of correspondence with the various stakeholders must be included in the Final SR. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments. The Public Participation Process must be conducted in terms of Regulation 39, 40, 41, 42, 43 and 44 of the EIA Regulations 2014.	Director: Strategic Infrastructure Developments	(dated 29 October 2015) sent via email	Phase and Scoping Phase (i.e. based on a 30-day review of the BID, Scoping Report and Addendum to the Scoping Report) were captured in the updated Issues and Responses Trail and addressed in this finalised Scoping Report, where required and as applicable. These comments raised during the Scoping Phase by stakeholders, I&APs and Organs of State have been retained in the EIA Report and updated responses have been provided where applicable. Copies of the Scoping Report and Addendum were sent to the DEA Biodiversity and Conservation Directorate via courier. Proof of courier (i.e. waybills) is included in Appendix E of this EIA Report. To date, no comments have been received from the DEA Biodiversity and Conservation Directorate within the stipulated comment periods. Proof of correspondence sent to registered I&APs and stakeholders during the Project Initiation and Scoping Phases is included in Appendix E of this EIA Report. All correspondence sent by I&APs during the Project Initiation Phase (i.e. prior to the release of the Scoping Report) and during the 30-day review of the Scoping Report and Addendum are included in Appendix G of this EIA Report. Proof of follow up correspondence with key stakeholders and I&APs during the Scoping Phase (such the SKA, SANRAL, Department of Water and Sanitation, and Transnet Freight Rail) are included in Appendix E of this correspondence. It is important to note that all comments received from I&APs during the review of EIA Report will be included in the Comments and Responses Trail, as well as the appendices of the finalised EIA Report, which will be submitted to the DEA for decision-making. As noted above, no comments have been received from the DEA Biodiversity and Conservation Directorate within the stipulated comment periods. In line with Regulation 3 (4) of the 2014 EIA Regulations, it is regarded that the DEA Biodiversity and Conservation Directorate has no comments on the Scoping Report and Addendum.

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
				The PPP for this Scoping and EIA Process is being undertaken in compliance with the 2014 EIA Regulations, as summarised below: - Regulation 39: As shown in Appendix H of this EIA Report, Van Niekerk Geinstrust is the only owner of the land on which the proposed project will take place (i.e. the remaining extent of Onder Rugzeer Farm 168). Proof of notice to the landowner and permission from the landowner has been obtained by the Project Applicant, which is included in Appendix 4 of the original Application for EA. - Regulation 40: Throughout the Scoping Phase, all reports and documents compiled for public review (such as the BID, Scoping Reports and Addendum to the Scoping Reports) were made available to registered and pre-identified I&APs, including the DEA, for a 30-day comment period. During the EIA Phase, the EIA Report is currently being made available for public review for a period of 30-days. The PPP undertaken thus far has provided all project information available, which is understood to be important for the decision-making phase. - Regulation 41: As noted in Chapter 4 of this EIA Report, site notice boards were placed for the commencement of the BA, Scoping and EIA Processes. A copy of the notice boards and proof of placement thereof is included in Appendix F of this EIA Report. In addition, during the Project Initiation Phase, written notification letters were sent to pre-identified I&APs to inform them of the proposed projects and invite potential I&APs to register on the project database. Furthermore, in order to notify the public of the proposed project and invite I&APs to register on the project database, the project and EIA Process was advertised in one local newspaper (i.e. The Gemsbok), as shown in Appendix D of this report. During the Scoping Phase, letters were sent to registered and pre-identified I&APs to notify them of the release of the Scoping Reports for comment. These letters were mailed via registered mail and email (where postal,

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
				physical and email addresses were available). Email notifications were also sent to registered and pre-identified I&APs for the release of the Addendums to the Scoping Reports. Copies of the written notifications sent during the Project Initiation and Scoping Phases are included in Appendix E of this EIA Report. During the combined BA and EIA Phase (i.e. this phase), letters have been sent to registered and pre-identified I&APs, and an advertisement has been placed in a local newspaper (i.e. The Gemsbok) as a notification of the release of the BA and EIA Reports for comment. As noted in the Plan of Study for the EIA (Chapter 8 of the Scoping Report) and Chapter 4 of this EIA Report, an advertisement will also be placed in a local newspaper to notify I&APs of the outcome of the decision-making phase (should an EA be granted for the proposed project). It is not anticipated that the proposed project will have an impact beyond the boundary of the Local Municipality; therefore local newspapers will be used during the PPP. Regulation 41 (2) (e) of the 2014 EIA Regulations is not applicable at this stage, however it will be complied with as agreed by the Competent Authority should the need arise as part of the PPP. - Regulation 42: As noted in Chapter 4 of this EIA Report, an initial database of I&APs (including key stakeholders and organs of state) was developed. Appendix C of this EIA Report contains the current I&AP database, which has been updated to include requests to register interest in the project, and comments received during the 30-day review of the Scoping Report and Addendum. At the time of compiling this EIA Report for I&AP review, the database stands at 80 I&APs. I&AP details are being captured and automatically updated as and when information is distributed to or received from I&APs. - Regulation 43: As noted above, registered I&APs and relevant organs of state have been provided with a 30-day comment period on the BID, Scoping Reports and Addendum

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				to the Scoping Reports. Registered I&APs and relevant organs of state also being provided with a 30-day comment period on the BA and EIA Reports. - Regulation 44: The comments raised by I&APs thus far during the Scoping Phase have been recorded in this EIA Report, with responses provided by the EAP and Project Applicant, which have been updated where required. This approach will be adopted during the EIA and BA Phase as well.
2.8	Specialist studies must be submitted to the Department with the Final SR.	Coenrad Agenbach, National DEA, Deputy Director: Strategic Infrastructure Developments	2 November 2015, Letter (dated 29 October 2015) sent via email	**CSIR:** Specialist input was included in the Scoping Report, in terms of the description of the affected environment (Chapter 3 of the Scoping Report), and the identification of potential issues and impacts (Chapter 6 and Chapter 8 of the Scoping Report), applicable legislation (Chapter 4 of the Scoping Report), and preliminary mitigation measures (Chapter 6 and Chapter 8 of the Scoping Report). As such, the specialist scoping inputs were included in the relevant chapters of the Scoping Reports. The requirements of Appendix 2 of the 2014 EIA Regulations were fulfilled in the Scoping Report, as shown in Chapter 1 (Table 1.3) and Chapter 8 (Table 8.1) of the Scoping Report. The DEA accepted the Scoping Reports on 8 December 2015 (as shown in Appendix I.4 of this EIA Report).
2.9	Comments from the SKA must be included in the Final SR.	Coenrad Agenbach, National DEA, Deputy Director: Strategic Infrastructure Developments	2 November 2015, Letter (dated 29 October 2015) sent via email	**CSIR:** Comments from the SKA Project Office were received during the Project Initiation Phase (Section 6.2 of this chapter) and the Scoping Phase (Section 6.3 of this chapter). Copies of the comments raised by the SKA are included in Appendix G of this EIA Report. As noted above, as requested by the SKA, Solar has complied with the requirements from the SKA Project Office and a technical EMI and RFI study has been commissioned by Scatec Solar. As noted in Chapter 4 of this EIA Report, Scatec Solar appointed MESA Solutions (PTY) Ltd to undertake the Cumulative Topographical Analysis of Proposed PV Projects in AGA Area, which is included in Appendix K of this EIA Report, with a summary provided in Chapter 15. The SKA Project Office will

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
				review the findings of this study and provide feedback during the EIA Phase.
2.10	Please provide a description of any identified alternatives for the proposed activity that are feasible and reasonable, including the advantages and disadvantages that the proposed project activity or alternatives will have on the environment and on the community that may be affected by the activity as per Appendix 2 of GN R.982 of 2014. Alternatively, you should submit written proof of an investigation and motivation if no reasonable or feasible alternatives exist in terms of Appendix 2.	Coenrad Agenbach, National DEA, Deputy Director: Strategic Infrastructure Developments	2 November 2015, Letter (dated 29 October 2015) sent via email	**CSIR:** Chapter 5 of the finalised Scoping Report includes a detailed review and assessment of the alternatives that were considered in the Scoping Phase. The Scoping Report included the advantages and disadvantages of the alternatives that were considered during the Scoping Phase, as well as a high level assessment of potential impacts and risks identified for each of the location alternatives identified (Refer to the scoping Report for additional information). Chapters 5 and 16 of this EIA Report provide additional details regarding the preferred alternatives that have been considered in this EIA Phase.
2.11	In accordance with Appendix 2 of the EIA Regulations 2014, the details of – (i) the EAP who prepared the report; and (ii) the expertise of the EAP to carry out Scoping and Environmental Impact Assessment procedures; must be submitted.	Coenrad Agenbach, National DEA, Deputy Director: Strategic Infrastructure Developments	2 November 2015, Letter (dated 29 October 2015) sent via email	**CSIR:** Comment noted. The details of the EAP who prepared the Scoping Report and the expertise of the EAP were included in Chapter 1 and Appendix A of the Scoping Report. Appendix B also included the EAP's declaration of interest**.** Refer to the Scoping Report (CSIR, 2015) for a copy of the EAPs Declaration of Interest and Curriculum Vitae. Appendix A of this EIA Report includes the Curriculum Vitae of the EAP, as well as the specialist team. Appendix B of this EIA Report includes the declaration of independence and interest of the EAP and the specialist team.
2.12	You are further reminded that the final SR to be submitted to this Department must comply with all the requirements in terms of the scope of assessment and content of Scoping Reports in accordance with Appendix 2 and Regulation 21 (1) of the EIA Regulations, 2014.	Coenrad Agenbach, National DEA, Deputy Director: Strategic Infrastructure Developments	2 November 2015, Letter (dated 29 October 2015) sent via email	**CSIR:** The requirements of Appendix 2 of the 2014 EIA Regulations were fulfilled in the Scoping Report, as shown in Chapter 1 (Table 1.3) and Chapter 8 (Table 8.1) of the Scoping Report. The DEA accepted the Scoping Reports on 8 December 2015 (as shown in Appendix I.4 of this EIA Report).
2.13	Further note that in terms of Regulation 45 of the EIA Regulations, 2014, this application will lapse if the applicant fails to meet any of the timeframes prescribed in terms of these Regulations, unless an extension has been granted in terms of Regulation 3(7).	Coenrad Agenbach, National DEA, Deputy Director: Strategic Infrastructure Developments	2 November 2015, Letter (dated 29 October 2015) sent via email	**CSIR:** Comment noted.

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2.14	You are hereby reminded of Section 24F of the National Environmental Management Act, Act No 107 of 1998, as amended, that no activity may commence prior to an environmental authorisation being granted by the Department.	Coenrad Agenbach, National DEA, Deputy Director: Strategic Infrastructure Developments	2 November 2015, Letter (dated 29 October 2015) sent via email	**CSIR:** Comment noted.
2.15	Please find attached a copy of the comments by the Department of Water and Sanitation. The original will be sent to you via registered mail. Please feel free to contact this department should you have any queries.	Ms Chantèl Schwartz, Orange Proto- CMA, Department of Water and Sanitation	3 November 2015, Email	**CSIR:** Comment noted. Appendix G of this EIA Report includes a copy of the comments received from the Department of Water and Sanitation during the Scoping Phase.
2.16	The following proposed developments have reference: Kenhardt PV 1: CSIR/CAS/EMS/ER/2015/0007/B Kenhardt PV 2: CSIR/CAS/EMS/ER/2015/0008/B Kenhardt PV 3: CSIR/CAS/EMS/ER/2015/0009/B Please refer to attached comments.	Elsabe Swart, Deputy Director – Research and Development Support, Northern Cape Department of Environment and Nature Conservation	5 November 2015, Email	**CSIR:** Ms. Elsabe Swart has been included on the project database of I&APs. Refer to Appendix C of this EIA Report for a copy of the current database of I&APs. The complete correspondence received from the Northern Cape Department of Environment and Nature Conservation is included in Appendix G of this EIA Report. This correspondence includes several figures and maps, as well as project background information (based on the information provided in the Scoping Report for review). Only the comments relating to the proposed project as included in the correspondence from the Department are extracted and included in this chapter.
2.17	Noted, thank you.	Jacoline Mans, Designation: Chief Forester (NFA Regulation), Directorate: Forestry Management (Other Regions) Northern Cape, DAFF	5 November 2015, Email	**CSIR:** This email was sent by Ms. Jacoline Mans of the DAFF, in response to the receipt of the comments issued by the Northern Cape Department of Environment and Nature Conservation. Ms. Elsabe Swart copied the comments from the Northern Cape Department of Environment and Nature Conservation to the DAFF.
2.18	Point 3 - The proposed development do not form part of the Strategic Environmental Assessment (SEA) for Eskom's electricity grid upgrades and roll-outs as it falls outside one of the corridors identified by Eskom (i.e. the Western Corridor; one of the five identified	Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la	5 November 2015, Letter sent via email	**CSIR:** Comment noted. Field surveys were undertaken by the relevant specialists during the Scoping and EIA Phases. The only specialist study that did not entail a field visit is the Desktop Palaeontological Impact Assessment (Chapter 10 of this EIA Report), which as explained in the Response to Comment 1.1 in

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
	corridors; refer to Figure 3). Comprehensive field surveys (within appropriate seasons) should thus be done for this specific area; it didn't form part of Eskom's assessment and the former project's surveys can thus not be used as baseline studies. Caption Figure 3 - Strategic Environmental Assessment (SEA) for ESKOM's electricity grid upgrades and roll-outs (Feb 2014) in relation to the proposed development (black arrow) near Kenhardt The proposed development falls outside one of the corridors identified by ESKOM (i.e. the Western Corridor; one of the five identified corridors), hence, it didn't form part of Eskom's assessment. *Note from the CSIR: Refer to Appendix G of this EIA Report for the complete correspondence sent by the Northern Cape Department of Environmental and Nature Conservation for context.*	Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation		Section 6.3 above; a desktop study is warranted based on the low palaeontological sensitivity of the area. The findings of the field surveys have been included in the relevant specialists studies (Chapters 7 to 15) as part of the EIA Reports (which are currently being released for a 30-day comment period during the EIA Phase). The relevance of the site visits are described in the relevant specialist studies. In addition, as mentioned in Chapter 4 of this EIA Report, the proposed project area did not form part of the preliminary corridors identified as part of the EGI SEA. However based on the final corridors, as shown in Figure 4.2 (Chapter 4) of this report, the proposed project does fall within one of the corridors identified as part of the EGI SEA. It is also important to note that the proposed project area also falls within a REDZ, as discussed in Chapters 1 and 5 of this EIA Report.
2.19	Point 8 - Once the proponent decides on a project name, the latter should be made explicit. If the project name should change during the EIA phase of the project, this should be thoroughly communicated will all I&APs. It has come to light that RE project names continuously change for various reasons and confusion is then caused by the interchangeable use of the various project names for a single project. *Note from the CSIR: Refer to Appendix G of this EIA Report for the complete correspondence sent by the Northern Cape Department of Environmental and Nature Conservation for context.*	Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation	5 November 2015, Letter sent via email	**CSIR:** Comment noted. If the project name changes during the EIA Process, I&APs will be informed of the change accordingly. However, the CSIR Reference Number provided for all six projects will be unchanged during the EIA and BA processes.
2.20	Point 11 - Information regarding the probability of a site-visit to be conducted by officials from DEA / DAFF should be communicated with the DENC. This is to ensure cooperative governance, liaison and to enable a collaborative site-visit to be conducted.	Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la	5 November 2015, Letter sent via email	**CSIR:** Comment noted. The Department of Environment and Nature Conservation will be contacted if any site visits are to be conducted by the DEA or DAFF during the EIA and BA Phases.

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
	Note from the CSIR: Refer to Appendix G of this EIA Report for the complete correspondence sent by the Northern Cape Department of Environmental and Nature Conservation for context.	Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation		
2.21	Conclusion and recommendations: The proposed development is supported provided that the recommendations in this document are incorporated. *Note from the CSIR: Refer to Appendix G of this EIA Report for the complete correspondence sent by the Northern Cape Department of Environmental and Nature Conservation for context.*	Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation	5 November 2015, Letter sent via email	**CSIR:** Comment noted.

3. Project Description and Impact on Existing Infrastructure

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
3.1	Please send us three different drawings as this is 3 separate applications.	Marina Lourens, Transnet Freight Rail	25 September 2015, Email	**CSIR:** Separate maps showing the location of the proposed Kenhardt PV 1, Kenhardt PV 2 and Kenhardt PV 3 projects, as well as the location of the nearby Transnet Freight Rail access road and railway line, were sent to Ms. Marina Lourens and copied to Mr. Gilbert Nortier of Transnet Freight Rail on 22 October 2015. Refer to Appendix E of this EIA Report for a copy of this email response. Discussions have been held between the Applicant and Transnet Freight Rail to discuss the proposed project and the potential use of the Transnet Service Road.
3.2	Please find attached Eskom requirements for renewable infrastructure development at or near Eskom infrastructure. Note from the CSIR: The complete documents of	John Geeringh (*Pr. Sci. Nat*), Senior Consultant Environmental Management, Eskom	29 September 2015, Email	**CSIR:** Comment noted. The following documents were received from Mr. John Geeringh via email on 29 September 2015: ▪ Eskom requirements for work in or near Eskom servitudes; and

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	Eskom requirements are attached in Appendix H of this report.			▪ Renewable Energy Generation Plant Setbacks to Eskom Infrastructure. The abovementioned complete documents are included in Appendix G of this EIA Report, and have been sent to the Project Applicant for consideration in the design, where required and as applicable (i.e. in terms of work in or near Eskom servitudes and setback distances for Solar PV Facilities from power lines and substations). Some of Eskom's general requirements in terms of work in or near Eskom servitudes are addressed in the EMPr (Part V of the EIA Report), such as waste management and ensuring that rubble or other material will not be dumped within the servitude. Discussions have been held between the Applicant and Eskom to discuss the proposed project and the connection point to the Eskom Nieuwehoop Substation.
3.3	This serves as a notice of receipt and confirms that your application has been captured in our electronic AgriLand tracking and management system. It is strongly recommended that you use the on-line AgriLand application facility in future. Detail of your application as captured: Application Type: Scoping Reports: Three Solar Photovoltaic Facilities Your reference number: Property Description: Onder Rugzeer 168 Dated: 25 September 2015 Please use the following reference number in all enquiries: AgriLand reference number: 2015_10_0050 Enquiries can be made to the above postal, fax or e-mail address.	HJ Buys, Director: Land Use and Soil Management, Department of Agriculture, Forestry and Fisheries (National)	6 October 2015, Letter sent via email	**CSIR**: Comment noted. The Department of Agriculture, Forestry and Fisheries on-line AgriLand application facility will be used in future, as required, and the assigned reference number will be used in all future enquiries submitted to the Department in relation to the proposed project (as required).

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
3.4	I would herewith like to register as an IAP for the above listed project. May I also request a locality plan please. I would like to know if there is a transport plan available for this project yet.	Nicole Abrahams, Environmental Coordinator, SANRAL – Western Region	14 October 2015, Email	**CSIR:** SANRAL was identified as a key stakeholder and thus pre-included on the project database of I&APs and Organs of State at the outset of the Scoping and EIA Process. Ms. Nicole Abrahams has been included on the project database of I&APs as requested. Refer to Appendix C of this EIA Report for a copy of the current database of I&APs. In addition, separate maps showing the location of the proposed Kenhardt PV 1, Kenhardt PV 2 and Kenhardt PV 3 projects were sent to Ms. Nicole Abrahams on 30 October 2015. Refer to Appendix E of this EIA Report for a copy of this email response. The anticipated traffic loads on the R27, R383, unnamed farm road and Transnet Service Road are expected to be significantly less than the design capacity of these roads. With this in mind, the traffic volumes contributed by the construction and operation phases of the facility on the existing traffic volumes are considered acceptable. To this end, a Traffic Impact Statement has been prepared by the EAP and is included in Chapter 14 of this EIA Report. Recommendations for traffic impacts have been included in the EMPr. Ms. Nicole Abrahams was also informed of the Traffic Impact Statement. Refer to Appendix E of this EIA Report for a copy of this email response.
3.5	In summary, a detailed EMI and RFI survey would need to be undertaken to characterise the expected radio emissions from the facility. Once this has been conducted, radio frequency propagation modelling would need to be undertaken to determine the quantitative impact the proposed facility would have on the SKA. The relevant developer would need to contract EMI specialists to undertake these studies. I can suggest a group based in Pretoria, who have undertaken similar studies.	Dr. Adrian Tiplady Head: Strategy, SKA South Africa	29 October 2015, Email	**CSIR:** This comment was received in response to a follow up correspondence sent by the CSIR on 23 October 2015 and 27 October 2015 regarding the EMI and RFI specialist surveys required by the SKA Project Office. Refer to Appendix E and Appendix G of this EIA Report for a copy of this email response. Linked to this, during the 30-day review of the Scoping Report, the CSIR contacted the SKA Project Office (via email) in order to confirm the scope, requirements and specifications of these EMI and RFI specialist studies. As noted in the response to Comment 2.2 in Section 6.2 above, Scatec Solar has complied with the requirements from the SKA Project Office. A technical EMI and RFI study has been commissioned by Scatec Solar. As noted in Chapter 4 of this EIA Report, Scatec Solar appointed MESA

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				Solutions (PTY) Ltd to undertake the Cumulative Topographical Analysis of Proposed PV Projects in AGA Area, which is included in Appendix K of this EIA Report, with a summary provided in Chapter 15. The SKA Project Office will review the findings of this study and provide feedback during the EIA Phase.
3.6	I will confirm tomorrow - however, I suspect our comments will be no different from what we have already submitted. Should we send no further comments, please treat our previous comments as still valid as we have not received any evidence of studies having been conducted. Unless I have missed something?	Dr. Adrian Tiplady Head: Strategy, SKA South Africa	29 October 2015, Email	**CSIR:** This comment was received in response to a further follow up correspondence sent by the CSIR on 29 October 2015 to query whether the SKA Project Office has any comments on the Scoping Report. Refer to Appendix E and Appendix G of this EIA Report for a copy of this email response.
3.7	I would like to confirm that our letter applies to all potential facilities of the same nature located at this site, and future requests for comments on this and other facilities. Once we have been able to assess and analyse appropriate measurement reports, we will issue a further comment.	Dr. Adrian Tiplady Head: Strategy, SKA South Africa	30 October 2015, Email	**CSIR:** Refer to the responses provided to Comment 2.2 in Section 6.2 above, as well as Comments 3.5 and 3.6 in Section 6.3 above.
3.8	Thank you for the locality plans. If any transport plan will be developed then you should forward that to me please.	Nicole Abrahams, Environmental Coordinator, SANRAL – Western Region	30 October 2015, Email	**CSIR:** Refer to the response provided to Comment 3.4 in Section 6.3 above.

4. Impact on Aquatic/Freshwater Resources

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
4.1	The Department of Water and Sanitation (DWS) hereby acknowledges receipt of your scoping and environmental impact assessment for the proposed development of three Solar Photovoltaic Facilities (Referred to as Kenhardt PV 1, Kenhardt PV 2 and Kenhardt PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province. The department has reviewed the document and the comments are as follows:	Ms Chantèl Schwartz, Orange Proto- CMA, Department of Water and Sanitation	3 November 2015, Email	**CSIR:** ▪ As noted in the response to Comment 2.1 in Section 6.3 above, hard copies and CD copies of the Scoping Report for the Kenhardt PV 1, Kenhardt PV 2, and Kenhardt PV 3 projects, including Letter 2, a Comment and Registration Form and Executive Summaries, were sent to Ms. Melinda Mei of the Department of Water and Sanitation via courier on 30 September 2015.

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
	▪ Please note that no development should take place within 100 m horizontal distance from a water course or within 1:100 year flood line. Operation and storage of equipment within the riparian zone must be limited as far as possible. ▪ All sewage, grey and wash water, as well as any waste generated during the construction phase of the facilities will be collected, contained and disposed of at the permitted and/or licenced facilities of the Local Authority. Please note that proof of the agreement between the applicant and the concerned Local Authority must be submitted to this Department. ▪ Any spillage of any hazardous materials including diesel that may occur during construction and operation must be dealt with and reported immediately to this Department. ▪ Storm water must be diverted from the construction works and roads and must be managed in such a manner as to disperse runoff and to prevent the concentration of stormwater flow. Where necessary, works must be constructed to attenuate the velocity of the storm water discharge and to protect the banks of the watercourse. ▪ Please note that no taking of water or storing of water from the water resource shall be lawful without a water use authorisation. Due to the high number of renewable energy projects that are taking part in the Department of Energy (DOE) bidding process, this Department (DWS) will only process applications for water use authorisations received from developers who have attained preferred bidder status.			▪ Comment noted. It is important to re-iterate that as far as possible, the proposed structures and infrastructure will be sited outside of the sensitive areas as identified by the specialists (Chapters 7 to 14 of this EIA Report). In particular, the Ecological Impact Assessment (including Terrestrial Ecology, Aquatic Ecology and Avifauna) included a survey of the area available for development (i.e. 1341 ha). The specialist highlighted sensitive environmental features (such as watercourses, and protected vegetation species etc.) that occur within the surveyed area. Refer to the Ecological Impact Assessment (included in Chapter 7 of this EIA Report), which provides a detailed response to this comment relating to the construction of the proposed project in proximity to watercourses. The Ecological Impact Assessment states that the 100 m set back is noted, however given the fact that hydrogeomorphological indicators and vegetation structure have been used to delineate drainage features; a 100 m non-development area around such features is considered excessive. The specialist study further explains that a 100 m exclusion area around the drainage lines would incorporate extensive tracts of land which are in no way indicative of the concentrated surface hydrology. The use of the more conservative 32 m buffer is appropriate as this incorporates the identified vegetation indicators and provides a cordon around the erosive edges of such hydrological features. The Ecological Impact Assessment has identified zones that should be subject to exclusion from any proposed development within the Kenhardt PV 3 area (Appendix 7.A of Chapter 7 of this EIA Report). These zones relate to the major drainage features that are associated with and proximal to the Wolfkopseloop and Rugseers drainage systems, two quartzite kopjies and aloes in association with these kopjies. As mentioned above, a 32 m “buffer” or “setback” around the major drainage lines has been established, which is an indicative “norm” recommended by the various authorities. No additional sites of ecological significance that should be excluded from the development footprint have been identified in the Ecological Impact Assessment

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	Developers who wish to submit applications for water use authorisations may however proceed to do so, with the understanding that their applications will be processed as soon as we have confirmation of their status with the DOE. Attached to this letter is Annexure 1 that details information, which must be submitted as part of the application for water use authorisation.			for the Kenhardt PV 3 area. Minor drainage lines were also identified within the Kenhardt PV 3 area, as noted in the Ecological Impact Assessment (Chapter 7 of this EIA Report). The "minor" drainage features are not considered to require exclusion from any land use change or the proposed development, due to the transformed surface hydraulics arising from the establishment of the Sishen-Saldanha railway line and its associated stormwater management infrastructure, as well as other anthropogenic interventions, such as borrow pits and roadways, which have further altered surface drainage, and the origins of the minor drainage features (as explained in the Ecological Impact Assessment in Chapter 7 of this EIA Report, as well as the generally benign impact of solar arrays on surface flow. The Ecological Impact Assessment notes that although the minor drainage lines occurring within the site do not require avoidance, it would however be best for the design of the proposed solar PV facility to note the presence of these minor features and avoid establishing structures such as transformers, buildings and other permanent and significant structures within them. If necessary, it would be best to incorporate the minor drainage lines into the solar arrays. The sensitive features identified in all relevant specialist studies, including the Ecological Impact Assessment (Chapter 7 of this EIA Report), are summarised and spatially indicated in a sensitivity map shown in Chapter 16 of this EIA Report. Thereafter, together with the Applicant, a suitable location has been selected for the siting of the 250 ha facility, within the larger area surveyed by the specialists, and as far as possible, outside of the sensitive areas identified. The Ecological Impact Assessment (including Terrestrial Ecology, Aquatic Ecology and Avifauna) also includes recommendations for mitigating any potential negative impacts on nearby watercourses and surface hydrological features during the construction and

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
				operational phases. ▪ As noted in Chapter 4 of this EIA Report, waste will be generated during the construction, operational and decommissioning phases of the proposed project. Recommendations for the management of waste in order to reduce potential negative impacts on the surrounding environment have been included in the EMPr (Part B of the EIA Report), as applicable. During the construction and operational phase, all waste will be safely stored, and will be removed from site on a scheduled basis by an appointed contractor. The waste, where applicable, will be disposed at a licenced municipal landfill site. Confirmation from the municipality (in terms of landfill space and provision of services) will be sought during the EIA Phase. During the operational phase, the regional DWS will be informed of any agreements reached with the Local Authority in terms of waste management and disposal. Nevertheless, all waste generated during the construction, operational and decommissioning phases of the proposed project will be correctly disposed at a registered waste disposal facility and proof of disposal will be obtained and retained on file, for auditing purposes. ▪ It is important to re-iterate that it is proposed to store less than 30 m^3 of dangerous goods (such as petrol and diesel) on site during the construction phase. Recommendations for the temporary storage of petrol and diesel on site during the construction phase are provided in the EMPr (Part B of the EIA Report). The proposed solar facility will also undergo routine maintenance which will necessitate the use of hydraulic oils, grease and other lubricants. Recommendations for the management of potential spillages of oil, chemicals or fuel during the construction and operational phases are included in the EMPr (Part B of the EIA Report). The EMPr stipulates that all spillages that occur on site as a result of the proposed project must be cleaned immediately, with correct disposal of the resulting

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				spilled material. The regional DWS will be informed of any significant spills that occur on site during the construction and operational phases. ▪ These recommendations for stormwater management will be considered by the Applicant during the design phase, as applicable and where possible. Recommendations for erosion control and stormwater management are included in the relevant specialist studies undertaken during the EIA Phase, as well as the EMPr (Part B of the EIA Report). ▪ As explained in Chapter 4 of this EIA Report, any activities that take place within a water course or within 500 m of a wetland boundary require a WUL under the Section 21 (c) and Section 21 (i) of the NWA. The Ecological Impact Assessment (Chapter 7 of this EIA Report) includes additional information regarding the need for a WUL. The Ecological Impact Assessment states that authorisation for changes in land use; up to 500 m from a defined water resource/wetland system will require an application for a WUL from the DWS. The Ecological Impact Assessment explains that a WUL will be required in respect of the proposed development under Section 21 (c) and (i) of the NWA, however such licence should not preclude the proposed development. ▪ However, it is important to note that considerable efforts will be made to place the proposed solar field and project infrastructure outside of wetland areas and any sensitive surface hydrological features identified by the specialist. As noted above, a 32 m buffer has been recommended around the major drainage lines (i.e. the Wolfkopseloop) within the Kenhardt PV 3 area. No construction will occur within 32 m of the major drainage lines as recommended in the Ecological Impact Assessment. As noted previously, the preferred site for the proposed Kenhardt PV 3 project includes approximately 1341 ha of land, however the proposed solar facility and associated infrastructure

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
				requires a development area of approximately 250 ha only. The larger area has been proposed to allow for the avoidance of major environmental constraints in the siting of the location and layout of the 250 ha facility, which as far as possible, is sited outside of the sensitive areas identified by the specialists. Additional information regarding the siting of the proposed 250 ha facility is provided in Chapter 16 of this EIA Report. The DWS will be consulted with during the EIA Process to confirm the need for a WUL, as well as to seek further comment on the proposed project. It is understood that WUL Applications will only be processed by the DWS if preferred bidder status has been awarded to the Project Applicant. The requirements for WUL Applications have been provided to the Project Applicant for review and consideration.
4.2	Point 6 - It is advisable that RE facilities are not proposed for areas that favour local faunal diversity (e.g. endorheic pans, dry river washes, rocky outcrops, etc.). The Northern Cape is water scarce province, hence any form of sustained water, has the potential to stimulate vegetative growth and attract faunal species. Above-mentioned areas should be noted as sensitive areas during the EIA phase. *Note from the CSIR: Refer to Appendix G of this EIA Report for the complete correspondence sent by the Northern Cape Department of Environmental and Nature Conservation for context.*	Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation	5 November 2015, Letter sent via email	**CSIR:** Comment noted. As far as possible, the proposed structures and infrastructure have been sited outside of the sensitive areas identified by the specialists as part of the EIA Phase. In particular, the Ecological Impact Assessment (including Terrestrial Ecology, Aquatic Ecology and Avifauna) included a survey of the area available for development (i.e. 1341 ha). The specialist then highlighted any sensitive environmental features (such as watercourses, faunal and protected vegetation species etc.) that occur within the surveyed area. A suitable location has thereafter been selected (together with the Project Applicant) for the siting and layout of the 250 ha facility, within the larger area surveyed by the specialists. The layout and siting of the facility is as far as possible, located outside of the sensitive areas identified. The Ecological Impact Assessment (Chapter 7 of this EIA Report) also includes recommendations for mitigating any potential negative impacts on nearby watercourses and surface hydrological features during the construction and operational phases. Refer to the Ecological Impact Assessment (included in Chapter 7 of this EIA Report), which also provides a detailed response to this comment.

5. Impact on Terrestrial Ecology (Flora and Fauna)

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
5.1	Point 1 - It should be noted that the areas where the proposed developments are to be constructed have been historically poorly surveyed, hence extrapolations from desktop studies for specialist's studies will give an incomplete representation of the biodiversity within the area (refer to Figure 2). Caption Figure 2- South African National Biodiversity Institute's (SANBI) PRECIS database (2013) indicating the number of plant specimens collected for specific Quarter Degree Grid Squares (QDGS). The proposed development falls within QDGS indicative of a very low species count (i.e. 1 – 50 species sampled per grid). Red squares denote zero specimens. *Note from the CSIR: Refer to Appendix G of this EIA Report for the complete correspondence sent by the Northern Cape Department of Environmental and Nature Conservation for context.*	Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation	5 November 2015, Letter sent via email	**CSIR:** Comment noted. The Ecological Impact Assessment (including Terrestrial Ecology, Aquatic Ecology and Avifauna), included in Chapter 7 of this EIA Report included a desktop component, as well as field work component. The desktop component of the study assisted the specialist to compile a baseline description of the terrestrial and aquatic ecology (including avifauna) of the study area, and provide an overview of the entire study area in terms of ecological significance and sensitivity. The desktop review was undertaken using spatial data, SANBI conservation data, as well as other related information. The desktop survey also prepared the specialist for the fieldwork component by providing the necessary background information. The specialist then undertook field work and sampling across the site to record relevant data and to compile an overview of the habitat under review. The field assessment aimed to confirm the nature and structure of the habitat within the study area from an ecological perspective. Refer to the Ecological Impact Assessment (included in Chapter 7 of this EIA Report), which also provides a response to this comment. The Ecology Specialist notes that field reconnaissance was undertaken during assessment and that the PRECIS database is noted and confirmed.
5.2	Point 2 - Large *Aloe dichotoma* populations are known to occur in the region. The species is protected under the Northern Cape Nature Conservation Act (Act 9 of 2009) and at present there is a moratorium in place in the Northern Cape on the removal of *A. dichotoma* from the wild due to historic trade related pressures on populations (Proclamation No 968, 1 April 2005). Hence, trees may not be removed until the moratorium is lifted. All trees within the development or close proximity thereof should be mapped and information provided with the EIA documents.	Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation	5 November 2015, Letter sent via email	**CSIR:** As noted in Chapter 3 of this EIA Report, based on previous research, there are two quiver tree forests located towards the north of the proposed project site, on the Gemsbok Bult Farm (ASHA Consulting, 2015). This is also noted in the Ecological Impact Assessment (Chapter 7 of this EIA Report), which explains that *Aloe dichotoma* was noted in adjacent lands but not associated with the Kenhardt PV 3 area. These species have been excluded from the development areas for Kenhardt PV 1 and PV 3. Aloes were found within the larger PV 3 area, in association with the two quartzite kopjies found on site, however these are not located within the footprint of the actual facility. One single specimen of *Aloe dichotoma* was found within the Kenhardt PV 2 site, which is discussed further in the

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
	Note from the CSIR: Refer to Appendix G of this EIA Report for the complete correspondence sent by the Northern Cape Department of Environmental and Nature Conservation for context.			EIA Report for Kenhardt PV 2. The presence of these protected trees on site is included in the relevant sensitivity mapping.
5.3	Point 5 - The development is proposed for an area that falls within the Bushmanland Arid Grassland, one of the most extensive vegetation types within the Northern Cape (Mucina and Rutherford, 2006). This vegetation types is poorly conserved in formal protected areas and extensive areas have been historically overgrazed. As a result, large areas are currently degraded and drainage lines have been modified as a result of anthropogenic impacts. As a result of the extent of the area, impact would most likely be on landscape connectivity as the site is in close proximity of drainage lines and wetlands (refer to Figure 5). Caption Figure 5 - Several landscape scale connections through drainage lines are evident within the area in question. The two proposed facilities i.e. the Three Solar PV (blue arrow) and Seven Solar PV (black arrow) are to be located in close proximity of drainage lines and wetlands. *Note from the CSIR: Refer to Appendix G of this EIA Report for the complete correspondence sent by the Northern Cape Department of Environmental and Nature Conservation for context.*	Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation	5 November 2015, Letter sent via email	**CSIR:** Comment noted. The Ecological Impact Assessment (including Terrestrial Ecology, Aquatic Ecology and Avifauna) has assessed the impact of the proposed project on the vegetation and aquatic ecology within the study area, and is included in Chapter 7 of this EIA Report. The Ecological Impact Assessment notes that the landscape connectivity has been considered in the specialist study and preserved. In addition, the specialist study also explains that the drainage lines that are considered to be major watercourse features are excluded from development.
5.4	Point 7 - The disturbance of soil and indigenous vegetation can initiate the prolific growth of invasive alien plants (IAPs). The latter should be avoided by all means as it has detrimental impacts on indigenous faunal and floral species, as well as underground water resources. A proper IAP management plan must thus be factored into the EIA phase (as part of the	Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern	5 November 2015, Letter sent via email	**CSIR:** Comment noted. As noted in Chapter 4 of this EIA Report, alien plant species occurring within the study area will be managed in line with the EMPr (Part B of the EIA Report).

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
	EMP). Please consult the National Environment Management: Biodiversity Act's (Act No. 10 of 2004) Regulations on Alien and Invasive Species as promulgated on 1 August 2014. *Note from the CSIR: Refer to Appendix G of this EIA Report for the complete correspondence sent by the Northern Cape Department of Environmental and Nature Conservation for context.*	Cape Department of Environment and Nature Conservation		
5.5	Point 9 - It is advised that the consultants for this project liaise with the Forestry branch of the Department of Agriculture, Forestry and Fisheries (DAFF) if trees protected under the National Forest Act (Act No. 84 of 1998) are to be impacted by the proposed development. *Note from the CSIR: Refer to Appendix G of this EIA Report for the complete correspondence sent by the Northern Cape Department of Environmental and Nature Conservation for context.*	Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation	5 November 2015, Letter sent via email	**CSIR:** As noted in Chapter 4 and Chapter 7 (Ecological Impact Assessment) of this EIA Report, the National Forest Act (Act 84 of 1998) allows for the protection of certain tree species. The Minister has the power to declare a particular tree to be a protected tree. According to Section 12 (1) d (read with Sections (5) 1 and 62 (2) (c)) of the National Forest Act (Act 84 of 1998), a licence is required to remove, cut, disturb, damage or destroy any of the listed protected trees. The most recent list of protected tree species was published in November 2014. The Department of Agriculture, Forestry and Fisheries (DAFF) is authorised to issue licences for any removal, cutting, disturbance, damage to or destruction of any protected trees. The protected trees that commonly occur in this region are *Acacia erioloba* and Boscia spp. *Boscia albitrunca*. The Ecological Impact Assessment (Chapter 7 of this EIA Report) established that none of the protected species in terms of the National Forest Act (Act 84 of 1998) were found on site during the survey. The Ecological Impact Assessment also notes that it is unlikely that an application for the "clearing of a natural forest", as defined within the National Forest Act (Act 84 of 1998), will be required for the Kenhardt PV 3 site. The DAFF will be consulted with if any protected trees under the National Forests Act (Act 84 of 1998) are found on site.
5.6	Point 10 - If the proposed PV developments triggers biodiversity offsets under the DAFF due to the number of protected trees to be removed, this should be communicated with the DENC (contact Ms E. Swart at elsabe.dtec@gmail.com).	Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District	5 November 2015, Letter sent via email	**CSIR:** Comment noted. The Department of Environment and Nature Conservation will be contacted if any biodiversity offsets are required.

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
	Note from the CSIR: Refer to Appendix G of this EIA Report for the complete correspondence sent by the Northern Cape Department of Environmental and Nature Conservation for context.	Ecologist), Northern Cape Department of Environment and Nature Conservation		
5.7	Point A. Specialist's studies: ▪ A thorough baseline survey of the grids 2921AB and 2921AD should be conducted during the EIA phase with at least the following biotic specialists: Ornithologist, Mammologist, Herpetologist (including amphibians) and Botanist. o Surveys for both the faunal and floral specialist reports should be done during the most optimum period for this area i.e. mid-summer to autumn, after the rains and during the growth season when maximum biota can be expected. o This should be done in order to give a good representation of the ecology in the area. o Due to the extreme variability in time and space of rainfall events, even a once-off survey within the rainy season will not provide a representative picture of the ecology of the area. o The number of plants of conservation concern (e.g. *Aloe dichotoma, Aloe spp., Trichocaulon spp., Hoodia spp., Boscia spp.* etc. under the Northern Cape Nature Conservation Act No. 9 of 2009 and National Environmental Management: Biodiversity Act No. 10 of 2004, etc.) that may be directly affected by the development must be estimated during the EIA phase. o Large *Aloe dichotoma* [NCNCA protected spp.] populations are known to occur in the region and any populations in close proximity to the planned facilities must	Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation	5 November 2015, Letter sent via email	**CSIR:** As noted above, an Ecological Impact Assessment has been undertaken by qualified specialists as part of the EIA Phase. The Ecological Impact Assessment (Chapter 7 of this EIA Report) includes an assessment of Terrestrial Ecology, Aquatic Ecology and Avifauna. The specialist team includes a Registered Professional Natural Scientist (Ecologist), an Avian Specialist (ornithologist), a Freshwater Ecologist/aquatic specialist (Registered Professional Natural Scientist) and a GIS specialist. The specialist study will also make use of previous surveys undertaken for the adjacent Nieuwehoop Solar Development EIA project, which was recently undertaken by the CSIR. Refer to the Ecological Impact Assessment (included in Chapter 7 of this EIA Report), which also provides a response to this comment. The Ecological Impact Assessment notes that timeframes do not allow for a February to April period assessment. A drought period and meteorological state was noted at time of assessment. In addition, timeframes do not allow for continued long term assessments. Interpretation of landform, floral and faunal findings and multivariate analysis has been used to interpret and compile assessment. Given the findings of the Ecological Impact Assessment and the general severely grazed nature of the site, the information collated is considered sufficient to draw a conclusion on the nature of the ecology within the area. Refer to the responses provided to Comments 5.1, 5.2, 5.3 and 5.5 in this section.

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
	be mapped. *Note from the CSIR: Refer to Appendix G of this EIA Report for the complete correspondence sent by the Northern Cape Department of Environmental and Nature Conservation for context.*			
5.8	Point C - Ecology and landscape connectivity: ▪ The proponent should include in the EIA an environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process and map combining the final layout plan overlain on the environmental sensitivity map. This map should be adequate in size to determine the extent of the development and to identify all aspects adequately as indicated on the maps. No-Go areas should be clearly identified. ▪ The final layout of the proposed developments (all 3 phases) and its constituents should be designed in such a manner as to enhance ecological value to fauna and flora within the area and to avoid pressures associated with surrounding farmland i.e. natural areas for greening and designing to support ecological corridors and landscape connectivity are strongly encouraged. ▪ The actual footprint for all activities related to the whole project (all Solar Park facilities) must be calculated to determine the total natural vegetation land cover transformation and loss. The collective and residual impact of all developments will be assessed also during permit applications. If the collective impact is assessed early enough the developer can better manage his risks and costs as he/she would know in advance whether a biodiversity offset is triggered also under DENC. ▪ If electrification of the property as security measure is considered, possible electrocution	Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation	5 November 2015, Letter sent via email	**CSIR:** ▪ As noted above, as far as possible, the proposed structures and infrastructure have been sited outside of the sensitive areas identified by the specialists as part of the EIA Phase. The relevant specialists have identified sensitive areas, such as no-go areas (based on the desktop research and fieldwork) and maps highlighting these sensitive features (including the layout map) are included in Chapter 16 of this EIA Report. ▪ Recommendations for rehabilitation and re-vegetation are provided in the Ecological Impact Assessment (Chapter 7 of this EIA Report) and the EMPr (Part B of the EIA Report). ▪ Comment noted. The actual footprint of all three Scoping and EIA Projects and three BA projects, together with potential residual impacts, are discussed in Chapter 16 of this EIA Report. ▪ The Ecological Impact Assessment (Chapter 7 of this EIA Report) includes a Faunal Assessment, which provides recommendations for potential negative impacts on fauna. Recommendations on fencing and the use of electric fencing have been identified in the Ecological Impact Assessment (Chapter 7 of this EIA Report). ▪ As explained in the EIA Report, existing roads (such as a private Transnet Service Road or an unnamed farm road) will be used to gain access to the preferred site. The Transnet Service Road can be accessed from the R27 and the farm road can be accessed from the R383 Regional Road also via the R27 National Road. An internal gravel road will be constructed from either the Transnet Service Road or the unnamed farm road to the proposed project site. The

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
	damage to small mammals such as pangolin and tortoises should be taken into consideration. ▪ Existing roads must be used as far as possible. ▪ The EIA should indicate how the Social-Agricultural-Conservation dynamic will change in terms of land use. Will the properties on which the developments occur still be actively farmed or will they become dormant or effectively be converted into conservation land with minimal land use management. Will problem animal control still occur as in standard practice in small livestock farming? How will fencing infrastructure change around the properties which has a bearing on problem animal control, but also on wildlife movement and landscape connectivity. ▪ The application must also be reviewed in the context of cumulative impacts of all RE developments in the region. *Note from the CSIR: Refer to Appendix G of this EIA Report for the complete correspondence sent by the Northern Cape Department of Environmental and Nature Conservation for context.*			internal gravel road is not expected to exceed 6 m in width (it is expected be approximately 4 m wide). An approximately 2.5 m wide perimeter road will also be constructed within the fenced area of the plant. Recommendations to mitigate potential negative impacts during internal gravel road construction are provided in the EMPr (Part B of the EMPr). ▪ At this point it is understood, based on feedback from the landowner, that farming operations will continue on the Onder Rugzeer Farm 168, in the areas surrounding the proposed Kenhardt PV 1, Kenhardt PV 2 and Kenhardt PV 3 projects (should an EA be granted). The farmers will continue to implement problem animal control measures to ensure the sustainability of the farm. As explained in Chapter 2 of this EIA Report, fencing will be installed around the boundary of the proposed PV facility for security and legal purposes. As noted above, the impact of the proposed project on fauna (such as the construction of security fencing), has been assessed as part of the Ecological Impact Assessment (Chapter 7 of this EIA Report). Refer to the Ecological Impact Assessment (included in Chapter 7 of this EIA Report), which also provides a response to this comment. ▪ As noted in Chapter 4 of this EIA Report, cumulative impacts have been assessed by identifying other solar energy projects and other applicable projects, such as construction and upgrade of electricity generation, transmission or distribution facilities in the local area (i.e. within 20 km of the proposed Kenhardt PV projects) that have been approved (i.e. positive EA has been issued) or the EIA is currently underway. The cumulative impacts are discussed in terms of each proposed Kenhardt PV project as well. Each specialist study (Chapters 7 – 15 of this EIA Report), as well as Chapter 16 of this EIA Report includes a description of the cumulative impacts.

6. Impact on Avifauna

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
6.1	Point 4 - The proposed area does not fall within or close to an Important Bird Area (IBA), yet it does resort within a region of grids classified has being sensitive to Wind Farm facilities (refer to Figure 4). The darker the pendent the more sensitive the specific area is to Wind Farm facilities. Closer scrutiny regarding bird studies is thus a prerequisite due to possible impacts of birds on grid infrastructure as by implication local or regional migratory species that move around in response to surface water availability may be at risk from infrastructure collisions. It is also critical to point out that bird data for this area is based on the South African Bird Atlas Project 1 (SABAP1); data published in 1997 and recorded at a much broader scale than the SABAP2 data survey. Evidently, one can conclude that data for this area is outdated. This is specifically highlighted as a point of concern as each of the three PV projects will be separately linked to the Eskom grid through its own set of powerlines. Caption Figure 4: The three Solar PV facility (blue arrow) is proposed for an area classified as being sensitive to Wind Farm facilities. The darker the pendent the more sensitive the specific area is to Wind Farm facilities. Though the proposed development is not a Wind Farm facility it poses significant risks to birds through collision with grid infrastructure as each of the three facilities will have its own transmission lines connecting to the Eskom Nieuwehoop grid station north east of the proposed development. A seven Solar PV facility (black arrow) is proposed north east of the proposed three Solar PV facility, each also having its own transmission line.	Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation	5 November 2015, Letter sent via email	**CSIR:** As noted in Chapter 3 of this EIA Report, based on input provided by the Ecology Specialist, according to the SABAP2, an average of 182 bird species have been recorded in the greater study area. The study area does not fall within or in close proximity to any IBAs, with the closest being the Augrabies Falls National Park, located over 100 km to the north west of the study area (SDP, 2015). The impact of the proposed Kenhardt PV 1, Kenhardt PV 2 and Kenhardt PV 3 solar facilities on avifauna has been assessed in the EIA Phase in the Ecological Impact Assessment (Chapter 7 of this EIA Report). As noted in Chapters 1 and 2 of this EIA Report, the impact of the proposed transmission lines on the surrounding environment have been assessed separately as part of a BA Process. The impact of the proposed transmission lines and associated electrical infrastructure projects (i.e. Kenhardt PV 1 – Transmission Line, Kenhardt PV 2 – Transmission Line and Kenhardt PV 3 – Transmission Line) on avifauna will be assessed in the BA reports, which is also being released for a 30-day comment period in conjunction with the EIA Reports. As noted above, the Ecological Impact Assessment included a desktop and fieldwork component, and it notes electric fencing, rather than overhead powerlines, is considered to be greatest risk to particular species of avifauna. Furthermore, as explained in Chapter 4 of this EIA Report, the proposed adjacent Mulilo Solar Development consisting of seven 75 MW PV Solar Energy Facilities, has been considered in terms of cumulative impacts during the EIA and BA phases.

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
	Note from the CSIR: Refer to Appendix G of this EIA Report for the complete correspondence sent by the Northern Cape Department of Environmental and Nature Conservation for context.			
6.2	Section B - Bird Monitoring: ▪ Bird monitoring programmes should form part of the Environmental Management Programme. o Monitoring of birds over a full seasonal period (12 months) is supported. o This will help to support a comparative lack of data on bird species in the study area from the SABAP database. o The information will also provide data on bird flight paths, risk of collision in specific areas, habitat niches etc. o An extensive monitoring area across the study area (i.e. non-resident species) is advised to comprehensively account for the movement of species. ▪ Appropriate bird deterrent devices must be placed around the facility to lessen the impact caused by collision of avifauna with the development infrastructure (Hernandez et al., 2014, Kagan et al., 2014). o All Power lines should be clearly marked with bird flappers / markers. o Bird marker devices must be put on the earth wires (live wires) of the power line as appose to the conductors [Bird Flight Divertor (BFD) as oppose to other bird marker devices are suggested (Anderson, 2001)]. ▪ Relevant Birdlife SA protocols should be consulted to conduct the EIA assessment for birds (Guide to	Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation	5 November 2015, Letter sent via email	**CSIR:** Refer to the response provided to Comment 6.1 above. As noted above, an Avifaunal Assessment has been undertaken as part of the Ecological Impact Assessment (Chapter 7 of this EIA Report). The assessment aims to determine the impact of the proposed project on avifauna within the study area. Relevant guidelines will be consulted during the assessment. The recommendations for the design of the transmission lines will be addressed as part of the separate BA Processes, which will be undertaken in line with the EIA Phase. Refer to the Ecological Impact Assessment (included in Chapter 7 of this EIA Report), which also provides a response to this comment. It is important to note that Birdlife South Africa and the SKA Project Office were included on the project database of I&APs since the commencement of the EIA and BA processes (as shown in Appendix C of this EIA Report). As such, both organizations have been sent all notifications, to date, regarding the PPP associated with the proposed project. To date, comments have been received from the SKA Project Office (Appendix G of this EIA Report). No comment has been received from Birdlife South Africa to date. They will be kept on the database for the remainder of the EIA and BA processes. The SAEON Arid Node has been placed on the database for the EIA Phase (as shown in Appendix C of this EIA Report).

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
	Access Avian Data for Environmental Impact Assessment Reports, Retief et al. 2013; BirdLife South Africa / Endangered Wildlife Trust best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa, Jenkins et al. 2012). Although the Jenkins and others guideline refers specifically to Wind farms, many of the principles apply for a thorough assessment. The electricity grid infrastructure especially remains a significant risk for bird collisions. ▪ Potential impacts on water fowl such as flamingos, ducks and geese as well as large Terrestrial Birds such as bustards and korhaan as well as raptors must be investigated. Potential impacts must speak to the Renewable Energy technologies and infrastructure as well electricity grid infrastructure. ▪ BirdLifeSA must be informed as I&AP to provide comment on the development. ▪ SKA must be consulted as I&AP to provide comment on the development. ▪ SAEON Arid Node must be informed as I&AP to provide comment on the development. *Note from the CSIR: Refer to Appendix G of this EIA Report for the complete correspondence sent by the Northern Cape Department of Environmental and Nature Conservation for context.*			

7. Recommendations for the EMPr

NO	ISSUES RAISED	COMMENTATOR	DATE	RESPONSE
7.1	Section D: Environmental Management Programme: ▪ Training and awareness on the illegal poaching and removal of succulents (e.g. *Hoodia gordonii, Euphorbia spp*.) and the protected quiver tree, *Aloe dichotoma*. ▪ The EIA must address how risk of alien plan infestation by predominantly *Prosopis* will be addressed, since the region is known to be under threat from infestation. ▪ A proper invasive alien management plan should be written into the EMPr. The area should be kept clear of invasive alien species; active management is a prerequisite. ▪ Bird deterrent devices to lessen the impact caused by collision of avifauna with development infrastructure. ▪ Possible electrocution of small mammals should be taken into account if electric fences are considered as a security measure. ▪ Free movement of small mammals if the development property is to be fenced. ▪ Rehabilitation plans must be provided as to how post construction rehabilitation will be approached as well as operational phase control measures for protecting equipment, for example cutting/scraping/ herbicide applications underneath solar panels.	Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation	5 November 2015, Letter sent via email	**CSIR:** ▪ The EMPr (Part B of the EIA Report) recommends that construction and operational staff are inducted and provided with Environmental Awareness Training in order to inform them of the presence, sensitivity of and importance of fauna. ▪ The Ecological Impact Assessment (Chapter 7 of this EIA Report) addresses the impact of the spread of alien invasive vegetation as a result of construction and operational activities. Alien plant species will be managed in line with the EMPr ((Part B of the EIA Report)). ▪ Refer to the responses provided to Comment 6.1 and Comment 6.2 above. ▪ The Ecological Impact Assessment (Chapter 7 of this EIA Report) includes a Faunal Assessment, which provides recommendations for potential negative impacts on fauna. Refer to the Ecological Impact Assessment (included in Chapter 7 of this EIA Report), which also provides a response to this comment. ▪ As noted above, the Ecological Impact Assessment (Chapter 7 of this EIA Report) includes a Faunal Assessment, which provides recommendations for potential negative impacts on fauna. Refer to the Ecological Impact Assessment (included in Chapter 7 of this EIA Report), which also provides a response to this comment. ▪ Rehabilitation recommendations (as applicable) have been incorporated into the EMPr (Part B of the EIA Report).

EIA REPORT

CHAPTER 7:

Ecological Impact Assessment

Scoping and **Environmental Impact Assessment** for the Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province

Report prepared for:

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March 2016

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS

Requirements of Appendix 6 - GN R982	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Appendix A of the EIA Report
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Section 7.1.6 of this chapter and Appendix B of the EIA Report
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 7.1.1
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 7.1.4.
e) a description of the methodology adopted in preparing the report or carrying out the specialised process;	Section 7.1.3
f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;	Section 7.3
g) an identification of any areas to be avoided, including buffers;	Section 7.3
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 7.3, Section 7.5 and Section 7.6
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 7.1.4
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	Section 7.6
k) any mitigation measures for inclusion in the EMPr;	Sections 7.6 and 7.8
l) any conditions for inclusion in the environmental authorisation;	Sections 7.6, 7.8 and 7.9
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 7.8
n) a reasoned opinion- i. as to whether the proposed activity or portions thereof should be authorised; and ii. if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 7.9
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 7.6
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Section 7.5
q) any other information requested by the competent authority.	n/a

list of abbreviations

DEA	Department of Environmental Affairs
EIA	Environmental Impact Assessment
ELP	Electrical light pollution
NEMA	National Environmental Management Act
NEMBA	NEM Biodiversity Act
TWINSPAN	Two Way Species Indicator Analysis

glossary

Definitions	
Arid	Areas which receive low levels of rainfall or there is a moisture deficit.
Crepuscular	Fauna that is active at twilight
Dendrogram	A diagram showing relationships determined through a cluster analysis
Calcrete	A carbonate horizon formed in semi-arid regions. Also known as a caliche.
Dolerite	Form of igneous rock.
Drainage line	A geomorphological feature in which water may flow during periods of rainfall.
Edaphic	Pertaining to soils.
Fossorial	Pertaining to burrowing animals or those which live underground
Geophyte	Plants with underground storage organs.
Graminoid	Grasses or grass-like. Also monocotyledonous plants.
Gully	An erosion line exceeding 30cm in depth where water flow is concentrated and erosion resulting from flow is clearly evident.
Hydrogeomorphological	The interaction of geomorphic processes, landforms and /or weathered materials with surface and sub-surface waters.
Hygrophilous	Plants growing in damp or wet conditions
Multivariate analysis	A statistical method of evaluating non linear relationships between groups of data.
Non perennial	Flow is intermittent and irregular
Rill	Shallow erosion lines less than 30cm deep
Xeric	A dry, as opposed to wet (hydric) or mesic (intermediate environment.

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7 ECOLOGICAL IMPACT ASSESSMENT

This chapter presents the findings of the Ecological Impact Assessment (including Terrestrial Ecology, Aquatic Ecology and Avifauna) that was prepared by Mr. Simon Bundy (of Sustainable Development Projects cc (SDP)) as part of the EIA for the proposed Kenhardt PV 3 project within the Northern Cape Province.

7.1 INTRODUCTION AND METHODOLOGY

7.1.1 Scope and Objectives

As noted in Chapter 1 of the EIA Report, the establishment of a PV facility exceeding thresholds stipulated within the EIA Regulations requires an Application for Environmental Authorisation to be submitted to the relevant, mandated authority (i.e. the National DEA), as well as the undertaking of an EIA Process. This Ecological Impact Assessment specialist study is being undertaken as part of the EIA Process in order to evaluate and study the bio-physical and ecological aspects of the receiving environment in relation to the proposed development.

This biophysical evaluation of a portion of the farm Onder Rugzeer 168 was undertaken during the period August to November 2015 and entailed both a literature review of the region, as well as on site evaluations, during which specific primary data was collected and evaluated. In addition, the identification of key ecological features on site and an interpretation of the prevailing habitat form were undertaken.

All data collected in the field and during the literature review was evaluated and interpreted in order to provide an understanding of the nature of the prevailing environment at a landscape and habitat level, together with specific evaluation of data relating to habitat form and structure, in order to identify anomalies within the prevailing environment. Such variance may be considered to be indicative of differing habitat forms, which under consideration, may be of higher order ecological value in relation of the prevailing environment.

7.1.2 The Terms of Reference

The overall objectives of the Ecological Impact Assessment were to:

- Identify and establish an understanding of the site under consideration at a landscape scale of evaluation with particular consideration being given to aquatic or important terrestrial habitats, as they may be identified.
- Provide an evaluation and status of habitat composition and significance within the site in order to evaluate the potential impact of the proposed development on the ecological function of the site.
- Assess the actual and potential impacts arising from the proposed development on both the habitat and fauna within the study site. Such impacts may be directly applicable to the site and contained within the site boundaries, or may be indirect impacts, which may have ramifications outside of the site boundary, or may be of a cumulative nature in terms of impacts arising from similar developments or activities within the region.
- Provide guidance on the implementation of mitigation measures that may serve to moderate any negative impacts that may arise on site as a consequence of the development.

The Scope of Work is based on the following broad Terms of Reference, which have been specified for this specialist study:

- Review detailed information relating to the project description and precisely define the environmental risks to the terrestrial and aquatic environment (including avifauna) and consequences for ecology.
- Compile a baseline description of the terrestrial and aquatic ecology (including avifauna) of the study area, and provide an overview of the entire study area in terms of ecological significance and sensitivity (i.e. in terms of the major habitat forms within the study area, giving due consideration to terrestrial ecology (flora), terrestrial ecology (fauna) and freshwater ecosystems/wetlands).
- Provide specific ecological data in respect of the floral, faunal and aquatic components of the site using ground-truthing methods, with an emphasis on those areas considered to be of "high" and possibly, "moderate" sensitivity (based on the desktop study).
- Based on the desktop study, undertake field work and sampling across the site to record relevant data and to compile an overview of the habitat under review.
- Collate all data collected during the field work and undertake a statistical review using methodologies that allows for comparison of biological data.
- Consider wetlands (endoreic pans) and associated water resources within the site in terms of significance within the catchment, habitat value and significance and delineation of extent through preliminary on site evaluation and the use of aerial imagery interpretation (where these arise). Determine if a Water Use Licence is required.
- Undertake a faunal investigation on site based on the points identified during the preliminary aerial photographic interpretation.
- Provide a detailed terrestrial and aquatic ecological sensitivity map of the site, including mapping of disturbance and transformation on site.
- Identify and rate potential direct, indirect and cumulative impacts (in line with the impact assessment methodology provided in Chapter 4 of the EIA Report) on the terrestrial and aquatic ecology, communities and ecological processes within the site during the construction, operation and decommissioning phases of the project.
- Provide input to the EMPr, including mitigation and monitoring requirements to ensure that the impacts on the terrestrial and aquatic ecology are limited.
- Compile an assessment report qualifying the risks and potential impacts on terrestrial and aquatic ecology in the study area and impact evaluations.

7.1.3 Approach and Methodology

A literature review and desktop analysis was undertaken prior to the field investigation, utilizing various sources including the South African National Biodiversity Institute (SANBI) data and other relevant sources. Recent and historical aerial imagery of the site was reviewed in order to identify points for investigation during the field survey.

Utilising the above information, a field investigation was undertaken during the early summer of 2015 (November), whereby:

- Sites of geomorphological or topographic variance were identified and subjected to an evaluation of species present within a 40 m transect established across the selected site. Species were identified and collated according to a "presence – absence" method of evaluation (Figure 7.1). A total of 10 transects were established on this site, in addition to data collected from transects at neighbouring sites.
- Additional random sample points were selected from across the site for comparative purposes.
- Any additional species of significance (e.g. *Aloe dichotoma*), not identified within the sample sites were also noted.

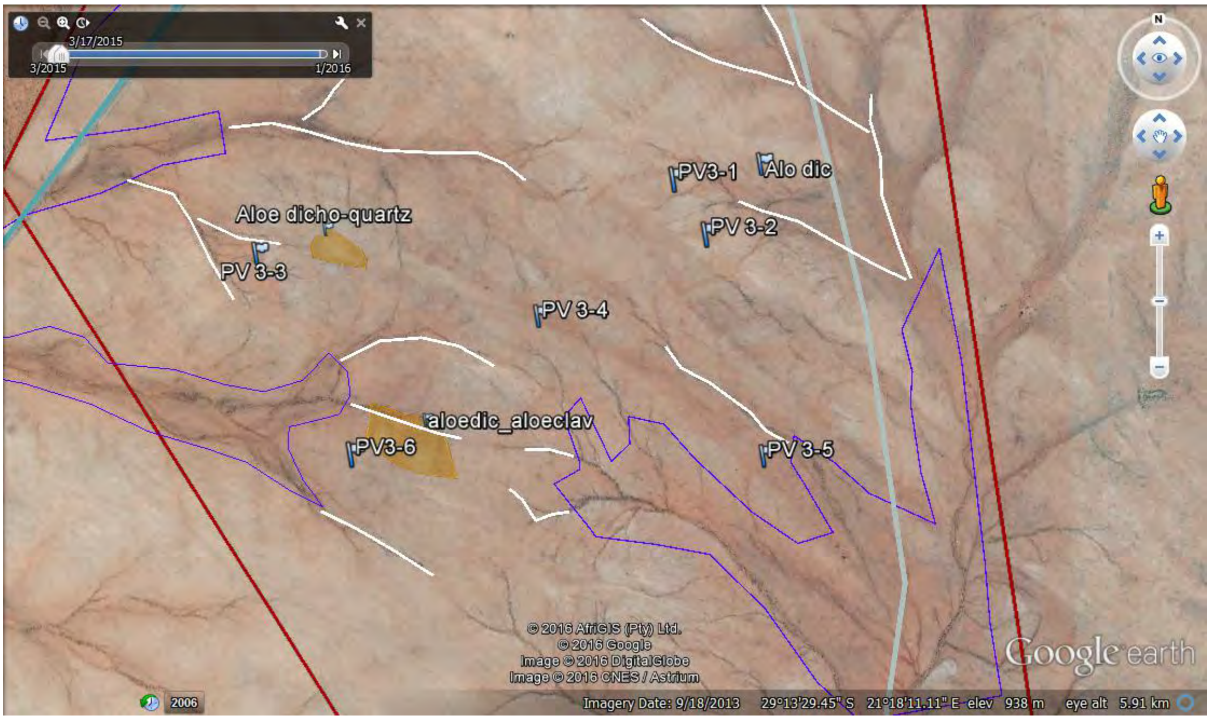

Figure 7.1: Image of site indicating sample points across property, as well as the major drainage line (shown in purple) and minor drainage lines (shown in white). Not to scale (Image Source: Google Earth, 2015).

All data was collated and subject to evaluation using multi-variate statistical methods in order to:

1. Place the data into a hierarchy of similarities according to species composition and sample sites.
2. Give consideration to the overall structure of habitat within the subject site.
3. Identify any habitat anomalies that may be identified in such analysis.
4. Allow for the interpretation of such data in order to prioritise and evaluate habitat form and structure within the study area.

In addition, using methods identified in the Department of Water Affairs' "A Practical Field Procedure for Identification of Wetlands and Riparian Areas" (2005), wetland and riparian areas were identified. Such evaluations utilised both geomorphological, geohydromorphic edaphic conditions and botanical indicators in order to identify such components. In practice, only geomorphological components were utilised, as discussed below. Where riparian and wetland systems are identified and lie within 500 m of the proposed development/activity, an application in terms of Section 21 c and i, of the National Water Act (1998) is required to be submitted to the mandated authority.

It is important to note that an alternative site for the proposed Kenhardt PV 3 project (referred to as Kenhardt PV 3b) was considered during the Scoping Phase. Only the preferred alternative has been assessed as part of this EIA Phase.

7.1.4 Assumptions and Limitations

The site assessment and collation of data was undertaken during the period 3 – 7 November 2015, during a period of successional and unseasonably high temperatures and low rainfall (SA Weather Services, http://www.weathersa.co.za). Such meteorological stressors mean that some botanical species, in particular graminoids and geophytes, are not generally evident. This may affect both the analytical and observation results of the investigation.

Allied to the above, the site investigation coincided with the regular, early summer dry period. As higher rainfall in the region is a late summer phenomenon, many botanical species remain dormant, until the advent of rains, effectively masking their presence.

As noted above, the assessment was undertaken using a random sampling method. As such minor outliers within the site may not have been evaluated. The random sampling method, if correlated to topography and other aspects, is however a robust method of evaluating habitat across a large area. Upon the finalisation of the detailed design of the proposed project, an evaluation of the final footprint should be undertaken (subsequent to the issuing of an Environmental Authorisation (should one be granted for the proposed project) and upon completion of the detailed engineering prior to the commencement of construction).

In terms of the assessment of potential cumulative impacts included in this specialist study, these take into consideration certain developments that occur with a 20 km radius of the proposed project, as shown in Chapter 4 of the EIA Report.

7.1.5 Source of Information

This assessment was undertaken utilising:

- 1:50 000 topographic mapping sourced from the Surveyor General's office; and
- Aerial imagery sourced from Google Earth.

In addition, use was made of the following data:

- Wetland and riparian habitat GIS data sourced from the National Freshwater Ecological Priority Area Programme of SANBI;
- SANBI veld types; and
- Literature as referenced.

7.1.6 Declaration of Independence of Specialist

Refer to Appendix A of this EIA Report for the Curriculum Vitae of Mr. Simon Bundy and Mr. Andy Blackmore, which highlights their experience and expertise. The declaration of independence by the specialist is provided in Box 7.1 below and included in Appendix B of this EIA Report.

BOX 7.1: DECLARATION OF INDEPENDENCE

I, Simon Bundy, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed Kenhardt PV 3 Project, application or appeal in respect of which I was appointed, other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.

Simon Bundy

7.2 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO TERRESTRIAL AND AQUATIC ECOLOGY (INCLUDING AVIFAUNA AND HYDROLOGICAL FEATURES)

The proposed project will require the following key actions that are relevant to ecological aspects of the site:

1. Cordoning and fencing of the site during both the construction and operational phases. This component of the project usually entails the establishment of an electrified fence which remains *in situ* for the lifetime of the project (i.e. for the operational phase). For the construction phase, the construction area and construction site camp may also be cordoned off with temporary fencing.

2. Clearance or partial clearance of topographic features and significant vegetation where applicable during the construction phase.

3. Establishment of roadways (i.e. internal gravel access roads) and hardpanning of surfaces, with minor storm water management aspects being introduced during the construction and operational phases.

4. Establishment of module arrays with concomitant cabling and provision of invertors within arrays. The footing of the module framework is founded into the ground using an earthscrew or similar method. Cables are placed in trenches to a depth of approximately 1.0 m.

5. Establishment of step up transformer and the on-site substation. This facility is expected to occupy an area of approximately 2 ha. It is fenced and isolated from the balance of the site.

6. Establishment of offices and related infrastructure.

7. A yard for storage and general operations will be set aside, adjacent to the built offices.

The establishment of site will thus entail *low to significant* alteration of the prevailing habitat, depending upon the final design and layout of the PV facility. A general sequestering of the subject area, through the fencing of the site from the surrounding habitat forms thus arises.

A detailed project description is included in Chapter 2 of the Draft EIA Report, which includes dimensions and specifications of the proposed project components.

It is important to note that the information regarding the proposed transmission lines is indicatively provided in this report. A detailed description of the transmission line corridor is provided and assessed separately in the Basic Assessment for the Kenhardt PV 3 – Transmission Line project.

7.3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

According to Mucina and Rutherford's veld type classification of 2006, Kenhardt and surrounding regions fall within the Bushmanland Arid Grassland veld type (NKb3). This veld type is located extensively south of the Orange River, but may include a number of smaller habitat forms within its broader extent.

The Kenhardt PV 3 study site can be described as a generally level portion of land, with a low gradient, straddling the watershed between two *non perennial* drainage features. To the west of the site, drainage is towards the west, into a shallow feature known locally as "Wolfkopseloop" and to the east, towards the Rugseersrivier (Figure 7.2). Both drainage systems eventually serve the Hartebees River, which in turn serves the Sout River and Orange River systems.

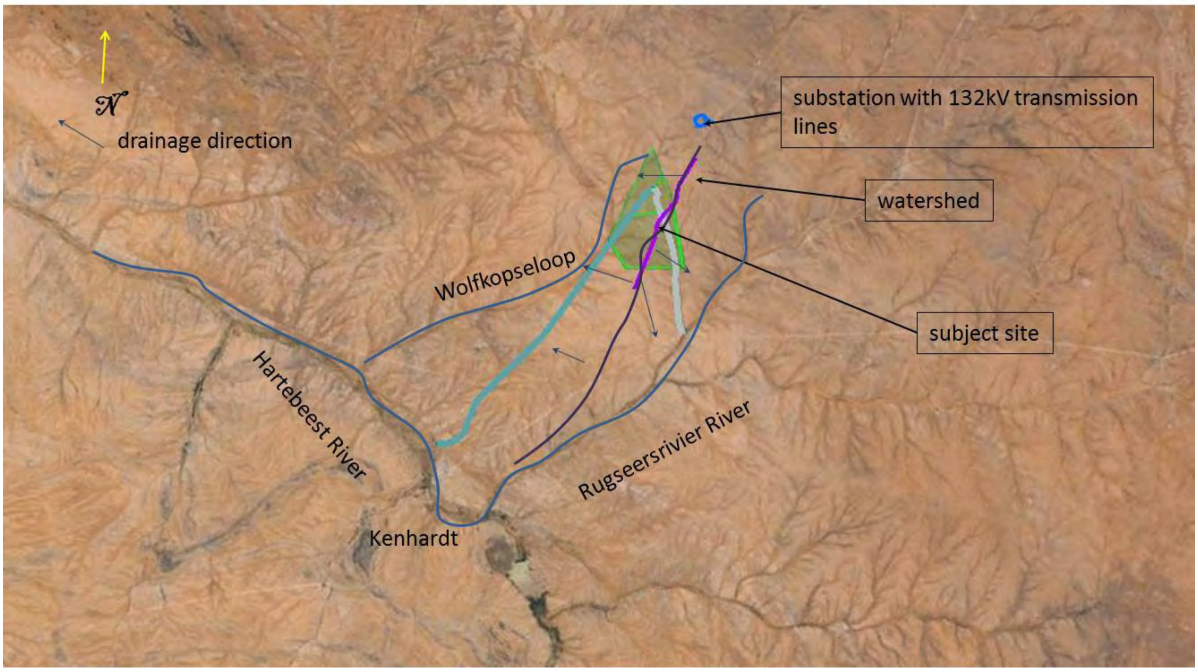

Figure 7.2: Map indicating drainage lines associated with the Kenhardt PV 3, including the two catchments of Wolfkopseloop and Rugseersrivier. (Source Google Earth, 2015 – not to scale)

The area in general can be considered to have a low rainfall of less than 200 mm per annum (SA Weather Services, 2015) although the recorded average rainfall for the period 2000 to 2012 approximates 238 mm within an average of 51 rain days per year (www.worldweatheronline.com). As such the area has been described as a "semi-arid region" (Bailey 1979). Using the Koppen-Geiger climate classification method (www.koeppen-geiger.vu-wien.ac.at), the area is classified "BWh", which is indicative of an *arid hot environment*, this classification is supported by Esler *et. al.* (2006) who have defined areas with an annual rainfall of less than 200 mm as being "deserts". This *desert* status may be the case in the Kenhardt region under its lower rainfall periods. In addition, the highest annual temperatures for the region are recorded between January and February, with maximum temperatures being 37˚C (www.worldweatheronline.com). Extreme temperatures thus coincide with the peak rainfall period. Such correlation may give rise to the low groundwater recharge rates projected for the region, this being estimated at approximately 0.03 mm / annum. (Musekiwa and Majola, 2011). Groundwater is described in greater detail in Geohydrological Assessment (which forms Chapter 11 of the EIA Report).

With the above in mind, the most definitive physical drivers of the Bushmanland Arid Grassland veld type that lies within the study area, are meteorological in nature and will relate to surface and subsurface hydrology. Other physical drivers will include localised geologies and edaphics.

7.3.1 Habitat and Vegetation

The proposed Kenhardt PV 3 site (i.e. preferred) lies to the south east of the Sishen – Saldanha railway line and its associated support road. The establishment of the railway line has had a minor impact on surface hydrology on site, effectively limiting surface drainage from the site and concentrating such drainage at points. The area can be described as comprising of gently grading quartz dominated lands dissected by three major drainage features which serve the Wolfkopseloop drainage line (Figure 7.3).

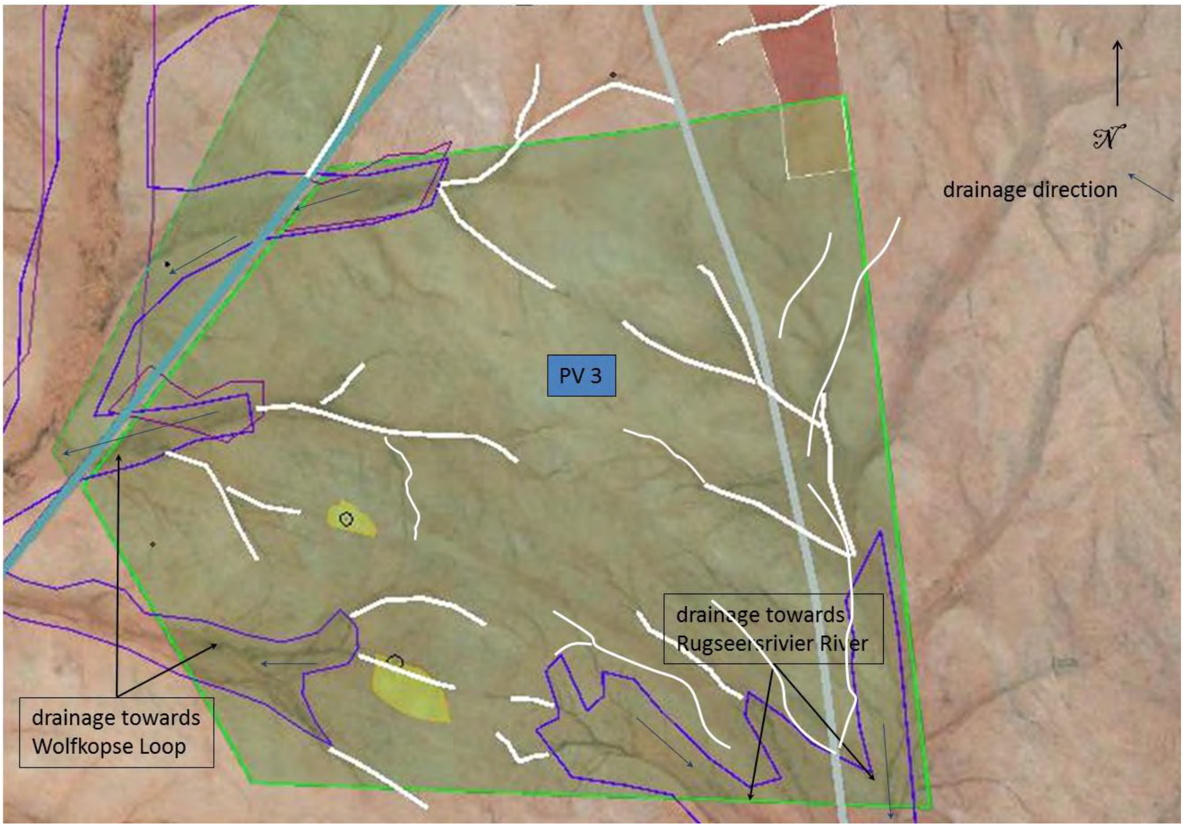

Figure 7.3: Image of study site indicating major (purple) and minor (white) drainage features in relation to site. The Wolfkopseloop feature and its associated drainage lines, lying to the north of the site, is considered a major hydrogeomorphic feature and is outlined in purple. Minor dendritic drainage features are identified in white. Other PV sites, PV 1 and PV 2, which is the subject of a separate assessment, lie to the north of the site. Image Source: Google Earth, 2015, not to scale.

Dendritic drainage features in turn drain towards the west and the east from the abovementioned watershed. Other factors that serve to alter surface drainage patterns include intermittent excavations, farm roads and related anthropogenic structures.

A uniform habitat prevails across the site and surrounds, which has been driven by extensive and significant grazing. Kenhardt PV 3 appears to comprise of two camps, with the eastern camp showing significant grazing having taken place. The dominant vegetation form appears to be a Rhigozum – Aristida association, with quartz exposures showing limited vegetation cover and the absence of even succulents, which are plants often associated with these features. Two quartzite kopjies are positioned to the west of the site, which are the most elevated portions of the site and show some habitat variation, comparative to the calcrete dominated flat lands that predominate on the site (Figures 7.4 and 7.5). These quartzite kopjies are distinct topographic anomalies within the site and, in line with their geological divergence; they offer some variability to the prevailing habitat form. The major and minor drainage features within the property show no hygrophilous vegetation or geohydromorphic soil conditions but are defined geomorphologically and by the presence of more verdant associations and consociations of *Rhigozum trichomotum* and Aristida spp. along with *Stipagrostis ciliata*. A list of species identified across site is presented in Table 7.1 below.

Table 7.1: List of observed species within the study indicating conservation significance in terms of relevant legislation.

Species	Conservation Significance	
	NC NCA *	NFA#
Acacia mellifera		
Aizoon elongatum		
Aloe dichotoma	X	
Aloe claviflora	X	
Aptosimum spinescens		
Aristida ascensionis		
Aristida congesta		
Asparagus suaveolens		
Cadaba aphylla		
Chrysocoma ciliata		
Enneapogon scaber		
Datura ferox$		
Enneapogon cenchroides		
Eragrostis nindensis		
Eriocephalus encoides		
Euphorbia glanduligera		
Euphorbia stellispina		
Lyceum cinereum		
Mesembryanthemum guerichianum		
Pentzia spinescens		
Prosopis glandulosa $		
Rhigozum trichotomum		
Riccua albornata		
Salsola tuberculata		
Schmidtia pappophoroides		
Stipagrostis ciliata		
Tetragonia arbuscular		
Tribulus cristatus		
Tribulus pterophorus$		

*NC NCA = Northern Cape Nature Conservation Act (1998)
#NFA = National Forest Act (1998) Protected Trees
$ = exotic

Figure 7.4: View of a portion of the Kenhardt PV 3 site indicating calcrete exposures within drainage feature.

Figure 7.5: View of the quartzite kopjie found to the west of Kenhardt PV 3.

In order to further evaluate the nature of the prevailing habitat on site, the primary collection of data relating to species composition across the proposed site was undertaken. As mentioned previously, a total of six sites were evaluated on a *presence – absence* basis, using a 40 m transect (Figure 7.1). Utilising the data collected from the sites, a two way indicator species analysis (TWINSPAN) was undertaken to discern any similarities and variation between vegetation. The dendrogram depicting the results for vegetation on site is presented below.

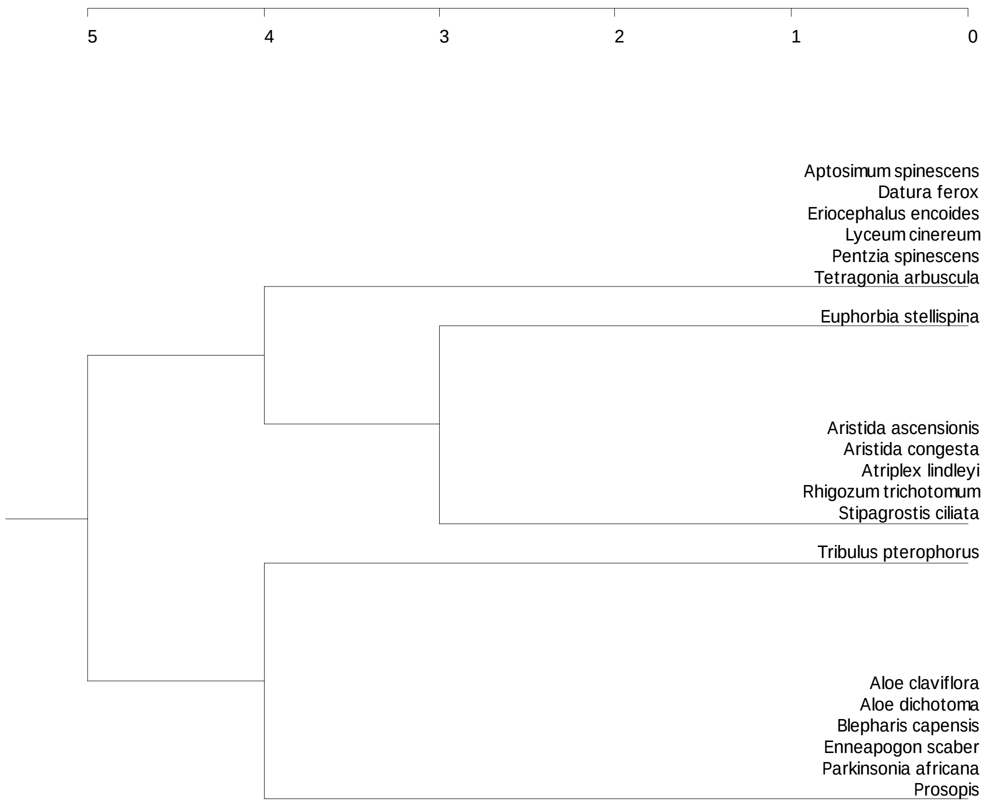

Figure 7.6: TWINSPAN Results presented as a dendrogram indicating vegetation species similarities and association.

Figure 7.6 also identifies a number of key features within the prevailing habitat, namely that there are three prevailing associations which can be identified, these being;

- An associes including generally heavily grazed areas associated with the presence of amongst other species, L cinereum and Pentzia spinescens.
- An association which includes Aristida spp and R trichomotum, which is also indicative of high grazing pressures, but may indicate other physical drivers such as soil variations.
- An association which includes A claviflora and A dichotoma which is associated with those areas proximal to the quartzite kopjies.

The above data compares with similar data collected on adjacent sites, showing similarities in species association and composition and therefore similarity in drivers, such as geology and topography across the greater region.

In order to identify any similarity of habitat across the site, use of TWINSPAN was further undertaken in order to group the various sample sites. Figure 7.6 below presents a dendrogram of the results.

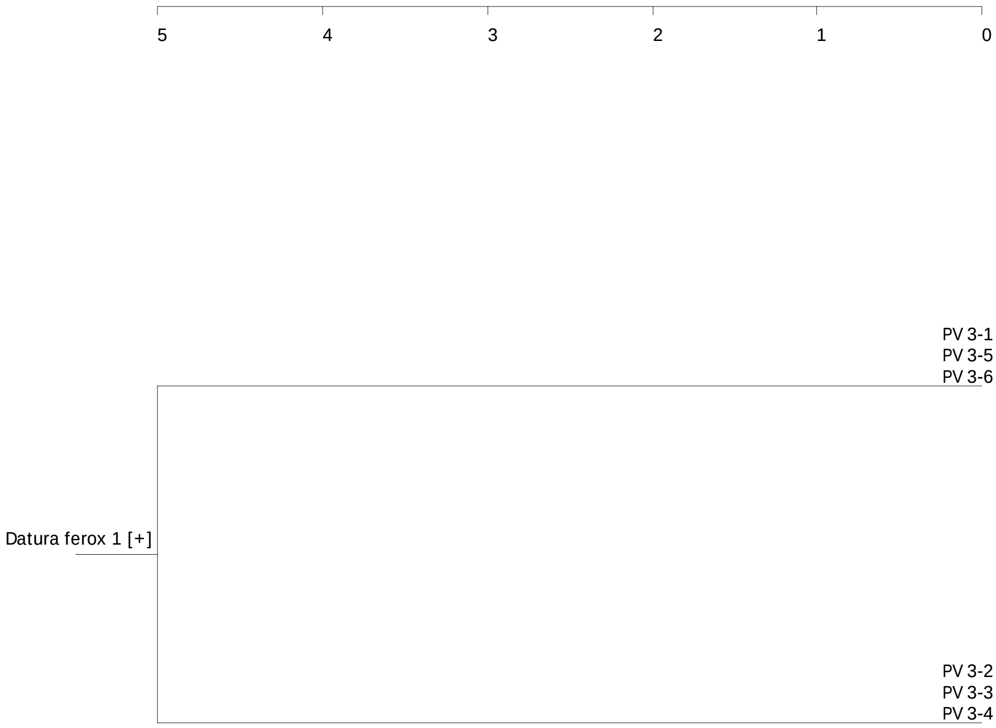

Figure 7.7: TWINSPAN results presented as a dendrogram indicating sample sites according to species composition.

Figure 7.7 indicates that there appears to be no significant variation in the distribution of the various vegetation associations across the site as most sites show similarities in composition. However, it is of interest, that site PV 3-3 and PV 3-4 both lie in, or proximal to the abovementioned quartzite kopjies, indicating similar habitat forms at these points. As with much of the surrounding area, high grazing pressures by livestock appears to account for most of the habitat structure identified within the study area.

7.3.2 "Aquatic" and Riparian Habitat

Three major drainage features are evident on site, which all drain towards the Wolfkopseloop system that lies to the west (Figure 7.3). . These drainage lines within the site do not show specific hygrophilous vegetation characteristics as may be defined, nor do they show the presence of geohydromorphic soils, primarily on account of the erratic and intermittent levels of inundation over extended periods of time. Interaction with the farmer presently utilising the land in question, indicated that the drainage lines show short term inundation during high rainfall periods, "every 4 to 5 years" (S Strauss *pers. comm.*). Flow is sluggish under these conditions, and following the cessation of rains, the water rapidly drains from site on account of the percolative, sandy conditions, or is lost to evaporation. For this reason, the major drainage lines have been delineated according to geomorphological features and an apparent change in vegetation form from a sparse and arrested growth form, to a more verdant state (Figure 7.8).

Hydrogeomorphological features are indicated primarily by evidence of flow or deposition of materials (Brinson et al 1993; USDA 2008) while verdant vegetation establishment is a combination of both improved plant water relations and increased nutrient availability. Therefore major drainage features were allied with a combination of both vegetation structure and significant geohydromorphic indicators, while minor drainage features were distinguished through the presence of a more verdant vegetative association and in some cases indicators of minor surface flow ('rills').

The interface between major and minor drainage lines is often vague, however where rills exceeded a depth of 30cm (gullies), such features were defined as 'major' drainage systems.

Figure 7.8: An image indicative of a minor drainage feature located within the site. Note the verdant vegetation state compared to adjacent vegetation forms which appear arrested in growth.

Although ephemeral in terms of the presence of water within these features, these drainage lines do bestow intermittent hydrological benefit to the landscape and can be considered groundwater "recharge zones" in respect of the local subsurface hydrology. From a biotic perspective, the drainage lines do serve as seasonally important refugia and congregation points for *inter alia* invertebrates (e.g. Class Odonata) and vertebrates (e.g. Order Anura) (faunal aspects are described further in Section 7.3.4 of this chapter).

Figure 7.3 indicates the position and extent of the major drainage features on the site, with minor dendritic features (those features that show only minor indications of flow and some vegetation change) also being identified. A number of the minor drainage features are associated with the interface between quartzite kopjies and calcrete at lower lying elevations within the landscape. While major drainage lines may be considered to be important ecological factors within the landscape, the minor dendritic features are of lesser significance, but should be given consideration, where they may intersect with the development footprint of the proposed Solar PV facility.

7.3.3 Habitat Sensitivity

Appendix 7.A indicates exclusion zones, relating to the proposed development within the study site. These zones relate to the major drainage features present on the site and the identified quartzite kopjies. **The kopjies are considered to be worthy of exclusion from the development footprint on account of the variation in habitat that these geological formations bestow upon a generally uniform landscape**. Given their topographic variance, the kopjies are likely to offer ecological variation within the locality. A 250 m buffer from the highest point of these quartzite kopjies has been recommended. As such the aloes found on and around the two quartzite kopjies in the Kenhardt PV 3 area, will be excluded from the development footprint, as the kopjies themselves require exclusion on the grounds of habitat preservation. It will be best for the laydown area to be located to the east of these quartzite areas and that the kopjies remain outside of the proposed PV park.

A 32 m "buffer" or "setback" around the major drainage lines has been established, which is an indicative "norm" recommended by the various authorities. This buffer is to be established and applied around the major drainage systems. This buffer is considered acceptable in light of the fact that hydrogeomorphic features are the primary dictate in the identification and delineation of the major drainage lines, rather than other functional features such as geohydromorphic soil conditions or botanical species diversity and compositional variation. It is evident that a 100m exclusion area around the major drainage lines would incorporate extensive tracts of land which are in no way indicative of the concentrated surface hydrology. The application of 32m from such features is expected to accommodate both the variation in habitat structure and the erosive action associated with gullies and larger drainage features.

The "minor" drainage features are not considered to require exclusion from any land use change or a development akin to that proposed on account of:

- The transformed surface hydraulics arising from the establishment of the railway line and its associated stormwater management infrastructure, as well as anthropogenic interventions, such as borrow pits and roadways, which have further altered surface drainage from the site, particularly in the west;
- The origins of many of the minor features, as explained above. and
- The generally benign impact of solar arrays on surface flow, as indicated in Figure 7.9

Figure 7.9: Image of solar arrays indicating the limited influence that such structures generally have on the flow of surface waters within a solar facility.

Therefore, based on the above, the minor drainage lines occurring within the site do not require avoidance. It would however be best for the design of the proposed Solar PV Facility to note the presence of these minor features and avoid establishing structures such as transformers, buildings and other permanent and significant structures within them. It would be best to incorporate the minor drainage lines into the solar arrays (as shown and explained above).

7.3.4 Fauna

7.3.4.1 Terrestrial

Fauna on site is considered to be typical of a xeric environment, with limited habitat variation across the study area. Table 7.2, below indicates species or evidence of their presence observed on the site and surrounds and includes other species that are likely to be encountered on the site.

The occurrence of such species is likely in respect of these animals either utilizing the site as refugia or as part of a wider foraging range or territory.

As is typical of the region, a large number of fossorial and burrowing species, including mammals and invertebrates, were identified across the site in general. Such species included suricates (meerkat) (*Suricata suricatta*) and ground squirrel (*Xerus inauris).* These species live in mutual habitation within active burrows (Figures 7.10 and 7.11). In addition, foraging excavations indicating the presence of aardvark (*Orycteropus afer*), as well as the porcupine (*Hystrix africaeaustralis*) were evident.

Other larger mammals that were noted on site include Springbok (*Antidorcas marsupalis),* which are prevalent across the area and may be accompanied by Steenbok (*Raphicerus campestris*), which are also common in the region and open habitat (Estes, 1992).

Most larger mammals located within the subject site are not reliant upon the study area in particular and are likely to forage over extensive ranges that extend beyond the study area. Estes (1992) indicates that suricates may use warrens for a number of months or possibly years, before relocating. Noted on other solar PV sites, suricates are quite capable of establishing warrens within solar parks following establishment, while aardvark (*O. afer*) and other fossorial species are capable of excavating under fencing which may initially serve to exclude them from an area.

Figure 7.10: Suricate warren located on site.

Figure 7.11: Ground squirrel (*Xerus inauris*).

Table 7.2: List of terrestrial species identified within and around site and likely to be present within region/site. Species of conservation importance identified.

		Observations	TOPS (2007)	Conservation Importance (IUCN Red List) *
Mammals				
Orycteropus afer	Aardvark	Foraging evidence?		LC
Felis nigripes	Black-footed cat			VU
Atelerix frontalis	South African hedgehog	Pers.comm J Orven	Protected	LC
Canis mesomelas	Black back jackal			Not listed
Xerus inauris	Cape ground squirrel	Observed		Not listed
Lepus capensis	Cape hare	Observed		Not listed
Felis caracal ?	Caracal ?	Remains of prey		Not listed
Procavia capensis	Rock dassie	Observed		LC
Suricata suricatta	Meerkat	Observed		LC
Aethomys namaquensis	Namaqua rock mouse			Not listed
Hystrix africaeaustralis	Porcupine	Foraging evidence?		LC
Antidorcas marsupalis	Springbok	Observed		LC
Raphicerus campestris	Steenbok			LC
Cynictis penicillata	Yellow mongoose	Observed		LC
Reptiles				
Ptenopus spp	Barking gecko			LC
Naja nivea	Cape cobra			Not listed
Chondrodactylus angulifer	Giant ground gecko			LC
Cordylus spp	Girdled lizard		Protected	*C cataphractus* ; - VU
Psammobates tentorius	Karoo tent tortoise			Not listed
Geochelone pardalis	Leopard tortoise	Observed		Not listed
Bitis arietans	Puff adder			Not listed
Agama makarikarica	Spiny agama			Not listed
Amphibians				
Tomopterna cryptotis	Tremolo sand frog			LC
Invertebrates				
Locustana pardalina	Brown locust	Observed		Not listed
Pterinochilus spp	Baboon spider		Protected	Not listed
Seothyra spp	Buckspoor spider			Not listed

		Observations	TOPS (2007)	Conservation Importance (IUCN Red List) *
Family Vespidae	Various wasps	Observed		
Opistophthalmus spp	Burrowing scorpions?	Burrow entrance?	Protected	Not listed
Parabuthus spp	Parabuthid scorpion			Not listed
Family Hodotermitidae	Termite			Not listed

TOPS – Threatened or Protected Species (GN R151 of the National Environmental Management: Biodiversity Act (Act 10 of 2004))
IUCN – International Union of Conservation Networks
* LC = Least concern; NT = Near threatened; VU = Vulnerable; EN = Endangered
CR = Critically Endangered; EW = Extinct in the wild; NE = not evaluated; DD = data deficient

7.3.4.2 Avifauna

As the study area is located in an arid region, it is expected that the avifaunal densities will be low, typical of the Bushmanland Arid Grassland environment. Consideration of the birds observed on site during the beginning of November 2015 (Table 7.3) and the Southern African Bird Atlas Project (SABAP) sighting data (see http://sabap2.adu.org.za/) indicates that the solar park presents a limited risk to the avifaunal community.

The SABAP data indicates three species of potential concern. These species are two raptor species - the Pygmy Falcon (*Polihierax semitorquatus*) and the Southern Pale Chanting Goshawk (*Melierax canorus*), and the Kori Bustard (*Ardeotis kori*). The predatory flight habit of the raptor species is such that they are likely to avoid collision with the solar panels and associated infrastructure. It is, however, to be recognised that the powerlines, pylons, fencing and other erect infrastructure provides these species with artificial perching points. This, as has been recorded elsewhere, provides both the falcon and goshawk a predatory advantage, increasing their prey species vulnerability. Given the current low numbers of these artificial perches, this impact is considered *low to moderate* at a site specific level and *low* at a landscape level. Caution is however raised that with an increase in the number of artificial perching points in the future, the resultant cumulative impacts are likely to become significant at a landscape level with consequential changes in terms of the localized ecology. This has a generally “negative” outcome in terms of population equilibria in the region. The assessment of this potential impact is assessed in Section 7.6 of this chapter.

The Kori Bustard is classified as ‘Near Threatened’ and is particularly vulnerable to collision with powerlines. At these points the placement of *Bird Flight Diverters* (BFD) or bird flappers along the powerlines is advised as a suitable mitigation (which will be assessed as part of a separate Basic Assessment Process). Given the paucity of wetlands and open water within that landscape, the impact of the proposed solar PV facility on wetland avifauna is considered negligible. As indicated above, drainage features in the form of gullies show an extremely limited presence of flow or indeed the presence of water. Water fowl in the region are to be considered transitory in nature or associated with times of inundation of the abovementioned drainage features. There may be some disturbance to migratory wetland birds in that the solar panels may appear as open water. While this is a concern, to date there is no data (in areas of higher wetland bird densities) to show that this phenomenon poses a significant threat to wetland birds. Finally, given the abundance of habitat surrounding the proposed solar farm, the loss of habitat integrity as a consequence of the establishment of the PV facility is likely to have a low measurable impact on avifauna. Notwithstanding this observation, the continued and cumulative loss of habitat at a landscape to regional level is a possible matter of concern.

Table 7.3: Species noted within and adjacent to the study area.

		Observations
Aves		
Cercomela schlegelii	Karoo chat	Observation on site
Cisticola aridulu	Desert cisticola	Observation on site
Corvus albus	Pied crow	Observation off site
Egretta garzetta	Little Egret	Observation off site
Lanius collaris	African fiscal	Observation off site
Melierax gabar	Gabar goshawk	Observation off site
Oena capensis	Namaqua dove	Observation on site
Philetairus socius	Weaver, sociable	Proximal nesting site
Streptopelia capicola	Cape turtle dove	Observation off site
Streptopelia senegalensis	Laughing dove	Observation off site

7.4 APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

The proposed establishment of a PV facility within the study site is considered to elicit a requirement for compliance with the following legislation.

1. The National Environmental Management: Biodiversity Act (Act 10 of 2004)
2. The National Water Act (Act 36 of 1998)
3. The National Forest Act (Act 84 of 1998)
4. The Northern Cape Nature Conservation Act (Act 9 of 2009)
5. The Conservation of Agricultural Resources Act (Act 43 of 1983)

The potential applicability of the abovementioned acts to the subject site is provided below:

<u>1. The National Environmental Management: Biodiversity Act (Act 10 of 2004)</u>

This Act serves to control the disturbance and land utilisation within certain habitats, as well as the planting and control of certain exotic species. The proposed development, taking place in the identified Bushmanland Arid Grassland environment, may not necessitate any particular application for a change in land use from an ecological perspective, however the effective disturbance and removal of species identified in Tables 7.1 and 7.2, as well as possible other species (i.e. TOPS species), will require specific permission from the applicable authorities.

In addition, the planting and management of exotic plant species on site, if and where required, will be governed by the Alien and Invasive Species (AIS) regulations, which were gazetted in 2014. These regulations compel landowners to manage exotic weeds on land under their jurisdiction and control.

<u>2. The National Water Act (Act 36 of 1998)</u>

The National Water Act controls activities in and around water resources, as well as the general management of water resources, including abstraction of groundwater and disposal of water. Authorisation for changes in land use, up to 500 m from a defined water resource/wetland system will require an application for a Water Use Licence from the Department of Water and Sanitation. A Water Use Licence will be required in respect of the proposed development under Section 21 (c) and (i), of the Act, however such license should not preclude this development.

<u>3. The National Forest Act (Act 84 of 1998)</u>

The National Forest Act (Act 84 of 1998) governs the removal, disturbance, cutting or damage and destruction of identified "protected trees". Listed species that may be encountered with the site include Boscia spp. and possibly *Acacia erioloba*.

It is unlikely that an application for the "clearing of a *natural forest*", as defined within the Act, will be required on the site in question.

4. The Northern Cape Conservation Act

The Northern Cape Conservation Act under its pertinent regulation governs the disturbance of species listed in Tables 7.1 and 7.2 above, or possibly other species not yet identified on site. A permit from the Provincial Department of Environment and Nature Conservation will be required in order to disturb or translocate such species.

5. The Conservation of Agricultural Resources Act

Invasive plant species that should be removed or maintained only under certain commercial situations are identified in terms of the Conservation of Agricultural Resources Act (CARA). This Act will be applicable to the project if and where such plants arise within or adjacent to the project area. Notably most listed alien invasive species are propagated and driven by the disturbance of land during and following construction.

As the proposed sites are not within protected areas, nor within 5 kilometres of a protected area, are not within 10 kilometres of a World Heritage site and do not form part of a critical biodiversity area (CBA), the various regulations within the National Environmental Management Act and the NEM Protected Areas Act are not applicable to this site. It is also noted that the site does not fall within any expansion area in terms of a conservation strategy for the Northern Cape.

7.5 IDENTIFICATION OF KEY ISSUES

7.5.1 Key Issues Identified During the Scoping Phase

The following key issues were identified during the Scoping Process:

Construction Phase:

1. The ousting of fauna and loss or change in vegetation through anthropogenic activities, disturbance of refugia and general change in habitat.
2. Alteration of surface drainage patterns on account of construction activities leading to change in plant communities and general habitat structure, within the site and immediately adjacent to it.
3. Alteration of surface water quality on account of construction activities that lead to change in water chemistry.
4. Depending upon the origin of water for construction (import or through abstraction of groundwater), changes in subsurface water resources may arise, particularly in the case of the latter.
5. Changes in edaphics (soils) on account of excavation and import of soils, leading to the alteration of plant communities and fossorial species in and around these points. This may have further ramifications in terms of exotic weed invasion following disturbance.
6. Increased electrical light pollution, leading to changes in nocturnal behavioural patterns among fauna.
7. Exclusion or entrapment of (in particular) large fauna, on account of the fencing of the site.

Operational Phase:

1. Alteration of ecological processes on account of the exclusion of certain fauna, inherent to the functional state of the land within the proposed PV facility i.e. larger fossorial species and predators will be excluded from the PV facility site by virtue of its fencing, generally leading to possible variations in populations of other species that remain within the site, with concomitant ecological change.
2. Increased shading as a consequence of the PV arrays, will lead to changes in plant-water relations and possible changes in plant community structures within the site.

3. Changes in meteorological factors at a local scale, on account of the proposed PV array are likely to arise (e.g. subtle changes in wind dynamics, "heat bubble phenomenon" as well as the alteration in run off of surface water and evapotranspiration states), leading to long term, but generally latent changes in habitat.
4. Potential abstraction of groundwater for the cleaning of modules, as well as operational use, will alter the state of sub surface water resources, depending upon nature and origin of such water.
5. Possible overhead medium voltage (33 kV) transmission lines (i.e. those that will be constructed to connect the on-site converter station to the proposed on-site substation), as well as subtle changes in habitat are likely to result in the alteration of avian behavior in and around the site. It is important to re-iterate that the impact of the proposed overhead transmission line, extending from the Kenhardt PV 3 site (and possibly through the PV 2 and PV 1 sites) to the national grid system via the Eskom Nieuwehoop Substation, is being assessed in a separate Basic Assessment Process.
6. The fencing of the site, possibly with electric fencing, is likely to impact upon faunal behavior, leading to the exclusion of certain species and possible mortalities. Alternatively, such changes may also favour some specific individuals, particularly those that remain within the confines of the PV facility, which is likely to lead to further localised alteration of habitat and ecological processes within the proposed PV facility.

In terms of comments from I&APs and authorities, the Scoping Report was released for a 30-day comment period which extended from 25 September 2015 to 27 October 2015. The Addendum to the Scoping Report was also released for a 30-day comment period, extending from 6 October 2015 to 5 November 2015. To date, the following comments and issues have been raised by I&APs in relation to ecological impacts. Chapter 6 of the EIA Report includes the complete list of comments and responses.

COMMENT	COMMENTATOR AND DATE	RESPONSE FROM SPECIALIST
Point 3 - The proposed development do not form part of the Strategic Environmental Assessment (SEA) for Eskom's electricity grid upgrades and roll-outs as it falls outside one of the corridors identified by Eskom (i.e. the Western Corridor; one of the five identified corridors; refer to Figure 3). Comprehensive field surveys (within appropriate seasons) should thus be done for this specific area; it didn't form part of Eskom's assessment and the former project's surveys can thus not be used as baseline studies. Caption Figure 3 - Strategic Environmental Assessment (SEA) for ESKOM's electricity grid upgrades and roll-outs (Feb 2014) in relation to the proposed development (black arrow) near Kenhardt The proposed development falls outside one of the corridors identified by ESKOM (i.e. the Western Corridor; one of the five identified corridors), hence, it didn't form part of Eskom's assessment.	• Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation • 5 November 2015 (Letter via email)	1. Refer to the response provided in Chapter 6 of this EIA Report regarding the SEA for the Eskom Electricity Grid Infrastructure SEA. 2. Field and desktop investigations have been undertaken during November 2015. The primary data collated on site and the sampling regime employed has been extrapolated to consider other seasonal variations.
The Department of Water and Sanitation (DWS) hereby acknowledges receipt of your scoping and environmental impact assessment for the proposed development of three Solar Photovoltaic Facilities (Referred to as Kenhardt PV 1, Kenhardt PV 2 and Kenhardt PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province. The department has reviewed the document and the comments are as follows: ▪ Please note that no development should take place within 100 m horizontal distance from a water course or within 1:100 year flood line.	• Ms Chantèl Schwartz, Orange Proto- CMA, Department of Water and Sanitation • 3 November 2015 (Email)	1. 100m set back has been noted, however given the fact that hydrogeomorphological indicators and vegetation structure have been used to delineate drainage features; a 100m non-development area around such features is considered excessive. The use of the more conservative 32m buffer is appropriate as this incorporates the

COMMENT	COMMENTATOR AND DATE	RESPONSE FROM SPECIALIST
Operation and storage of equipment within the riparian zone must be limited as far as possible. ▪ Storm water must be diverted from the construction works and roads and must be managed in such a manner as to disperse runoff and to prevent the concentration of storm water flow. Where necessary, works must be constructed to attenuate the velocity of the storm water discharge and to protect the banks of the watercourse. ▪ Please note that no taking of water or storing of water from the water resource shall be lawful without a water use authorisation. Due to the high number of renewable energy projects that are taking part in the Department of Energy (DOE) bidding process, this Department (DWS) will only process applications for water use authorisations received from developers who have attained preferred bidder status. Developers who wish to submit applications for water use authorisations may however proceed to do so, with the understanding that their applications will be processed as soon as we have confirmation of their status with the DOE. Attached to this letter is Annexure 1 that details information, which must be submitted as part of the application for water use authorisation.		identified vegetation indicators and provides a cordon around the erosive edges of such hydrological features.2. Advisory on dispersal of storm water is noted and it is proposed that engineering and layout of the site will accommodate this requirement. 3. Applicant has been advised and is aware of the Water Use License requirements.
Point 6 - It is advisable that RE facilities are not proposed for areas that favour local faunal diversity (e.g. endorheic pans, dry river washes, rocky outcrops, etc.). The Northern Cape is water scarce province, hence any form of sustained water, has the potential to stimulate vegetative growth and attract faunal species. Above-mentioned areas should be noted as sensitive areas during the EIA phase.	• Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation • 5 November 2015 (Letter via email)	1. Habitat that favours faunal diversification and increased faunal populations have been excluded from the "development area" 2. Features mentioned have been incorporated into the assessment.
Point 1 - It should be noted that the areas where the proposed developments are to be constructed have been historically poorly surveyed, hence extrapolations from desktop studies for specialist's studies will give an incomplete representation of the biodiversity within the area (refer to Figure 2). Caption Figure 2- South African National Biodiversity Institute's (SANBI) PRECIS database (2013) indicating the number of plant specimens collected for specific Quarter Degree Grid Squares (QDGS). The proposed development falls within QDGS indicative of a very low species count (i.e. 1 – 50 species sampled per grid). Red squares denote zero specimens.	• Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation • 5 November 2015 (Letter via email)	1. Field reconnaissance was undertaken during assessment. 2. PRECIS data base noted and confirmed.
Point 2 - Large Aloe dichotoma populations are known to occur in the region. The species is protected under the Northern Cape Nature Conservation Act (Act 9 of 2009) and at present there is a moratorium in place in the Northern Cape on the removal of A. dichotoma from the wild due to historic trade related pressures on populations (Proclamation No 968, 1 April 2005). Hence, trees may not be removed until the moratorium is lifted.	• Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and	*A dichotoma* are excluded from the development footprint.

COMMENT	COMMENTATOR AND DATE	RESPONSE FROM SPECIALIST
All trees within the development or close proximity thereof should be mapped and information provided with the EIA documents.	Nature Conservation • 5 November 2015 (Letter via email)	
Point 5 - The development is proposed for an area that falls within the Bushmanland Arid Grassland, one of the most extensive vegetation types within the Northern Cape (Mucina and Rutherford, 2006). This vegetation types is poorly conserved in formal protected areas and extensive areas have been historically overgrazed. As a result, large areas are currently degraded and drainage lines have been modified as a result of anthropogenic impacts. As a result of the extent of the area, impact would most likely be on landscape connectivity as the site is in close proximity of drainage lines and wetlands (refer to Figure 5). Caption Figure 5 - Several landscape scale connections through drainage lines are evident within the area in question. The two proposed facilities i.e. the Three Solar PV (blue arrow) and Seven Solar PV (black arrow) are to be located in close proximity of drainage lines and wetlands.	• Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation • 5 November 2015 (Letter via email)	1. Connectivity identified and preserved. 2. Drainage lines that are considered to be major watercourse features are excluded from development.
Point 9 - It is advised that the consultants for this project liaise with the Forestry branch of the Department of Agriculture, Forestry and Fisheries (DAFF) if trees protected under the National Forest Act (Act No. 84 of 1998) are to be impacted by the proposed development.	• Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation • 5 November 2015 (Letter via email)	1. All protected trees identified on site are excluded or to be avoided in the final layout or construction of powerlines/associated electrical infrastructure.
Point A. Specialist's studies: ▪ A thorough baseline survey of the grids 2921AB and 2921AD should be conducted during the EIA phase with at least the following biotic specialists: Ornithologist, Mammologist, Herpetologist (including amphibians) and Botanist. o Surveys for both the faunal and floral specialist reports should be done during the most optimum period for this area i.e. mid-summer to autumn, after the rains and during the growth season when maximum biota can be expected. o This should be done in order to give a good representation of the ecology in the area. o Due to the extreme variability in time and space of rainfall events, even a once-off survey within the rainy season will not provide a representative picture of the ecology of the area. o The number of plants of conservation concern (e.g. Aloe dichotoma, Aloe spp., Trichocaulon spp., Hoodia spp., Boscia spp. etc. under the Northern Cape Nature Conservation Act No. 9 of 2009 and National Environmental Management: Biodiversity Act No. 10	• Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation • 5 November 2015 (Letter via email)	1. An ecologist, ornithologist and aquatic specialist comprised part of the team. 2. Timeframes do not allow for February to April period assessment. Drought period and meteorological state is noted at time of assessment. 3. Timeframes do not allow for continued long term assessments. Interpretation of landform, floral and faunal findings and multivariate analysis has been used to interpret and compile assessment. Given the findings of the assessment and the general severely grazed nature of the site, the information collated is considered sufficient to draw a conclusion on the nature of the ecology within the area. 4. Identified specimens included under NEMBA have been identified and mapped spatially.

COMMENT	COMMENTATOR AND DATE	RESPONSE FROM SPECIALIST
of 2004, etc.) that may be directly affected by the development must be estimated during the EIA phase. o Large Aloe dichotoma [NCNCA protected spp.] populations are known to occur in the region and any populations in close proximity to the planned facilities must be mapped.		
Point C - Ecology and landscape connectivity: ▪ The proponent should include in the EIA an environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process and map combining the final layout plan overlain on the environmental sensitivity map. This map should be adequate in size to determine the extent of the development and to identify all aspects adequately as indicated on the maps. No-Go areas should be clearly identified. ▪ The final layout of the proposed developments (all 3 phases) and its constituents should be designed in such a manner as to enhance ecological value to fauna and flora within the area and to avoid pressures associated with surrounding farmland i.e. natural areas for greening and designing to support ecological corridors and landscape connectivity are strongly encouraged. ▪ The actual footprint for all activities related to the whole project (all Solar Park facilities) must be calculated to determine the total natural vegetation land cover transformation and loss. The collective and residual impact of all developments will be assessed also during permit applications. If the collective impact is assessed early enough the developer can better manage his risks and costs as he/she would know in advance whether a biodiversity offset is triggered also under DENC. ▪ If electrification of the property as security measure is considered, possible electrocution damage to small mammals such as pangolin and tortoises should be taken into consideration. ▪ Existing roads must be used as far as possible. ▪ The EIA should indicate how the Social-Agricultural-Conservation dynamic will change in terms of land use. Will the properties on which the developments occur still be actively farmed or will they become dormant or effectively be converted into conservation land with minimal land use management. Will problem animal control still occur as in standard practice in small livestock farming? How will fencing infrastructure change around the properties which has a bearing on problem animal control, but also on wildlife movement and landscape connectivity. ▪ The application must also be reviewed in the context of cumulative impacts of all RE developments in the region.	• Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation • 5 November 2015 (Letter via email)	1. 'Sensitivity'' map has been included in the assessment (i.e. Appendix 7.A of this chapter). 2. Recommendations in respect of the proposed layout have been included in report. 3. The proposed facility (Kenhardt PV 3) is expected to have a total footprint of 250 ha. The final siting of the proposed facility will be located outside of sensitive areas, where applicable. 4. Recommendations on fencing and the use of electric fencing have been identified in report. 5. The proposed project will either make use of the existing unnamed farm road or the Transnet Service Road to gain access to the proposed project site. Should the Transnet Service Road be considered the preferred access road, it is proposed that an internal gravel road will be constructed from the road to the proposed site. This internal gravel road is not expected to exceed 6 m in width. 6. Comment on broader land use change from a conservation – agricultural – socio economic perspective is provided in ecological report. Notable that there is broad long term uncertainty, however consideration of existing PV facilities indicates that parks, under management can act to change or possibly improve habitat at a regional scale, depending upon one's approach to "habitat management". 7. Cumulative impacts are reviewed where data and forecasting permits.
Point 4 - The proposed area does not fall within or close to an Important Bird Area (IBA), yet it does resort within a region of grids classified has being sensitive to Wind Farm facilities (refer to Figure 4).	• Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la	1. Project is PV related and not wind power. 2. Avifauna assessment

COMMENT	COMMENTATOR AND DATE	RESPONSE FROM SPECIALIST
The darker the pendent the more sensitive the specific area is to Wind Farm facilities. Closer scrutiny regarding bird studies is thus a prerequisite due to possible impacts of birds on grid infrastructure as by implication local or regional migratory species that move around in response to surface water availability may be at risk from infrastructure collisions. It is also critical to point out that bird data for this area is based on the South African Bird Atlas Project 1 (SABAP1); data published in 1997 and recorded at a much broader scale than the SABAP2 data survey. Evidently, one can conclude that data for this area is outdated. This is specifically highlighted as a point of concern as each of the three PV projects will be separately linked to the Eskom grid through its own set of powerlines. Caption Figure 4: The three Solar PV facility (blue arrow) is proposed for an area classified as being sensitive to Wind Farm facilities. The darker the pendent the more sensitive the specific area is to Wind Farm facilities. Though the proposed development is not a Wind Farm facility it poses significant risks to birds through collision with grid infrastructure as each of the three facilities will have its own transmission lines connecting to the Eskom Nieuwehoop grid station north east of the proposed development. A seven Solar PV facility (black arrow) is proposed north east of the proposed three Solar PV facility, each also having its own transmission line.	Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation • 5 November 2015 (Letter via email)	identified impacts on birds and has made recommendations. Electric fencing, rather than overhead powerlines, is considered to be greatest risk to particular species of avifauna.
Section B - Bird Monitoring: ▪ Bird monitoring programmes should form part of the Environmental Management Programme. o Monitoring of birds over a full seasonal period (12 months) is supported. o This will help to support a comparative lack of data on bird species in the study area from the SABAP database. o The information will also provide data on bird flight paths, risk of collision in specific areas, habitat niches etc. o An extensive monitoring area across the study area (i.e. non-resident species) is advised to comprehensively account for the movement of species. ▪ Appropriate bird deterrent devices must be placed around the facility to lessen the impact caused by collision of avifauna with the development infrastructure (Hernandez et al., 2014, Kagan et al., 2014). o All Power lines should be clearly marked with bird flappers / markers. o Bird marker devices must be put on the earth wires (live wires) of the power line as appose to the conductors [Bird Flight Divertor (BFD) as oppose to other bird marker devices are suggested (Anderson,	• Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation 5 November 2015 (Letter via email)	1. Avian monitoring assessment (post Environmental Authorisation) aligning with Bird life SA guidelines is proposed. 2. BFDs are included into recommendations for establishment of powerline. Use of specific non Delta type towers is recommended. 3. Birdlife SA assessment methods are noted, however time resources do not allow for exact application of these protocols. It is also noted that the methods of assessment do align with general ecological principles for faunal assessment; however a broad range evaluation of species within the region as well as a site specific evaluation was undertaken to garner primary data. Such data was matched with secondary data from the literature. 4. Water fowl populations considered to be minimal by avifaunal specialist 5. IAPs noted.

COMMENT	COMMENTATOR AND DATE	RESPONSE FROM SPECIALIST
2001)]. ▪ Relevant Birdlife SA protocols should be consulted to conduct the EIA assessment for birds (Guide to Access Avian Data for Environmental Impact Assessment Reports, Retief et al. 2013; BirdLife South Africa / Endangered Wildlife Trust best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa, Jenkins et al. 2012). Although the Jenkins and others guideline refers specifically to Wind farms, many of the principles apply for a thorough assessment. The electricity grid infrastructure especially remains a significant risk for bird collisions. ▪ Potential impacts on water fowl such as flamingos, ducks and geese as well as large Terrestrial Birds such as bustards and korhaan as well as raptors must be investigated. Potential impacts must speak to the Renewable Energy technologies and infrastructure as well electricity grid infrastructure. ▪ BirdLifeSA must be informed as I&AP to provide comment on the development. ▪ SKA must be consulted as I&AP to provide comment on the development. ▪ SAEON Arid Node must be informed as I&AP to provide comment on the development.		
Section D: Environmental Management Programme: ▪ Training and awareness on the illegal poaching and removal of succulents (e.g. Hoodia gordonii, Euphorbia spp.) and the protected quiver tree, Aloe dichotoma. ▪ The EIA must address how risk of alien plan infestation by predominantly Prosopis will be addressed, since the region is known to be under threat from infestation. ▪ A proper invasive alien management plan should be written into the EMPr. The area should be kept clear of invasive alien species; active management is a prerequisite. ▪ Bird deterrent devices to lessen the impact caused by collision of avifauna with development infrastructure. ▪ Possible electrocution of small mammals should be taken into account if electric fences are considered as a security measure. ▪ Free movement of small mammals if the development property is to be fenced. Rehabilitation plans must be provided as to how post construction rehabilitation will be approached as well as operational phase control measures for protecting equipment, for example cutting/scraping/ herbicide applications underneath solar panels.	• Elsabe Swart (Deputy Director – Research and Development Support) and Samantha De la Fontaine (District Ecologist), Northern Cape Department of Environment and Nature Conservation 5 November 2015 (Letter via email)	1. Assessment provides recommendations on removal of exotic weeds. 2. Avifaunal deterrents are incorporated into EMPr recommendations. 3. Impact of electric fence addressed in EMPr. 4. Recommendations on faunal pathways into and out of fence proposed. 5. Rehabilitation proposals provided in EMPr.

7.5.2 Identification of Potential Impacts

7.5.2.1 Construction Phase

The following potential impacts during the construction phase can be summarised:

- Alteration of habitat structure and composition;
- Ousting (and recruitment) of various fauna;
- Changes in the geomorphological state of drainage lines (i.e. changes to surface drainage patterns) due to construction activities leading to change in plant communities and general habitat structure, within the site and immediately adjacent to it;
- Increased electrical light pollution, leading to changes in nocturnal behavioural patterns of fauna;
- Exclusion or entrapment of (in particular) large fauna, on account of the fencing of the site;
- Changes in edaphics (soils) on account of excavation and import of soils, leading to the alteration of plant communities and fossorial species in and around these points;
- Changes in subsurface water resources;
- Changes in water resources and surface water in terms of water quality (i.e. impact on water chemistry) as a result of construction activities; and
- Exotic weed invasion.

7.5.2.2 Operational Phase:

The following potential impacts during the Operational Phase can be summarised:

- Continued alteration of habitat structure and composition on account of continuing low level anthropogenic impacts, such as “shading of vegetation” from arrays;
- Ousting (and recruitment) of various fauna on account of long term changes in the surrounding habitat/environment;
- Changes in the geomorphological state of drainage lines on account of long term climatic changes and the concomitant change in the nature of the catchment on account of the land use change;
- Changes in water resources and water quality (i.e. impact on water chemistry) as a result of operational activities. Such changes will be related to the long term activities on site, but are likely to be negligible; and
- Exotic weed invasion as a consequence of regular and continued disturbance of site.

7.5.2.3 Decommissioning Phase

Such alterations and changes will be dependent upon the expectant post-decommissioning land use. However, abandonment of the site would probably result in:

- A reversion to the present seral stage, where continued grazing by livestock and herbivory by game will arise;
- A reversion of present faunal population states within the study area;
- Changes in the geomorphological state of drainage lines as hydraulic changes arise within the catchment; and
- Exotic weed invasion as a consequence of abandonment of site and cessation of weed control measures.

7.5.2.4 Cumulative Impacts

Cumulative impacts arising from the implementation of this project and other land use changes in the region are likely to exhibit the following:

- Extensive alteration of habitat structure and composition over an extensive and wide area;
- Changes in fauna through exclusion of certain species and beneficiation of others over an extensive and wide area;
- Increased change in the geomorphological state of drainage lines on account of long term and extensive change in the nature of the catchment;
- The continued and cumulative loss of habitat at a landscape to regional level, with a particular impact on avi-faunal behaviour.
- Changes in water resources and surface water in terms of water quality (i.e. impact on water chemistry) on account of extensive changes in the catchment; and
- Exotic weed invasion as a consequence of regular and continued disturbance across an extensive area of site.

The cumulative impacts assessed in this specialist study consider certain developments that occur with a 20 km radius of the proposed project, as shown in Chapter 4 of the EIA Report.

7.6 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

The proposed development of the PV facility on the study site indicates that the land use change should be positioned to the east of the site, avoiding drainage features and the identified quartzite kopjies that lie in the west. A number of potential impacts have been identified in Section 7.5.1. These potential negative impacts are given further consideration below, with possible mitigation measures being proposed.

Construction Phase

7.6.1 The ousting of fauna and loss of vegetation/habitat through anthropogenic activities, disturbance of refugia and general change in habitat with concomitant ecological repercussions

During the construction phase, a high level of disturbance is likely to arise over a period of 9 – 14 months. Such disturbance will relate to excavation, noise and general anthropogenic influences associated with the building of the facility on site. This may include the cutting and removal of vegetation for the establishment of internal gravel roads (a permanent transformation) and the cutting and trampling of vegetation wherever the arrays may be established. Direct, indirect and cumulative impacts expected to arise on site are identified below:

Direct Impacts

- Loss of "*less resilient*" plant species and replacement with more *robust* species leading to a change in habitat form and structure.
- Introduction of exotic vegetation or the invasion of disturbed areas by exotic vegetation through either a physical vector (e.g. machinery, vehicles etc.) or more "natural" dispersion vectors (e.g. wind, avian dispersion).

- Ousting of fauna through disturbance and human presence. As such, the loss of fossorial and other species will alter the ecological processes inherent within the site (e.g. change in disturbance thresholds, herbivory etc.).
- Opportunistic animal species may benefit from the construction activities; in particular the exclusion of predators from the site may benefit former prey species which will take refuge within the area, skewing populations and predator – prey relations.

Indirect Impacts

- Changes in habitat form and structure may extend beyond the site boundaries as species prevalence changes within the PV site. This change will skew plant competition in areas around the site as propagule levels change and species competition in the immediate vicinity of the site alters.
- As indicated in the direct impacts, faunal populations may be favoured by the establishment of the facility and as such these changes will be evidenced beyond the boundaries of the PV facility.

Cumulative Impacts

- Presently the study site and surrounds are subject to limited anthropogenic impacts with the exception of the electrical infrastructure, railway and roads, fences and livestock management operations. It is expected that sites to the north and north east of the subject site will be developed for similar PV facilities including the Nieuwehoop (Phase 1 and Phase 2) PV projects that are located further east of the site. Should these sites be developed prior to the development of the Kenhardt PV 3 project, it is envisaged that:
  - Exotic species invasion may arise from adjacent projects (if not controlled on site), particularly as a consequence of the prevailing northerly winds; and
  - Fauna ousted from these sites may, in part relocate towards the subject site, and in turn be ousted towards the south and west of the site. Although lands to the south and west are similar in nature and form to the subject site, this marks a minor but nevertheless evident consequence of the cumulative impact of such facilities on fauna within the region.

The status of this impact is rated as negative and direct, indirect and cumulative in nature. The direct impact is rated with a site specific spatial extent; the indirect impact is rated with a local spatial extent, and the cumulative impact is rated with a local to regional spatial extent. The impacts are rated with a long-term duration (i.e. the impact and risk will occur for the project duration). The consequence and probability of both the direct and cumulative impacts are respectively rated as substantial and very likely. The consequence and probability of the indirect impact are respectively rated as substantial and likely. The reversibility of the direct impact is rated as low and the irreplaceability is rated as low. The reversibility of both the indirect and cumulative impact is rated as moderate and the irreplaceability is rated as low.

Significance of Impact without Mitigation **Moderate**

Mitigation

Proposed mitigation measures that may alleviate the significance of the above impacts include:

1. A second assessment of the site should be undertaken in or around February to March (subsequent to the issuing of an Environmental Authorisation and the completion of the detailed engineering) in order to identify any additional plant specimens of significance that may be evident on site. Such specimens may be relocated/removed (i.e. search and rescue) or avoided (with the relevant permits and approvals in place) prior to the commencement of construction.
2. The detailed design of the laydown footprint of the arrays should take consideration of the minor drainage lines present on site and any additional significant plant species that may be identified prior to the commencement of construction. Other features of the site should be incorporated into the PV array design.

3. An initial pre-construction clearance of all exotic vegetation on site should be undertaken to reduce the possibility of further exotic weed invasion. Continued exotic weed control measures should be implemented during the construction phase and may be incorporated into an exotic weed control plan for the site.
4. The ousting of larger game from fenced areas should be undertaken through a general sweep of the laydown area once the fence is erected.
5. The maintenance of vegetation and avoidance of the "blading" or clearance of vegetation by machinery. Vegetation is generally of such low level that blanket clearance is unnecessary.
6. Consideration of the siting and layout of the temporary construction site and worker camp.

Significance of the impact with mitigation **Low**

7.6.2 Alteration of surface drainage patterns on account of construction activities leading to change in plant communities and general habitat structure within the site and immediately adjacent to it

Significant drainage features on site will be avoided in the laydown of the proposed PV facility. It is however, evident that some surface flow change will arise on account of excavation, plant and human movement and the placement of structures. Direct, indirect and cumulative surface hydrological impacts expected to arise on site are identified below:

Direct Impacts

- Minor variation in the flow regimen within smaller drainage features, but possibly compounded within larger features.
- Increased sediment discharge into surface drainage features as a consequence of disturbance to soils and moderate to heavy rainfall. This may alter habitat for certain species that are related to the drainage lines.

Indirect Impacts

- Shifts in habitat form and structure as plant – water relations change across portions of the site.

Cumulative Impacts

- Sustained changes in the upper drainage pattern and watershed will see minimal changes in the major drainage lines. This will be compounded further downstream in the Wolfkopseloop system, particularly if other, similar developments within the same catchment arise. Changes may be manifest in the increased rate of flow within the system with consequences in terms of bed and bank morphology.

The status of this impact is rated as negative and direct, indirect and cumulative in nature. The direct impact is rated with a site specific spatial extent; the indirect impact is rated with a local spatial extent, and the cumulative impact is rated with a regional spatial extent. The direct, indirect and cumulative impacts are respectively rated with a medium-term, short-term and long-term duration. The consequence and probability of both the direct and indirect impacts are respectively rated as moderate and likely. The consequence and probability of the cumulative impact are respectively rated as substantial and likely. The reversibility of the direct and indirect impact is rated as high, whilst the cumulative impact is rated with a low reversibility. The irreplaceability of the direct and indirect impact is rated as low, whilst the cumulative impact is rated with a moderate irreplaceability.

Significance of Impact without Mitigation (Direct and Indirect Impacts): Low

Significance of Impact without Mitigation (Cumulative Impacts): Moderate

Mitigation
Proposed mitigation measures that may alleviate the significance of the above impacts include:

1. Exclusion of major drainage lines from the development footprint.
2. Avoidance of significant sculpting of land and maintenance of the general topography of the site.
3. Placement of energy dissipaters (such as stone levees or similar structures) within minor drainage lines to reduce velocity of flow through such features.
4. Undertaking and completion of earthworks and road construction outside of the high rainfall period (if possible).
5. Maintenance of a high level of housekeeping on site during the construction phase.
6. Inspection of drainage features immediately outside of the footprint of the proposed PV facility and removal of litter and solid waste on a regular basis.

Significance of Impact with Mitigation (Direct and Indirect Impacts): Very Low

Significance of the impact with mitigation (Cumulative Impact): Low

7.6.3 Alteration of surface water quality on account of construction activities that lead to change in water chemistry

Allied to the above, the construction phase will result in changes in water chemistry that will relate to:

Direct Impacts
- The physical alteration of surface run off (sediments, turbidity etc.).
- A change in dissolved substances within surface waters on account of excavation of onsite soils and import of soils and hardpan materials to site.
- A change in dissolved substances within the surface waters due to spillage of hydrocarbons and disposal of other liquids and foreign materials on site.
- Solid wastes, in particular plastics and paper, arising from site are likely to arise within drainage systems.

Indirect Impacts
- Water quality in the lower reaches of the Wolfskopseloop system and possibly in the Hartebees River may be subject to minor alteration in water chemistry, dependent upon rainfall in the catchment.

Cumulative
- The run off from all PV facilities, whether developed in tandem or subsequent to one another, will see small changes in water chemistry associated with run off from these sites.
- Changes in water chemistry will be more evident in the permanent water bodies, downstream of the sites; however dilution factors will make these particular impacts negligible.

The status of this impact is rated as negative and direct, indirect and cumulative in nature. The direct and indirect impacts are rated with a local spatial extent; whilst the cumulative impact is rated with a regional spatial extent. The direct and indirect impacts are rated with a short-term duration, and the cumulative impact is rated with a long-term duration. The consequence and probability of both the direct and indirect impacts are respectively rated as slight and likely. The consequence and probability of the cumulative impact are respectively rated as moderate and likely. The reversibility and irreplaceability of both the direct and indirect impacts are respectively rated as high and low. The reversibility and irreplaceability of the cumulative impact are rated as moderate. The irreplaceability of the direct and indirect impact is rated as low, whilst the cumulative impact is rated with a moderate irreplaceability.

Significance of Impact without Mitigation (Direct and Indirect Impacts): Very Low

Significance of Impact without Mitigation (Cumulative Impact): Moderate

Mitigation:
Proposed mitigation measures that may alleviate the significance of the above impacts include:

1. Undertaking and completion of earthworks and road construction outside of the high rainfall period in January to March (if possible and practical).
2. Maintenance of a high level of housekeeping on site during construction, including management and maintenance of vehicles, storage of dangerous goods including bulk liquids and disposal of wastes.
3. Inspection of drainage features immediately outside of the footprint of proposed PV facility and undertake removal of solid waste materials (if identified) on a regular basis. Exclusion of major drainage lines from the development footprint.
4. Avoidance of significance sculpting of land and maintenance of the general topography of the site.
5. Placement of energy dissipaters (such as stone levees or similar) within minor drainage lines to reduce velocity of flow through such features.

Significance of Impact with Mitigation (Direct and Indirect Impacts): Very Low

Significance of the impact with mitigation (Cumulative Impact): Low

7.6.4 Depending upon the origin of water (import or through abstraction of groundwater), changes in subsurface water resources may arise, particularly in the case of the latter

The construction of the proposed PV facility will require significant volumes of water, particularly for the construction of roadways. If local boreholes are utilised for the provision of such water, these resources may be placed under pressure, while the import of water to the site may alter the recharge of water to subsurface resources. It is important to note that the impact of the proposed project on groundwater and the geohydrology is assessed as part of a separate specialist study (i.e. Chapter 11 of the EIA Report).

Direct Impacts

- Abstraction from site is unlikely as the aquifer is considered to be low to moderate in yield at a preliminary level of consideration. However, increased demand on these aquifers will serve to reduce water availability, if such aquifers are located close to the surface. Such draw down of the aquifer may alter the plant water relations of larger specimens that rely on such resource e.g. *A erioloba*.
- The introduction of water to site by import may alter the availability of water to plants within the site and may lead to changes in habitat form and structure around areas that receive such import.

Indirect Impacts

- Abstraction of water from subsurface resources may have consequences for areas beyond the site perimeter, depending on the extent of the aquifer under consideration. Depletion of the aquifer may affect habitat forms at lower points within the catchment.

Cumulative Impacts

- Continued and sporadic abstraction of water by a number of users from the same aquifer may affect water resources downstream of the site, as well as the availability of water to other sites.

The status of this impact is rated as negative with a regional spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as substantial and likely. The reversibility and irreplaceability of the impact are both rated as moderate.

Significance of Impact without Mitigation **Moderate**

Mitigation
Proposed mitigation measures that may alleviate the significance of the above impacts include:

1. Identification of suitable water resources, preferably off site and not utilized by other PV facilities. Confirmation of yield will be required prior to abstraction.
2. Use of recycled water for construction purposes from identified resources e.g. sewerage facilities or similar facility.
3. Identify or consider alternative cleaning methods for the PV panels.

Significance of the impact with mitigation **Low**

7.6.5 Changes in edaphics (soils) on account of excavation and import of soils, leading to the alteration of plant communities and fossorial species in and around these points

The construction phase will include the import of soils from other sites, as well as the compaction of soils. The related direct, indirect and cumulative impacts are identified below.

Direct Impacts

- Depending upon the nature of soils (particle size, clay and mineral content etc.) changes in habitat form may arise at a very localized level as plant species that are tolerant of or prefer particular soils benefit at the expense of other species which are less tolerant.
- Compaction of soils by traffic and through the use of compactors, will allow for some plant species to competitively benefit over other species.

Indirect Impacts
None identified, unless soils are disturbed outside of the development footprint

Cumulative Impacts

- In a sandy environment, such as the Bushmanland Arid Grassland, differing soil forms will see some plant species benefit at the expense of others. With a number of similar projects underway within close proximity of each other, associations of particular species may become more prevalent on site, in clustered areas within the development sites.

The status of the direct impact is rated as negative with a site specific spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as moderate and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the direct impact without mitigation is rated as low.

The status of the indirect impact is rated as negative with a local spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as slight and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the indirect impact without mitigation is rated as very low.

The status of the cumulative impact is rated as negative with a regional spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as moderate and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the cumulative impact without mitigation is rated as low.

Significance of Impact without Mitigation (Direct and Cumulative Impacts): Low

Significance of Impact without Mitigation (Indirect Impact): Very Low

Mitigation
Proposed mitigation measures that may alleviate the significance of the above impacts include:

1. Ripping of compact soils when and where extensive compaction arises.

Significance of the impact with mitigation (Indirect and Cumulative Impacts): Very Low

Significance of Impact with Mitigation (Direct Impact): Low

7.6.6 Increased electrical light pollution (ELP), leading to changes in nocturnal behavioural patterns amongst fauna

As indicated above, operations at the site during the construction phase will require the placement of security lighting as well as the undertaking of operations at dusk and before dawn. Lighting will be required at points around the site.

Direct Impacts

- Increased lighting around the laydown area and possibly across the site will change faunal behavior. Nocturnal and crepuscular species may either benefit or be suppressed as a consequence of such lighting. For example, Chiropterans (bats) may be encouraged or attracted to site as a consequence of increased prey species being present in and around lighting, or certain species, such as night jar, may become more vulnerable to predation as a consequence of lighting.

Indirect Impacts

- As a consequence of lighting at the site, species may be drawn from other areas or alternatively ousted from points proximal to the site as a consequence of changes in behavior of one or more species, affected by ELP.

Cumulative Impacts

- With a number of PV projects being clustered in the area, it is envisaged that the ELP and the presence of a wider landscape based light imprint or “aura” may become a significant component of the regional environment. This may serve to change faunal behavior over a wide portion of the area in question.

The status of the direct impact is rated as negative with a local spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as moderate and very likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the direct impact without mitigation is rated as low.

The status of the indirect impact is rated as negative with a local spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as slight and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the indirect impact without mitigation is rated as very low.

The status of the cumulative impact is rated as negative with a regional spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as slight and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the cumulative impact without mitigation is rated as very low.

Significance of impact without mitigation (Direct Impact): Low

Significance of impact without mitigation (Indirect and Cumulative Impacts): Very Low

Mitigation

1. Lighting and its placement and use on site should be given consideration, whereby ELP is minimized. This may entail managing the position of lights, their direction and luminescence. The project should strive to minimise ambient situational light emissions.

Significance of impact with mitigation (Direct, Indirect and Cumulative Impacts): Very Low

7.6.7 Exclusion or entrapment of (in particular) large fauna on account of the fencing of the site

The placement of a fence around the site is one of the preliminary tasks affecting the site. Such fence serves to entrap some species within the laydown area, while other specimens can “escape”, (Figure 7.12) others still are enticed into the fenced area. This has some minor impacts, which are identified below.

Figure 7.12: Fossorial movement under fences by larger animals, porcupines and Aardvark (*Orycteropus afer*).

Direct Impacts

- Fossorial species, such as aardvark (*O afer*), can disrupt activities through their foraging activities. This is particularly evident around fences.
- The exclusion of some fauna serves to alter habitat state as the fossorial behavior of some fauna is an ecological process requirement (e.g. excavation of soils by some animals allows for the settlement and germination of seeds, while termites etc. are controlled by species such as *O afer*.

Indirect Impacts

- The ousting of certain fauna from the site requires that such specimens forage within other areas, resulting in various behavioural changes (e.g. territorial overlaps etc.).

Cumulative Impacts

- As a large and contiguous area will eventually fall under a similar land use, with exclusion areas for larger fauna, inter-specific and intra-specific competition may increase within the local area.

The status of the direct impact is rated as negative with a local spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as slight and very likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the direct impact without mitigation is rated as very low.

The status of the indirect impact is rated as negative with a local spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as slight and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the indirect impact without mitigation is rated as very low.

The status of the cumulative impact is rated as negative with a regional spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as slight and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the cumulative impact without mitigation is rated as very low.

Significance of impact without Mitigation (Direct, Indirect and Cumulative): Very Low

Mitigation

1. Ensure that the live electrical fence wire is not placed at ground level.

2. Conduct regular (daily) inspections of the fence line to address any animals that may be affected by the fence (i.e. tortoise).

Significance of impact with Mitigation (Direct, Indirect and Cumulative): Very Low

Operations

7.6.8 Alteration of ecological processes on account of the exclusion of certain fauna, inherent to the functional state of the land within the proposed PV facility i.e. larger fossorial species and predators will be excluded from the PV facility site by virtue of its fencing, generally leading to possible variations in populations of other species that remain within the site, with concomitant ecological change

As per the construction phase impacts, impacts arising from the cordoning of the site from faunal intrusion may see changes in the general ecological state of vegetation structure and form on site. Potential direct, indirect and cumulative impacts are described below:

Direct Impacts

- Changes in plant community structure as drivers of certain species are excluded from the subject area, for example herbivory is curtailed on certain plant species.
- Introduction of exotic vegetation where moribund vegetation arises as a consequence of changes in local ecological drivers.
- Opportunistic animal species may benefit from the exclusion of other species, such as prey species. This may lead to a skewing of populations within the site.

Indirect Impacts

- Changes in habitat form and structure may extend beyond the site boundaries as species prevalence changes within the proposed PV site. This change will skew plant competition in areas around the site as propagule levels change and species competition in the immediate vicinity of the site alters.
- Faunal populations may be favoured by the establishment of the facility and as such these changes will be evidenced beyond the boundaries of the PV facility.

Cumulative Impacts

- Should the additional expected PV facilities be established, together with the subject site, it is evident that a significant portion of land will be subject to the exclusion of certain fauna, with the concomitant cumulative effects identified above being more spatially extensive in nature.

The status of the direct impact is rated as negative with a site specific spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as moderate and very likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the direct impact without mitigation is rated as low.

The status of the indirect impact is rated as negative with a site specific spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as substantial and very likely. The reversibility and irreplaceability of the impact are both rated as low. The significance of the indirect impact without mitigation is rated as moderate.

The status of the cumulative impact is rated as negative with a regional spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as substantial and very likely. The reversibility and irreplaceability of the impact are both rated as low. The significance of the cumulative impact without mitigation is rated as moderate.

Significance of impact without mitigation (Direct Impact) Low

Significance of Impact without Mitigation (Indirect and Cumulative Impact) Moderate

Mitigation

1. Provision of critter paths within the fencing should be considered in the design. Similar fencing has been instituted in Dreunberg PV facility. Its use relates primarily to the movement of small mammals (suricates and ground squirrel) as well as the Giant African bullfrog (*Pyxicephalus adspersus*). These species have been noted to utilise the critter paths (Figure 7.12), however burrowing and other activities continue in respect of larger fauna, regardless of such mechanisms.

2. Promote and support faunal presence and activities within the proposed PV facility, where applicable. For example, the maintenance of suricate warrens and possibly low, endoreic pans, where they may arise.

Significance of impact with Mitigation (Direct, Indirect and Cumulative) Low

7.6.9 Increased shading, as a consequence of the PV arrays, will lead to changes in plant-water relations and possible changes in plant community structures within the site

The arrangement of the arrays across site will result in increased shading of large tracts of land and as a consequence the present loss of water from the affected soils will change, altering plant-water relations. In addition, the exclusion of both livestock and other herbivores may result in medium to long term changes in habitat form and structure. The following impacts are forecast:

Direct Impacts

- Minor changes in habitat composition as certain species are ousted and others favoured as a consequence of the change in improved plant-water relations.
- Increased verdant growth in some species lying below the arrays.
- Reduced herbivory may give rise to changes in plant composition and structure on site.

Indirect Impacts

- With herbivory reduced and improved plant-water relations within large areas of the park, the area may act as a natural propagule repository for certain plant species, particularly those normally subject to grazing by livestock.

Cumulative Impacts

- As a number of PV projects will span a significant portion of contiguous land, and if all impacts are similar across these sites, then it may be expected that the above changes in habitat will encompass a significant portion of the surrounding environment.
- A large scale seed repository, free from intensive grazing pressures will be established within the region.

The status of the direct impact is rated as neutral with a site specific spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as slight and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the direct impact without mitigation is rated as very low.

The status of the indirect impact is rated as negative with a local spatial extent and short-term duration (i.e. the impact and risk will be experienced for less than 1 year). The consequence and probability of the impact are respectively rated as slight and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the indirect impact without mitigation is rated as very low.

The status of the cumulative impact is rated as negative with a site specific spatial extent and medium-term duration (i.e. the impact and risk will be experienced for 1-10 years). The consequence and probability of the impact are respectively rated as moderate and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the cumulative impact without mitigation is rated as low.

Significance of impact without mitigation (Direct and Indirect Impacts): Very Low

Significance of impact without mitigation (Cumulative Impact): Low

Mitigation

1. None identified.

Significance of impact with mitigation Not applicable

7.6.10 Changes in meteorological factors at a local scale, on account of the proposed PV array are likely to arise (e.g. subtle changes in wind dynamics, "heat bubble phenomenon" as well as the alteration in run off of surface water and evapotranspiration states), leading to long term, but generally latent changes in habitat

The potential direct impact is rated below.

Direct Impacts:

- The abovementioned "heat bubble" may alter behavioural patterns in some avian species, particularly raptors and larger species that utilize thermals. The consequence of such changes are however unknown.

Indirect Impacts:

- None identified

Cumulative Impacts:

- None identified

The status of the direct impact is rated as neutral with a site specific spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as slight and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the direct impact without mitigation is rated as very low.

Significance of impact without mitigation **Very Low**

Mitigation measures

None identified.

Significance of impact with mitigation **Not Applicable**

7.6.11 Potential abstraction of groundwater for the cleaning of modules, as well as operational use, will alter the state of subsurface water resources, depending upon nature and origin of such water

It is doubtful if the requisite amount of water required for the cleaning of the PV panels is available on site; however the following impacts are forecast. As mentioned above, the impact of the proposed project on groundwater and the geohydrology is assessed as part of a separate specialist study (i.e. Chapter 11 of the EIA Report).

Direct Impacts

- Increased demand on local aquifers will serve to reduce water availability, if such aquifers are located close to the surface. Such draw down of the aquifer may alter the plant-water relations of larger specimens that rely on such resource e.g. *A erioloba*.

Indirect Impacts

- Abstraction of water from subsurface resources at the rate required may have consequences for areas beyond the site perimeter, depending upon the extent of the aquifer under consideration. Depletion of the aquifer may affect habitat forms at lower points within the catchment.

Cumulative Impacts

- As a number of PV facilities will be in operation in and around the identified aquifers, continued and regular abstraction of water by a number of users from the same aquifer(s) may affect water resources downstream of site, as well as the availability of water to other sites.

The status of the direct impact is rated as negative with a local spatial extent and very short-term duration (i.e. the impact and risk will be instantaneous). The consequence and probability of the impact are respectively rated as slight and likely. The reversibility and irreplaceability of the impact are both rated as moderate. The significance of the direct impact without mitigation is rated as very low.

The status of the indirect impact is rated as negative with a local spatial extent and short-term duration (i.e. the impact and risk will be experienced for less than 1 year). The consequence and probability of the impact are respectively rated as substantial and likely. The reversibility and irreplaceability of the impact are both rated as moderate. The significance of the indirect impact without mitigation is rated as moderate.

The status of the cumulative impact is rated as negative with a regional spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as severe and likely. The reversibility and irreplaceability of the impact are respectively rated as moderate and low. The significance of the cumulative impact without mitigation is rated as high.

Significance of impact without mitigation (Direct and Indirect Impacts): Moderate

Significance of impact without mitigation (Cumulative Impact): High

Mitigation

1. Preferential use of recycled water arising from sewerage treatment facilities for operational phase requirements (instead of groundwater) where this may be available.
2. The prudent use of surface water resources where management and monitoring are more achievable than subsurface resources.
3. Adopt “dry” cleaning methods, such as dusting and sweeping the site before washing down.
4. Increased monitoring of the impact of dust generation and implement a more judicious cleaning protocol on site.
5. Low level and ongoing cleaning of the PV panels over time to reduce demand on aquifers i.e. cleaning is undertaken throughout the year rather than at singular intervals at select times of the year.

Significance of impact with mitigation (Direct and Indirect Impacts): Low

Significance of impact with mitigation (Cumulative Impact): Moderate

7.6.12 Overhead transmission lines, as well as subtle changes in habitat are likely to result in the alteration of avian behavior in and around the site

Direct Impacts

- Overhead lines, fences and other infrastructure will alter the foraging behavior of species, in particular raptors. An increase in perching opportunities will allow for improved predation amongst birds of prey. In addition, species such as jackal, may utilize fences in order to accost and entrap prey.

Indirect Impacts

- None identified

Cumulative Impacts

- As a large area of land will be affected by multiple PV facilities, it is evident that any behavioural changes, as described above, will be compounded by the extent of the facilities in the area.

The status of the direct impact is rated as negative with a local spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as slight and unlikely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the direct impact without mitigation is rated as very low.

The status of the cumulative impact is rated as negative with a site specific spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as slight and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the cumulative impact without mitigation is rated as very low.

Significance of impact without mitigation **Very Low**

Mitigation None identified.

Significance of impact with mitigation **Not Applicable**

7.6.13 The fencing of the site, possibly with electric fencing, is likely to impact upon faunal behaviour, leading to the exclusion of certain species and possible mortalities. Alternatively such changes may also favour some specific individuals, particularly those that remain within the confines of the PV facility, which is likely to lead to further localised alteration of habitat and ecological process within the proposed PV facility

Direct Impacts:

- As indicated above, the introduction of infrastructure into the area will change faunal behaviour. Electric fencing, the preferred method of securing PV facilities can have significant negative consequences for in particular, tortoise, small passerine birds and reptiles such as snakes. These species, if coming into contact with the charged wires of the fence can be severely maimed or killed. Tortoise, if moving up to an electric fence are unable to move away from the fence if they are unable to extend their head and neck. As such tortoise are susceptible to immobility and death through starvation if encountering an electric fence with a positive wire in or around ground level.

Indirect Impacts:

- None identified

Figure 7.13: Night Jar (*Caprimulgus rufigena*) electrocuted on energised electric fence.

Cumulative Impacts:

- As a large area of land will be affected by multiple PV facilities, it is evident that any mortalities and injury associated with electrocution from fencing may be compounded.

The status of the direct impact is rated as negative with a site specific spatial extent and long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as moderate and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the direct impact without mitigation is rated as low.

Significance of impact without mitigation **Low**

Mitigation

1. Ensure that the live electrical fence wire is not placed at ground level.

2. Conduct regular (daily) inspections of the fence line to address any animals that may be affected by the electric fence (i.e. tortoise).

Significance of impact with mitigation **Very Low**

Decommissioning Phase

The decommissioning phase is expected to see a reversion to an agricultural land use akin to the present state or alternatively some other agricultural activities. As such the structures on site will be removed, in particular the PV arrays.

7.6.14 A reversion to the present seral stage, where continued grazing by livestock and herbivory by game will arise

During the decommissioning phase, the potential impact of reverting to the present seral stage has been identified.

The spatial extent of this impact is site specific with a long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as moderate and very likely. The reversibility and irreplaceability of the impact are both rated as low. The significance of the impact without mitigation is rated as low.

Significance of impact without mitigation **Low**

No mitigation measures have been identified.

7.6.15 A reversion of present faunal population states within the study area

With the removal of infrastructure from site, areas of exclusion as well as anthropogenic influences on population states and presence within the site will alter accordingly. Such alteration will see species excluded from the area under a PV facility (larger mammals in particular), access areas from which they were previously excluded. Habitat change on site will influence population trends and traits within the area.

The spatial extent of this impact is site specific with a long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as moderate and likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the impact without mitigation is rated as low.

Significance without mitigation **Low**

No mitigation measures have been identified

7.6.16 Changes in the geomorphological state of drainage lines as hydraulic changes arise within the catchment

As infrastructure is removed from site, surface hydraulics will change in site. Habitat changes associated with the reversion to an agricultural land use will see concomitant changes in the geomorphological state of both major and minor drainage lines, resulting from an equilibria shift.

The spatial extent of this impact is local with a long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as moderate and very likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the impact without mitigation is rated as low.

Significance of impact without mitigation **Low**

No mitigation measures have been identified

7.6.17 Exotic weed invasion as a consequence of abandonment of site and cessation of weed control measures

Exotic weed invasion is a likely consequence the cessation of the PV facility operations. Decommissioning of site will see increased disturbance of the land and therefore increased susceptibility to exotic weed invasion.

The spatial extent of this impact is local-regional with a long-term duration (i.e. the impact and risk will be experienced for the project duration). The consequence and probability of the impact are respectively rated as moderate and very likely. The reversibility and irreplaceability of the impact are respectively rated as high and low. The significance of the impact without mitigation is rated as medium.

Significance without mitigation **Moderate**

Mitigation would include monitoring of the land and redress of exotic weeds found present on site. In addition, the stabilisation of disturbed lands immediately after the clearance of the land of the PV arrays and related infrastructure would serve to moderate the potential for invasion.

Significance with mitigation **Low**

7.7 IMPACT ASSESSMENT SUMMARY

Table 7.4: Direct impacts assessment summary table for the Construction Phase

Construction Phase													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Conse-quence**	**Proba-bility**	**Rever-sibility of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
The ousting of fauna through anthropogenic activities, disturbance of refugia and general change in habitat	Habitat and species loss	Negative	Site	Long-Term	Substantial	Very likely	Low	Low	Detailed design and incorporation of habitat and features Plant rescue operations Exotic weed control Game sweep of site The maintenance of vegetation and avoidance of the “blading” or clearance. Consideration of the siting and layout of the temporary construction site and worker camp.	Moderate	Low	4	High

Construction Phase													
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Duration	Conse-quence	Proba-bility	Rever-sibility of Impact	Irreplace-ability	Potential Mitigation Measures	Significance of Impact and Risk		Ranking of Residual Impact/ Risk	Confidence Level
										Without Mitigation/ Management	With Mitigation/ Management (Residual Impact/ Risk)		
Alteration of surface drainage patterns on account of construction activities leading to change in plant communities and general habitat structure	Habitat change through changes in topographic drivers	Negative	Site	Medium-Term	Moderate	Likely	High	Low	Avoidance of major drainage features during construction Undertaking and completion of earthworks and road construction outside of the high rainfall period (if possible). Avoidance of significant sculpting of land and maintenance of the general topography of the site Maintenance of a high level of housekeeping on site during the construction phase. Inspection of drainage features immediately outside of the footprint of the proposed PV facility and undertake removal of solid waste and litter on a regular basis.	Low	Very low	5	High

Construction Phase													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Conse-quence**	**Proba-bility**	**Rever-sibility of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Abstraction from subsurface aquifers may have a significant impact on plant water relations.	Water volume and ecological change	Negative	Local	Long term	Moderate	Likely	High	Low	Alternative water resources to be utilized	Very low	Very Low	5	Medium
The introduction of water to site by import may alter the availability of water to plants within the site and may lead to changes in habitat form and structure around areas that receive such import.	Change in plant water relations	indeter minate	Local	Long term	Slight	Likely	High	Low	None identified	Very Low	Very Low	5	High

Construction Phase													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Conse-quence**	**Proba-bility**	**Rever-sibility of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Alteration of surface water quality that lead to change in water chemistry	Water quality change and general pollution of resource	Negative	Local	Short term	Slight	Likely	High	Low	Avoidance of significant sculpting of land and maintenance of the general topography of site. Placement of energy dissipaters within minor drainage lines to reduce velocity of flow through such features.	Very low	Very low	5	Medium
Changes in edaphics (soils) on account of excavation and import of soils, leading to the alteration of plant communities and fossorial species in and around these points.	Habitat change and alteration in fauna and faunal behaviour	Negative	Site	Long term	Moderate	Likely	High	Low	Ripping of compact soils when and where extensive compaction arises	Low	Low	4	Medium
Increased ELP, leading to changes in nocturnal behavioural patterns amongst fauna	Changes in faunal behaviour	Negative	Local	Long term	Moderate	Very likely	High	Low	Reduce level of lighting and placement of lighting to be judiciously considered at time of implementation	Low	Very low	5	High

Construction Phase													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Conse-quence**	**Proba-bility**	**Rever-sibility of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Exclusion or entrapment of in particular large fauna, on account of the fencing of the site.	Animal mortalitie s	Negative	Site	Long term	Slight	Very likely	High	Low	Ensure that the live electrical fence wire is not placed at ground level. Conduct regular (daily) inspections of the fence line to address any animals that may be affected by the fence.	Very low	Very low	5	High

Table 7.5: Indirect impact assessment summary table for the Construction Phase

Construction Phase													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Conse-quence**	**Proba-bility**	**Reversi-bility of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
The ousting of fauna through anthropogenic activities, disturbance of refugia and general change in habitat	Habitat and species loss	Negative	Local	Long-Term	Substantial	Likely	Moderate	Low	Detailed design and incorporation of habitat and features Plant rescue operations Exotic weed control Game sweep of site The maintenance of vegetation and avoidance of “blading” or clearance. Consideration of the siting and layout of the temporary construction site and worker camp.	Moderate	Low	4	High

Construction Phase													
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Duration	Conse-quence	Proba-bility	Reversi-bility of Impact	Irreplace-ability	Potential Mitigation Measures	Significance of Impact and Risk		Ranking of Residual Impact/ Risk	Confidence Level
										Without Mitigation/ Management	With Mitigation/ Management (Residual Impact/ Risk)		
Alteration of surface drainage patterns on account of construction activities leading to change in plant communities and general habitat structure	Habitat change through changes in topographic drivers	Negative	Local	Short term	Moderate	Likely	High	Low	Undertaking and completion of earthworks and road construction outside of the high rainfall period (if possible). Avoidance of significance sculpting of land and maintenance of the general topography of the site. Placement of energy dissipaters (such as stone levees or similar) within minor drainage lines to reduce velocity of flow through such features. Maintenance of a high level of housekeeping on site during the construction phase. Inspection of drainage features immediately outside of the footprint of the proposed PV facility and undertake removal of solid waste and litter on a regular basis.	Low	Very low	5	High

Construction Phase													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Conse-quence**	**Proba-bility**	**Reversi-bility of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Alteration of surface water quality that lead to change in water chemistry	Water quality change and general pollution of resource	Negative	Local	Short term	Slight	Likely	High	Low	Exclusion of major drainage lines from the development footprint. Avoidance of significant sculpting of land and maintenance of the general topography of site. Placement of energy dissipaters within minor drainage lines to reduce velocity of flow through such features. Maintenance of a high level of housekeeping on site during the construction phase. Inspection of drainage features immediately outside of the footprint of the proposed PV facility and removal of litter and solid waste on a regular basis.	Very low	Very low	5	Medium

Construction Phase													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Conse-quence**	**Proba-bility**	**Reversi-bility of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Changes in edaphics (soils) on account of excavation and import of soils, leading to the alteration of plant communities and fossorial species in and around these points.	Habitat change and alteration in fauna and faunal behaviour	Negative	Local	Long term	Slight	Likely	High	Low	Ripping of compact soils when and where extensive compaction arises	Very low	Very low	5	Medium
Increased ELP, leading to changes in nocturnal behavioural patterns amongst fauna	Changes in faunal behaviour	Negative	Local	Long term	Slight	Likely	High	Low	Provision of critter paths within fencing should be considered in the design. Promote and support faunal presence and activities within the proposed PV facility, where applicable.	Very low	Very low	5	High
Exclusion or entrapment of in particular large fauna, on account of the fencing of the site.	Animal mortalities	Negative	Local	Long term	Slight	Likely	High	Low	Ensure that live electrical fence wire is not placed at ground level. Conduct regular (daily) inspections of the fence line to address any animals that may be affected by the fence	Very low	Very low	5	High

Table 7.6: Direct Impact assessment summary table for the Operational Phase

Operational Phase													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Dura-tion**	**Conse-quence**	**Proba-bility**	**Reversi-bility of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Alteration of ecological processes on account of the exclusion of certain fauna, inherent to the functional state of the land within the PV facility	Habitat and species loss	Negative	Site	Long-Term	Moderate	Very likely	High	Low	Provision of critter paths within the fencing should be considered in the design. Promote and support faunal presence and activities within the proposed PV facility	Low	Low	4	High
Increased shading, as a consequence of the PV arrays, will lead to changes in plant water relations and possible changes in plant community structures within the site.	Habitat change and species loss	Neutral	Site	Long-Term	Slight	Likely	High	Low	None identified	Very low	Not Applicable	5	High
Changes in meteorological factors at a local scale, on account of the PV array are likely to arise	Uncertainty in relation to change	Neutral	Site	Long-Term	Slight	Likely	High	Low	None identified	Very Low	Not Applicable	5	High

Operational Phase													
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Dura-tion	Conse-quence	Proba-bility	Reversi-bility of Impact	Irreplace-ability	Potential Mitigation Measures	Significance of Impact and Risk		Ranking of Residual Impact/ Risk	Confidence Level
										Without Mitigation/ Management	With Mitigation/ Management (Residual Impact/ Risk)		
Abstraction of groundwater for the cleaning of the PV panels, as well as for operational use, will alter the state of subsurface water resources	Water quantity changes with possible impact on habitat	Negative	Local	Very short term	Substantial	Likely	Moderate	Moderate	Preferential use of recycled water sources for operational phase requirements (instead of groundwater). The prudent use of surface water resources. Adopt "dry" cleaning methods, such as dusting and sweeping the site before washing down. Increased monitoring of the impact of dust generation and implement a more judicious cleaning protocol. Low level and ongoing cleaning of PV panels over time to reduce demand on aquifers.	Moderate	Low	4	High
Overhead transmission lines, as well as subtle changes in habitat are likely to result in the alteration of avian behaviour.	Change in animal behaviour	Negative	Local	Long term	Slight	Unlikely	High	Low	None identified	Very low	Not applicable	5	Medium

Operational Phase													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Dura-tion**	**Conse-quence**	**Proba-bility**	**Reversi-bility of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
The fencing of the site, possibly with electric fencing, is likely to impact on faunal behaviour, leading to the exclusion of certain species and possible mortalities	Animal mortality	Negative	Site	Long term	Moderate	Likely	High	Low	Ensure that the live electrical fence wire is not placed at ground level. Conduct regular (daily) inspections of the fence line to address any animals that may be affected by electric the fence.	Low	Very low	5	High

Table 7.7: Indirect Impacts for the Operational Phase

Operational Phase													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Dura-tion**	**Conse-quence**	**Proba-bility**	**Reversi-bility of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Alteration of ecological processes on account of the exclusion of certain fauna, inherent to the functional state of the land within the PV facility	Habitat and species loss	Negative	Site	Long-Term	Substantial	Very likely	Low	Low	Provision of critter paths within the fencing should be considered in the design. Promote and support faunal presence and activities within the proposed PV facility	Moderate	Low	4	High
Increased shading, as a consequence of the PV arrays, will lead to changes in plant water relations and possible changes in plant community structures within the site.	Habitat change and species loss	Negative	Local	Short term	Slight	Likely	High	Low	None identified	Very low	Not Applicable	5	High

Operational Phase													
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Dura-tion	Conse-quence	Proba-bility	Reversi-bility of Impact	Irreplace-ability	Potential Mitigation Measures	Significance of Impact and Risk		Ranking of Residual Impact/ Risk	Confidence Level
										Without Mitigation/ Management	With Mitigation/ Management (Residual Impact/ Risk)		
Abstraction of groundwater for the cleaning of the PV panels, as well as for operational use, will alter the state of subsurface water resources	Water quality change and general pollution of resource	Negative	Local	Short term	Substantial	Likely	Moderate	Moderate	Preferential use of recycled water sources for operational phase requirements (instead of groundwater). The prudent use of surface water resources. Adopt "dry" cleaning methods, such as dusting and sweeping of the site before washing down. Increased monitoring of the impact of dust generation and implement a more judicious cleaning protocol. Low level and ongoing cleaning of the PV panels over time to reduce demand on aquifers.	Moderate	Low	4	High

Table 7.8: Cumulative Impact assessment summary table for the Construction Phase

Construction Phase													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Dura-tion**	**Conse-quence**	**Proba-bility**	**Revers-ibility of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
The ousting of fauna through anthropogenic activities, disturbance of refugia and general change in habitat	Habitat and species loss	Negative	Local to Regional	Long-Term	Substantial	Very likely	Moderate	Low	Detailed design and incorporation of habitat and features Plant rescue operations Exotic weed control Game sweep of site The maintenance of vegetation and avoidance of the "blading" or clearance. Consideration of the siting and layout of the temporary construction site and worker camp.	Moderate	Low	4	High
Alteration of surface drainage patterns on account of construction activities leading to change in plant communities and general habitat structure	Change in drainage patterns and drainage features	Negative	Regional	Long-Term	Substantial	Likely	Low	Moderate	Exclusion of major drainage lines from development Avoid sculpting of land Surface flow energy dissipaters Maintenance of a high level of housekeeping on site during the construction phase.	Moderate	Low	4	High

Construction Phase													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Dura-tion**	**Conse-quence**	**Proba-bility**	**Revers-ibility of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
									Inspection of drainage features immediately outside of the footprint of the proposed PV facility and removal of litter and solid waste on a regular basis.				
Alteration of surface water quality that leads to change in water chemistry	Changes in drainage patterns and water quality	Negative	Regional	Long term	Moderate	Likely	Moderate	Moderate	Avoid construction during the rainy season (if possible and practical). Avoidance of significance sculpting of land and maintenance of the general topography of the site including the avoidance of major drainage lines. Placement of energy dissipaters (such as stone levees or similar) within minor drainage lines to reduce velocity of flow through such features Apply good site management and solid waste management outside of site (within the immediate vicinity)	Low	Low	4	Medium

Construction Phase													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Dura-tion**	**Conse-quence**	**Proba-bility**	**Revers-ibility of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Changes in sub surface water resources may arise	Effects upon groundwater resources	Negative	Regional	Long term	Substantial	Likely	Moderate	Moderate	Identify off site water resources Use of recycled water Identify or consider alternative cleaning methods for the PV panels	Moderate	Low	4	Medium
Changes in edaphics on account of excavation and import of soils, leading to the alteration of plant communities and fossorial species	Habitat alteration	Negative	Regional	Long term	Moderate	Likely	High	Low	Ripping of compact soils when and where extensive compaction arises	Low	Very low	5	Medium
Increased ELP	Faunal behavioural change	Negative	Regional	Long term	Slight	Likely	High	Low	Review the placement of lighting on the site.	Very low	Very low	5	Medium
Exclusion or entrapment of in particular large fauna, on account of the fencing of the site	Animal mortality	Negative	Regional	Long term	Slight	Likely	High	Low	Placement of live wires Monitoring of fence line	Very low	Very low	5	Medium

Table 7.9: Cumulative Impact assessment summary table for the Operational Phase

Operational Phase													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Dura-tion**	**Conse-quence**	**Proba-bility**	**Reversi-bility of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Alteration of ecological processes on account of the exclusion of certain fauna, inherent to the functional state of the land within the proposed PV facility	Habitat and species loss	Negative	Regional	Long-Term	Substantial	Very likely	Low	Low	Provision of critter paths within the fencing should be considered in the design. Promote and support faunal presence and activities within the proposed PV facility	Moderate	Low	4	High
Increased shading, as a consequence of the PV arrays, will lead to changes in plant water relations and possible changes in plant community structures within the site.	Exposed soil suscepti-ble to erosion	Negative	Site	Medium-Term	Moderate	Likely	High	Low	None identified	Low	Not Applicable	4	High

Operational Phase													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Dura-tion**	**Conse-quence**	**Proba-bility**	**Reversi-bility of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Abstraction of groundwater for the cleaning of the PV panels, as well as for operational use, will alter the state of subsurface water resources.	Changes in water resource quantity and perhaps quality	Negative	Regional	Long term	Severe	Likely	Moderate	Low	Preferential use of recycled water for operational phase requirements (instead of groundwater). The prudent use of surface water resources. Adopt “dry” cleaning methods, such as dusting and sweeping of the site before wash down. Increased monitoring of the impact of dust generation and implement a more judicious cleaning protocol. Low level and ongoing cleaning of the PV panels over time to reduce demand on aquifers.	High	Moderate	3	Medium
Overhead transmission lines, as well as subtle changes in habitat are likely to result in the alteration of avian behaviour	Changes in faunal behaviour	Negative	Site	Long term	Slight	Likely	High	Low	None identified	Very low	Not Applicable	5	High

Operational Phase													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Dura-tion**	**Conse-quence**	**Proba-bility**	**Reversi-bility of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
As a large area of land will be affected by multiple PV facilities, it is evident that any mortalities and injury associated with electrocution from fencing may be compounded	Cumulative change in faunal populations	Negative	Regional	Long term	Slight	Likely	High	Low	Management of potential sources of electrocution – electric fences	Low	Very low	5	High

Table 7.10: Decommissioning Phase Impact assessment summary table

Decommissioning Phase													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Dura-tion**	**Conse-quence**	**Proba-bility**	**Reversi-bility of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
A reversion to the present seral stage, where continued grazing by livestock and herbivory by game will arise	Habitat and species change	Neutral	Site	Long-Term	Moderate	Very likely	Low	Low	None identified	Low	Not Applicable	4	Medium
A reversion of present faunal population states within the study area	Habitat and species population change	Neutral	Site	Long term	Moderate	Likely	High	Low	None identified	Low	Not Applicable	4	Medium
Changes in the geomorphologic al state of drainage lines as hydraulic changes arise within the catchment	Surface hydrology change	Neutral	Local	Long term	Moderate	Very likely	High	Low	None identified	Low	Not Applicable	4	Moderate
Exotic weed invasion as a consequence of abandonment of site and cessation of weed control measures	Habitat change	Negative	Local - Regional	Long term	Moderate	Very likely	High	Low	Weed control and land management	Moderate	Low	4	High

7.8 INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME

Utilising the above information the following broad issues are considered within the Environmental Management Programme that would be associated with the proposed development.

Pre-Construction Phase:

- Pre-construction evaluation and possible plant rescue operations;
- Identification of intrusion of the proposed construction site and development footprint, into minor drainage lines (if any);
- Identification of laydown areas, roadways etc. on site and evaluation of affected points within site, particularly in respect of floral and faunal presence; and
- Permitting requirements in terms of the National Water Act and Northern Cape Conservation Act.

Construction Phase:

- Site induction and interaction within management on ecological aspects;
- Site inspection of any fauna within the construction area during post fencing completion;
- Monitoring of operations, including species presence within site, mortalities and sitings;
- Maintenance of vegetation and avoidance of unnecessary clearance of site;
- Exotic weed management; and
- Erosion control measures to be implemented where applicable.

Post Construction Phase:

- Monitoring of faunal activities within the fenced area of the site and immediate proximity of site;
- Management of faunal intrusion through the fencing, including possible mortalities;
- Consideration of lighting regime around the site and the impact of ELP.
- Vegetation management on site – consideration of redress methods of growth and habitat form around site;
- Exotic weed management; and
- Erosion control measures.

7.9 CONCLUSION AND RECOMMENDATIONS

The ecological evaluation of the site reviewed the entire property on the relevant portion of the Farm Onder Rugzeer (PV 3). Such evaluation included consideration of the bio physical state of drainage systems, topographical features and a holistic review of all components within the ecological landscape. The evaluation of the results of desktop and field reconnaissance identified and served to develop a plan for the exclusion of particular areas from any proposed development of a PV facility. Included in the assessment was consideration of terrestrial and hydrological systems, as well as fauna (including avi-fauna). Major impacts identified as a consequence of the development proceeding relate to, inter alia;

- Changes in the broader habitat as a consequence of variation in physical factors within the site (e.g. shading of vegetation, changes in surface water flow regime);
- Changes in the broader surface and possibly sub surface hydrology; and
- The ousting, and in some cases recruitment of species, with subsequent variation in populations in and around the development.

The ecological evaluation has determined that with the exclusion of the identified drainage areas from the development, within the subject site, the requisite ecological components associated with these features will be retained in a broader perspective, with only subtle changes to the ecogeomorphology of these systems becoming evident on minor drainage features. There will be minor to moderate changes evident in the terrestrial environment resulting from the development which in turn will be manifest in changes in faunal components of the environment.

None of the above impacts have been identified as being of high significance (with the implementation of mitigation measures), most impacts arising can be considered to be of low to very significance in a holistic evaluation.

Given the above information, it is evident that with the judicious placement of the proposed solar Kenhardt PV 3 facility within the boundaries of the study area, this proposed development cannot be precluded from the portion of the Farm Onder Rugzeer, presently under consideration and as such authorisation may be granted in this respect. Judicious management of the site would include:

- Avoidance of major drainage lines identified in the report;
- Avoidance of excessive clearance of vegetation within the site;
- Management of exotic weed invasion that may arise;
- Management of fauna within the site and surrounds, as well as the incorporation of “wildlife” porosity into fence lines and the implementation of measures on the energised fence line to avoid mortalities to wildlife; and
- General land management practices to avoid excessive erosion, dust emissions and possible sources of pollution to ground and surface water resources.

The above, along with the various mitigation measures espoused in this report should be incorporated as conditions, into any authorisation granted by the relevant authority.

It is our opinion that with the implementation of the above, the project proposal, which entails the laying down of a PV facility some 250ha in extent, subject to final design and adherence to the above recommendations, can be accommodated on site and should therefore be authorised.

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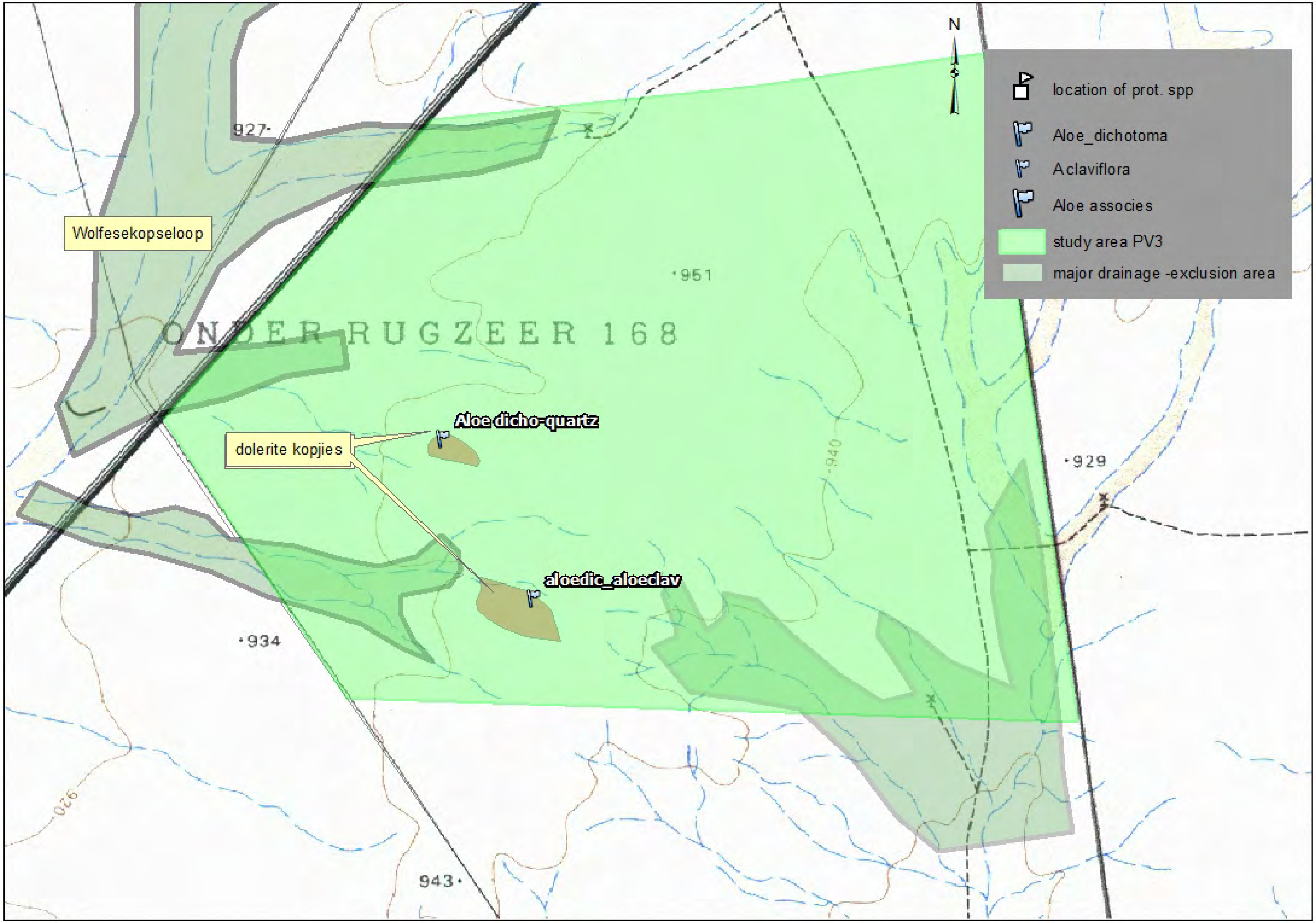
APPENDIX 7.A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location of prot. spp
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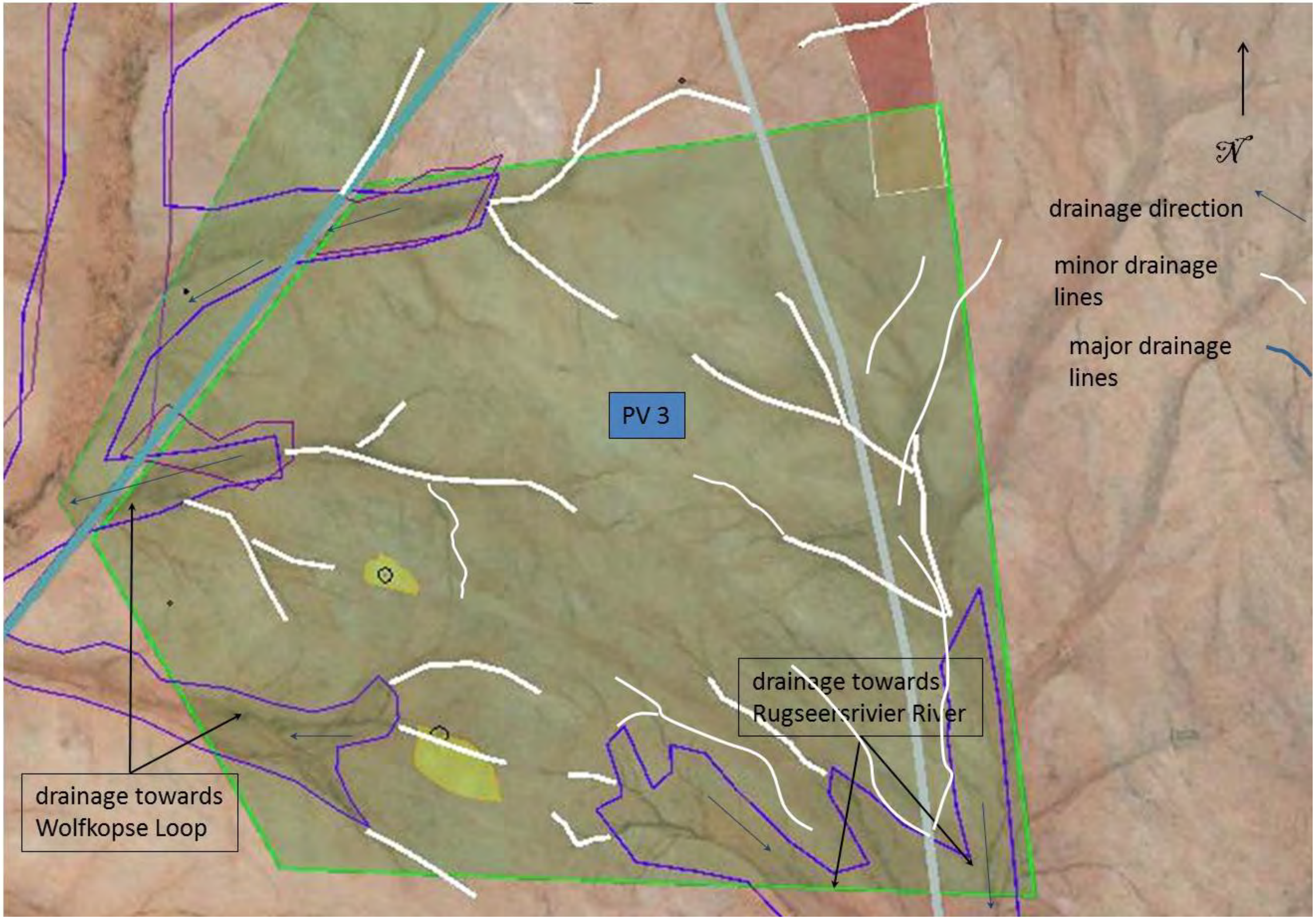
PV 3
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drainage direction
minor drainage lines
major drainage lines
drainage towards Rugseersrivier River
drainage towards Wolfkopse Loop

EIA REPORT

CHAPTER 8:

Visual Impact Assessment

Scoping and **Environmental Impact Assessment** for the Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province

Report prepared for:

CSIR – Environmental Management Services
P O Box 17001
Congella, Durban, 4013
South Africa

Report prepared by:

Henry Holland
8 Cathcart Street
Grahamstown, 6139
South Africa

March 2016

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS

Requirements of Appendix 6 - GN R982	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Appendix A of the EIA Report
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix B of the EIA Report and Section 8.1.6 of this chapter
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 8.1.1
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 8.1.3
e) a description of the methodology adopted in preparing the report or carrying out the specialised process;	Section 8.1.3
f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;	Section 8.3
g) an identification of any areas to be avoided, including buffers;	Section 8.3
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figure 8 1 and Section 8.3
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 8.1.4
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	Section 8.7
k) any mitigation measures for inclusion in the EMPr;	Section 8.9
l) any conditions for inclusion in the environmental authorisation;	None
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 8.9
n) a reasoned opinion- i. as to whether the proposed activity or portions thereof should be authorised; and ii. if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 8.10
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	None
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Section 8.5.1
q) any other information requested by the competent authority.	None

list of abbreviations

DEA	Department of Environmental Affairs
EIA	Environmental Impact Assessment
CPV	Concentrated Photovoltaic
DEM	Digital Elevation Model
GIS	Geographic Information System
PV	Photovoltaic
VIA	Visual Impact Assessment

glossary

Definitions	
Cumulative viewshed	A viewshed which indicates in some way how much of a development is visible from a particular viewpoint. In a raster based cumulative viewshed each pixel value will indicate how many points within the development area are visible. A power line development could, for example, use pylons as points to generate a cumulative viewshed for the development. Each pixel value in the viewshed will be a count (accumulation) of the number of pylons that will potentially be visible from that pixel.
Digital Elevation Model (DEM)	A digital or computer representation of the topography of an area.
Landscape baseline	A description of the existing elements, features, characteristics, character, quality and extent of the landscape (GLVIA, 2002).
Landscape character	The distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how this is perceived by people. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement. It creates the particular sense of place of different areas of the landscape (GLVIA, 2002).
Landscape impacts	Change in the elements, characteristics, character and qualities of the landscape as the result of development (GLVIA, 2002). These effects can be positive or negative, and result from removal of existing landscape elements, addition of new elements, or the alteration of existing elements.
Sense of place	That distinctive quality that makes a particular place memorable to the visitor, which can be interpreted in terms of the visual character of the landscape. The unique quality or character of a place, whether natural, rural or urban. Relates to uniqueness, distinctiveness or strong identity (Oberholzer 2005).
Viewer sensitivity	The assessment of the receptivity of viewer groups to the visible landscape elements and visual character and their perception of visual quality and value. The sensitivity of viewer groups depends on their activity and awareness within the affected landscape, their preferences, preconceptions and their opinions.
Viewshed	A viewshed is an area of land, water, and other environmental elements that is visible from a fixed vantage point. In digital imaging, a viewshed is a binary raster indicating the visibility of a viewpoint for an area of interest. A pixel with a value of unity indicates that the viewpoint is visible from that pixel, while a value of zero indicates that the viewpoint is not visible from the pixel.
Visual exposure	Visual exposure refers to the relative visibility of a project or feature in the landscape (Oberholzer, 2005). Exposure and visual impact tend to diminish exponentially with distance.
Visual impact assessment	A specialist study to determine the visual effects of a proposed development on the surrounding environment. The primary goal of this specialist study is to identify potential risk sources resulting from the project that may impact on the visual environment of the study area, and to assess their significance. These impacts include landscape impacts and visual impacts.
Visual intrusion	Visual intrusion indicates the level of compatibility or congruence of the project with the particular qualities of the area – its 'sense of place'. This is related to the idea of context and maintaining the integrity of the landscape (Oberholzer 2005).
Visual receptors	Visual receptors include viewer groups such as the local community, residents, workers, the broader public and visitors to the area, as well as public or community areas from which the development is visible.
Visual resource	Visual resource is an encompassing term relating to the visible landscape and its recognisable elements which, through their coexistence, result in a particular landscape and visual character

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8 VISUAL IMPACT ASSESSMENT

This chapter presents the findings of the Visual Impact Assessment that was prepared by Mr. Henry Holland as part of the EIA for the proposed Kenhardt PV 3 project within the Northern Cape Province.

8.1 INTRODUCTION AND METHODOLOGY

8.1.1 Scope and Objectives

As noted in Chapter 1 of this EIA Report, the proposed project includes the development of a 75 Megawatt (MW) Solar Photovoltaic (PV) Facility (referred to as Kenhardt PV 3) on the remaining extent of Onder Rugzeer Farm 168. The farm is located 30 km north-east of Kenhardt and 80 km south of Upington within the Kheis Local Municipality, Northern Cape Province. As noted above, this Visual Impact Assessment is being undertaken as part of the requisite EIA Process. The overall scope and objectives of this Visual Impact Assessment are to:

- Determine the current conditions in sufficient detail so that there is a baseline against which impacts can be identified and measured;
- Identify potential impacts that may occur during the construction, operational and decommissioning phases of development, as well as impacts associated with future environmental changes if the “no-go” option is implemented (both positive and negative);
- Assess the impacts, in terms of direct, indirect and cumulative impacts;
- Provide recommendations with regards to potential monitoring programmes;
- Determine mitigation and/or management measures which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts; and
- Incorporate and address all issues and concerns raised by I&APs and the public.

8.1.2 Terms of Reference

The Terms of Reference for the Visual Impact Assessment are as follows:

- Review detailed information relating to the project description and precisely define the environmental risks to the landscape and the risks to sensitive viewers, as well as the consequences thereto.
- Conduct a site visit and undertake a Photographic Survey of the surrounding region from which the landscape and visual baselines can be prepared.
- Compile a baseline description of the visual character/baseline and the landscape of the affected area.
- Undertake data preparation and the visibility analysis, which includes the calculation of viewsheds for various elements of the proposed development. Identify principal viewpoints and sensitive visual receptors.
- Identify and rate potential direct, indirect and cumulative impacts on the landscape and on sensitive viewers/receptors for the construction, operation and decommissioning phases of the proposed project. Study the cumulative impacts of the project by considering the impacts of existing industries within the area, together with the impact of the proposed project.
- Provide input to the Environmental Management Programme (EMPr), including mitigation and monitoring requirements to ensure that the visual impacts on the principal viewpoints and sensitive viewsheds are mitigated.
- Compile an assessment report (i.e. this report) qualifying the results of the fieldwork, risks and potential visual impacts, and impact evaluations, including potential mitigation measures, monitoring requirements as well as relevant recommendations.

8.1.3 Approach and Methodology

This Visual Impact Assessment (VIA) is based on guidelines for visual assessment specialist studies as set out by South Africa's Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) (Oberholzer, 2005), as well as guidelines provided by the Landscape Institute of the UK (GLVIA, 2002).

A visibility analysis was conducted for the region surrounding the proposed development site and components of the development relevant to the assessment of the potential visual impact (10 km radius) to identify key representative viewpoints and sensitive visual receptors. A site visit and photographic survey of this region followed to establish a baseline for visual resources to compare the proposed developments against. Spatial Development Frameworks (SDF) and Integrated Development Plans (IDP) for the relevant municipalities were studied to align the VIA with municipal objectives in terms of landscape and visual resources.

The key steps followed in the VIA are presented below:

Site Visit and Photographic Survey

The field survey (conducted on 23-25 October 2015) provided an opportunity to:

- Determine the actual or practical extent of potential visibility of the proposed development, by assessing the screening effect of landscape features;
- Conduct a photographic survey of the landscape surrounding the development;
- Take photos for use in photomontage images;
- Identify sensitive landscape and visual receptors;
- Viewpoints were chosen using the following criteria:
  - High visibility – sites from where most of the solar facility will be visible;
  - High visual exposure – sites at various distances from the proposed site; and
  - Sensitive areas and viewpoints such as nature reserves and game farms from which turbines will potentially be seen.
- Additionally, photo sites were chosen to aid in describing the landscape surrounding, and potentially affected by, the proposed development.

Field work was conducted in Spring but seasonal differences in vegetation cover and atmospheric conditions are slight and contrasts in texture and colour between development structures and landscape background will not change enough due to seasonal changes to invalidate this assessment.

Landscape Description

A desktop study was conducted to establish and describe the landscape character of the receiving environment. A combination of data analysis using a Geographic Information System (GIS), literature review and photographic survey was used to identify land cover, landforms and land use in order to gain an understanding of the current landscape within which the development will take place (GLVIA 2002). Areas of scenic interest, potential sensitive receptors (viewpoints, residences), preliminary zone of visual influence, and principal representative viewpoints were also identified. Landscape features of special interest were identified and mapped, as were landscape elements that may potentially be affected by the development.

VIA

A GIS (TNTmips[1]) is used to calculate viewsheds for various components of the proposed development. The viewsheds and information gathered during the field survey were used to define criteria such as visibility, viewer sensitivity, visual exposure and visual intrusion for the proposed development. These criteria were, in turn, used to determine the intensity of potential visual impacts on sensitive viewers. All information and knowledge acquired as part of the assessment process was then used to determine the potential significance of the impacts according to the standardised rating methodology as described in Chapter 4 of the EIA Report for the project.

[1] http://www.microimages.com/products/tntmips.htm

8.1.4 Assumptions and Limitations

8.1.4.1 Assumptions

Mitigation Measures

Mitigation measures in this report will assume that construction activities are managed and performed in such a way as to minimise its impact on the receiving environment. The following assumptions, in particular, apply since they are relevant to minimising visual impact during the construction phase:

- The contractor will maintain good housekeeping on site to avoid litter and minimise waste;
- Project developers will demarcate construction boundaries and minimise areas of surface disturbance;
- Vegetation and ground disturbance will be minimised and take advantage of existing clearings;
- Construction of new roads will be minimised and existing roads will be used where possible;
- Topsoil from the site will be stripped, stockpiled, and stabilised before excavating earth for the construction of the facility;
- Vegetation material from vegetation removal will be mulched and spread over fresh soil disturbances to aid in the rehabilitation process;
- Plans will be in place to control and minimise erosion risks;
- Plans will be in place to minimise fire hazards and dust generation; and
- Plans will be in place to rehabilitate cleared areas as soon as possible.

Cumulative Impacts

Cumulative impacts are assessed by adding expected impacts from this proposed development to existing and proposed developments with similar impacts in a 20 km radius (of the proposed Kenhardt PV projects). The existing and proposed developments that were taken into consideration for cumulative impacts include (CSIR 2015):

- Nieuwehoop 400/50 kV Substation located in close proximity to the proposed Solar Energy Facility (under construction);
- 2 x 400 kV power lines from Aries to the Solar CSP near Upington (under construction);
- 400 kV power line from Nieuwehoop Substation to the Solar CSP near Upington;
- Proposed Scatec Solar Kenhardt PV projects (i.e. Kenhardt PV 1 and Kenhardt PV 2);
- Proposed 132 kV Transmission Line to connect the proposed 75 MW Solar PV Facility (Kenhardt PV 1) to the Eskom Nieuwehoop Substation (i.e. Kenhardt PV 1 – Transmission Line);
- Proposed 132 kV/ 33 kV/ 22 kV Transmission Line to connect the proposed 75 MW Solar PV Facility (Kenhardt PV 2) to the Eskom Nieuwehoop Substation (i.e. Kenhardt PV 2 – Transmission Line);
- Proposed 132 kV/ 33 kV/ 22 kV Transmission Line to connect the proposed 75 MW Solar PV Facility (Kenhardt PV 3) to the Eskom Nieuwehoop Substation (i.e. Kenhardt PV 3 – Transmission Line);
- Proposed Mulilo Renewable Project Developments (Pty) Ltd Solar PV projects: Phase 1 (i.e. Boven Solar PV 1 (on the remaining extent of the Farm Boven Rugzeer 169, Kenhardt), Gemsbok Solar PV 1 (on the remaining extent of Portion 3 of the Farm Gemsbok Bult 120, Kenhardt) and Gemsbok Solar PV 2 (on the remaining extent of Portion 3 of the Farm Gemsbok Bult 120, Kenhardt));
- Proposed Mulilo Renewable Project Developments (Pty) Ltd Solar PV projects: Phase 2 (i.e. seven 75 MW PV OR Concentrated PV Solar Energy Facilities and associated infrastructure near Kenhardt); and
- Proposed Straussheim Solar project (initial phases of EIA Process).

All the developments that have been considered in the assessment of cumulative impacts are also listed in Chapter 4 of the EIA Report.

8.1.4.2 Limitations

Spatial Data Accuracy
Spatial data used for visibility analysis originate from various sources and scales. Inaccuracy and errors are therefore inevitable. Where relevant these will be highlighted in the report. Every effort was made to minimize their effect.

Viewshed Calculations
Calculation of the viewsheds does not take into account the potential screening effect of vegetation and buildings. Due to the relatively low vegetation cover in the region and the size and extent of the solar energy facility, the screening potential of vegetation is likely to be minimal over most distances.

Viewsheds are calculated using Digital Elevation Model (DEM) which is derived from 1:50000 scale contour lines with a 20 m vertical distance between contours. The DEM has a pixel resolution of 20 m x 20 m and covers a 70 km x 30 km area (within which a study area is located at 10 km radius around the development site).

8.1.5 Source of Information

The VIA is based on the following information:

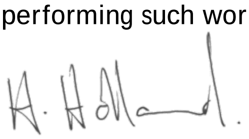
- Documentation supplied by the client and the CSIR;
- Digital topocadastral data at 1:50 000 scale from the National Geo-spatial Information database2;
- 1:250000 Geology map sheets covering the region;
- Google Earth software and data;
- South African digital land cover dataset of 2002;
- Renewable Energy EIA Application Database for SA, 2015 Quarter 3[3];
- Protected Areas Data Release - Third Quarter 2015;
- Eskom SPOT Building Count data set (de la Rey 2008); and
- 2013 Garmin map data for 'points of interest' layer.

8.1.6 Declaration of Independence of Specialist

Refer to Appendix A of this EIA Report for the Curriculum Vitae of Mr. Henry Holland, which highlights his experience and expertise. The declaration of independence by the specialist is provided in Box 8.1 below and included in Appendix B of this EIA Report.

BOX 8.1: DECLARATION OF INDEPENDENCE

I, Henry Holland, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed Kenhardt PV 3 Project, application or appeal in respect of which I was appointed, other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.



HENRY HOLLAND

[2] http://www.ngi.gov.za
[3] http://egis.environment.gov.za/frontpage.aspx?m=27

8.2 DESCRIPTION OF PROJECT ASPECTS RELEVANT to VISUAL IMPACTS

This section describes the aspects of the proposed project that are relevant in terms of potential visual impacts. Figure 8.1 below shows the proposed locality of the Kenhardt PV 3 Solar Facility.

All maps provided in this report are included in A3 format in Appendix 8.A of this chapter.

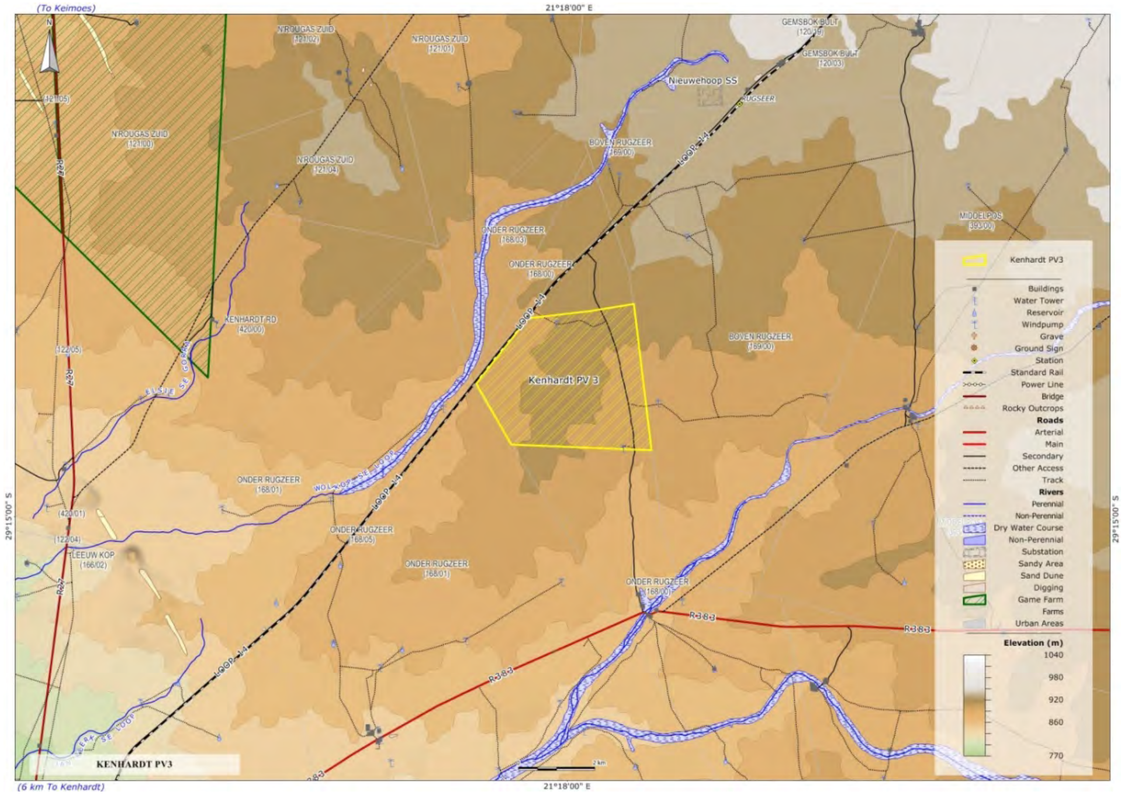


Figure 8.1: Proposed Kenhardt PV 3 solar energy facility site.

8.2.1 Construction and Decommissioning Phases

It is likely that all or most components of the proposed PV plant will contribute to potential visual impact during the construction and decommissioning phases. Elements of the construction and decommission phases that will have a potential visual impact include:

- A large area will be cleared of vegetation to host the solar field and associated buildings and structures;
- Laydown areas for equipment will also be required, although these will be temporary;
- Access roads, maintenance roads and power line servitudes will require clearing of vegetation. Exposure of large tracts of soil or rock will contrast significantly with the existing mottled landscape;
- Soil stockpiles and removed vegetation heaps will be visible;
- Alien invasive plant species may contrast strongly with surrounding vegetation;
- An increase in human activity in a remote area is likely to be noticed even by only a small number of visual receptors. Construction of the various components will require a large number of workers. Relatively large construction equipment and vehicles will be operating during these phases of development, and an increase in traffic on roads in the region is likely;
- Exposure of large areas of soil, and worker and equipment traffic will increase dust generation which will increase construction visibility;

- Buried pipelines and cables will not be visible during the operational phase, but activity, equipment and soil heaps will be visible during construction; and
- Construction or improvement of access roads will be more visible than the operational roads.

8.2.2 Operational Phase

Elements of the proposed project that will potentially cause significant visual impact during the operational phase include (maximum heights were used in the analyses to model a worst case scenario):

- Solar field – solar panels of up to 10 m high. The solar field covers a large area and is likely to contrast strongly with surrounding or background vegetation, particularly when viewed from elevated positions;
- Converter station and operations buildings (i.e. operational and maintenance control centre, offices, workshop/warehouse, operations office etc.) (7 m high);
- On-site substation (up to 30 m high) and 132 kV overhead distribution line[4] (30 m high) – these are likely to extend above the skyline for most visual receptors in the surrounding area;
- Security fencing (3 m high) and the guard cabin/house (3 m high). From some viewing angles the fence is more visible than the panels;
- Buildings and ancillary structures will likely contrast strongly with the solar field due to colour differences as well as the fact that most structures are taller than the solar panels; and
- Security and exterior lighting around buildings and parking areas could add to light pollution in the region.

Table 8.1: Heights of components used in viewshed analysis

Component	Maximum Height
Solar Panels	10 m
Inverter Stations	4 m
Operations Buildings	7 m
On-site Substation	30 m
Security Fencing	3 m
Guard Cabin	3 m

It is important to note that a complete, detailed project description is included in Chapter 2 of the EIA Report. The information regarding the proposed transmission line is indicatively provided in this report. A detailed description of the transmission line corridor is provided and assessed separately in the Basic Assessment for the Kenhardt PV 3 – Transmission Line project.

8.3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

The topography in the region surrounding the proposed development site is relatively flat with low open hills (Figure 8.2). Outcrops of erosion resistant rocks form occasional steep low hills which are distinctive in the landscape and often form a distant backdrop to views. The Hartbees River, a tributary of the Orange River, passes just south of Kenhardt. Wolfkop Se Loop and Rugseer River are tributaries of the Hartbees River which pass through the study area (Figure 8.3b and c). Rivers in this region only flow during heavy rain and are normally dry riverbeds.

[4] The potential visual impact for the 132 kV overhead distribution line is assessed separately in a Basic Assessment Report.

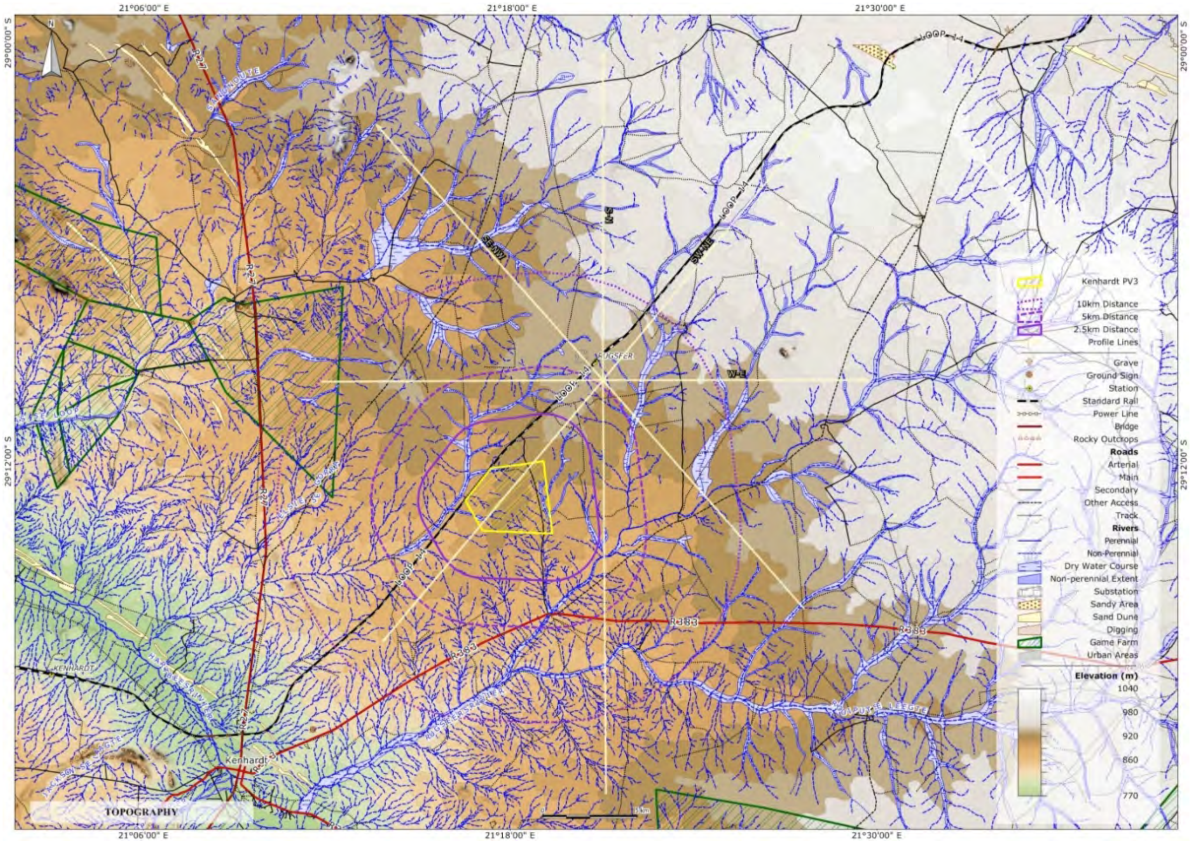


Figure 8.2: Topographic map of the region

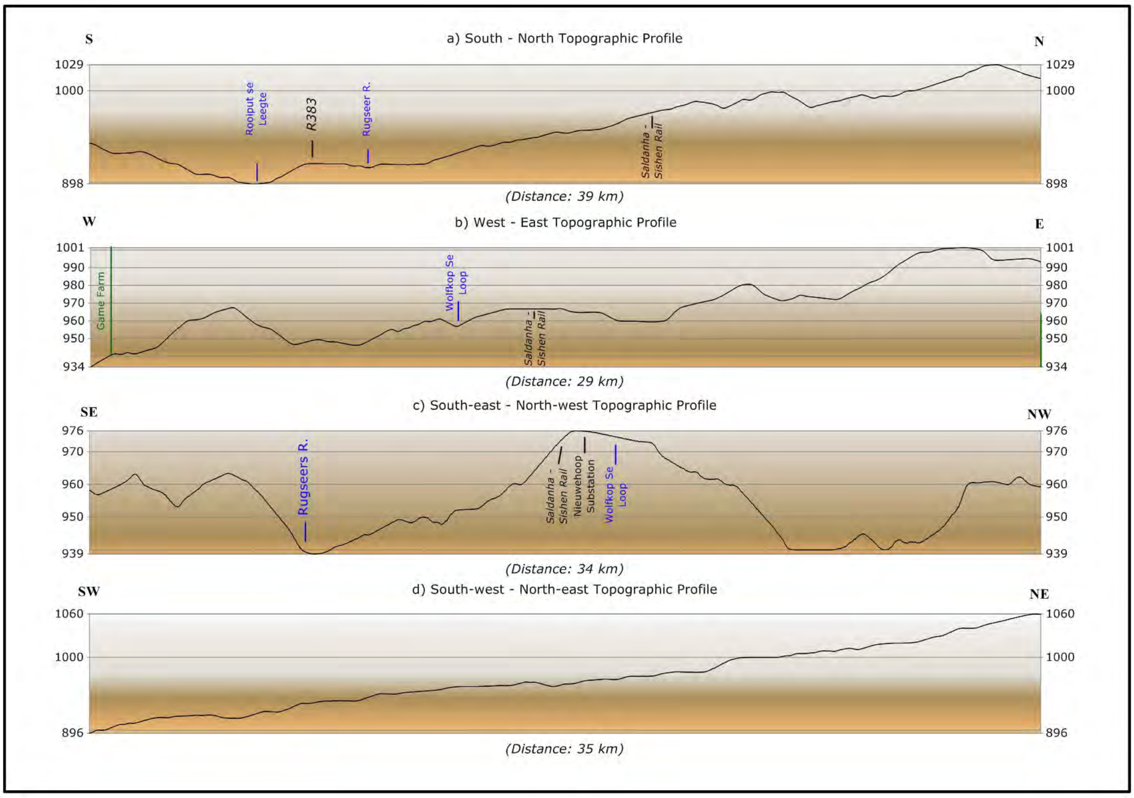


Figure 8.3: a) South-North Topographic Profile, b) East-West Topographic Profile, c) South-east - North-west Topographic Profile, d) South-west - North-east Topographic Profile. Topographic profiles as indicated on the topographic map above.

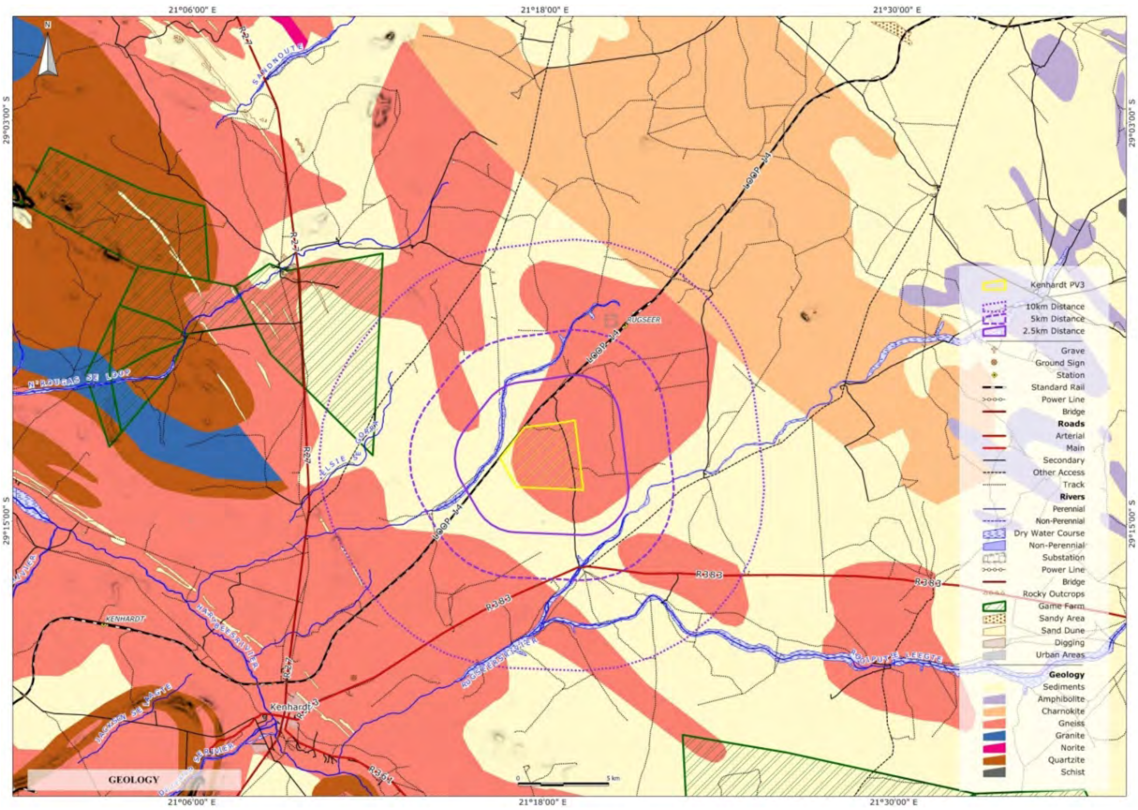


Figure 8.4: Simplified geology of the region.

The geological history of the region is complex with multiple metamorphic and deformation events (Figure 8.4). The region is therefore underlain by sedimentary and igneous rocks which were transformed into their metamorphic equivalents. The study area is located on migmatite (Kenhardt Migmatite) which is mostly overlain by more recent sediments of the Gordonia Group (Kalahari sands). A large number of pegmatites are found in the region and in some cases are mined for semi-precious stones. The steep, dark coloured hills around Kenhardt are quartzites which are relatively erosion-resistant rocks.

The study area is covered in grassland with low shrubs (Bushmanland Arid Grassland) which has been transformed by live-stock grazing (Figure 8.5). Sheep farming is the main agricultural activity. The vegetation produces a mottled background to most views which is relatively effective at making some development types such as power lines and pylons blend in with the background. There are no protected areas in the region and none are planned by the ZF Mgcawu District Municipality (Siyanda DM 2012) but there are a number of game farms in the surrounding landscape.

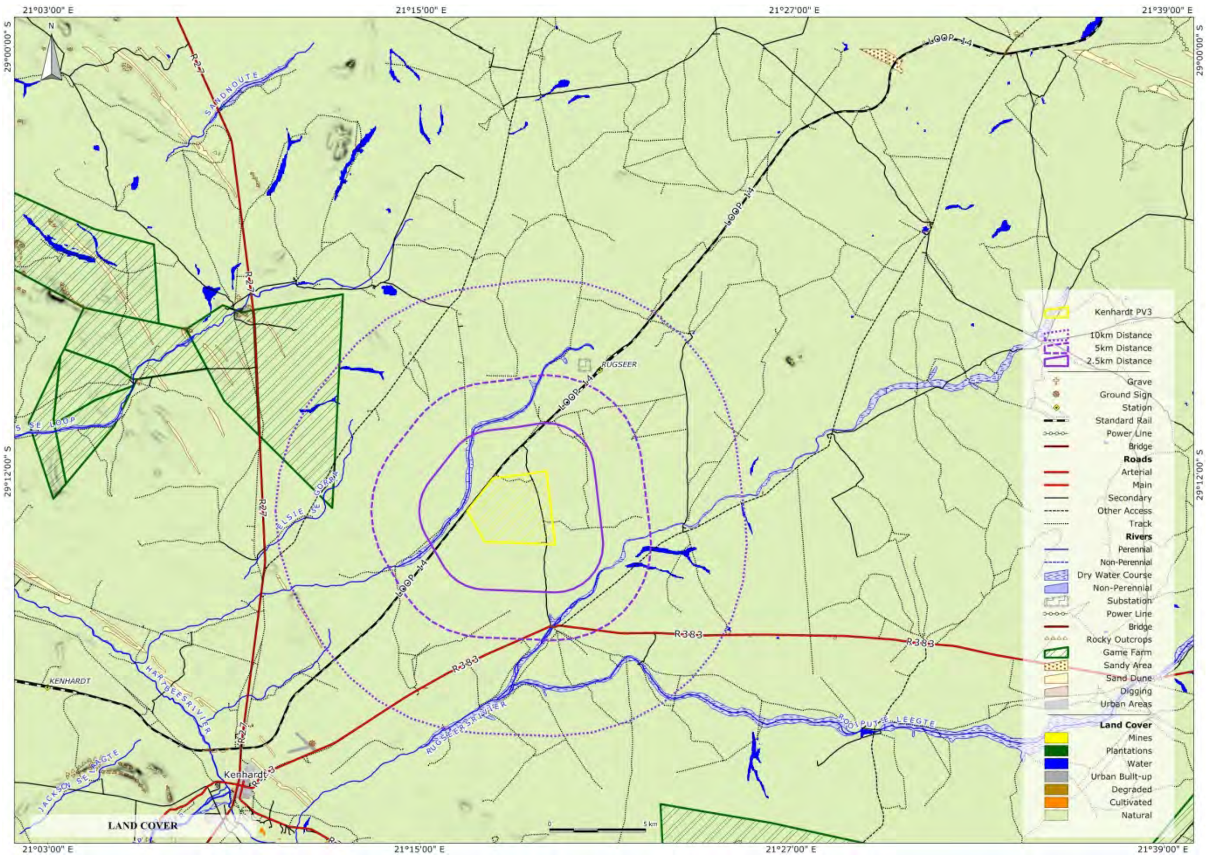


Figure 8.5: Land cover map of the region.

Kenhardt provides a service centre for the surrounding agricultural community (Figure 8.6). It is located approximately 30 km south-west of the proposed development site on the R27 provincial road. The road is often used by motorists travelling from Cape Town to the Northern Cape tourist destinations along the Orange River. The R383 is a gravel road between Kenhardt and Marydale. The Sishen-Saldanha railway passes through the property on which the proposed PV plant will be built and is a major feature in the landscape. A private (Transnet) gravel road runs adjacent to the rail tracks and provides limited access to the proposed site. A railway siding, Rugseer, is located near the proposed project site. The Eskom Nieuwehoop Substation is being constructed on a site just west of the Rugseer siding. Proposed 400 kV transmission lines from Ferrum Substation near Upington and from Aries Substation southwest of Kenhardt will connect to Nieuwehoop Substation and will potentially become highly visible features of the landscape.

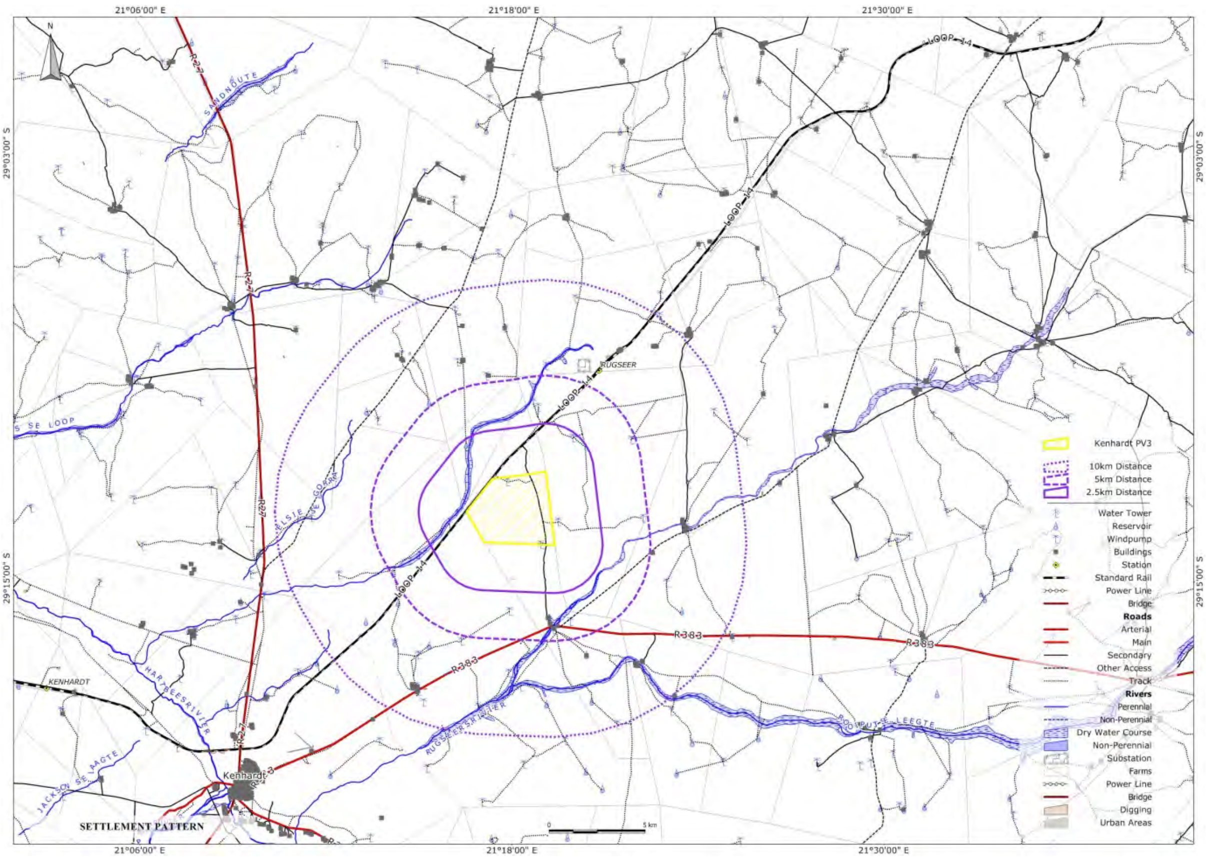


Figure 8.6: Prominent man-made structures and settlement patterns in the landscape.

The landscape surrounding the proposed site has a rural agricultural character. It is in a remote part of the country and is sparsely populated, but it has been transformed to some extent by extensive stock farming as well as by large scale infrastructure in the form of the Sishen-Saldanha ore railway line.

The topography and vegetation of the region is such that opportunities for screening the proposed development from public views are very limited. Changes in the layout of the PV plant are unlikely to reduce the visibility of the plant significantly. The Transnet road adjacent to the Sishen-Saldanha ore railway line will bring motorists into areas where they will be highly exposed to the proposed development (i.e. in close proximity to the PV plant). However, there are very few motorists using this road – it is a private road that belongs to Transnet but it is also used by farmers to access their properties.

In light of the above there are no specific areas on the proposed site that should be avoided in terms of visual considerations.

8.4 APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

The following legislation and local and district municipal plans are applicable to the proposed project:

- The National Environmental Management Act (NEMA) and the Regulations in terms of Chapter 5 of NEMA (Act 107 of 1998);
- The Protected Areas Act (PAA) (Act 57 of 2003, Section 17) which refers to the conservation and protection of natural landscapes;

- The Provincial Spatial Development Framework for the Northern Cape (Office of the Premier of the Northern Cape 2012) - The PSDF identifies a Solar Corridor where solar projects will be given priority – the Kenhardt PV 3 project does not fall within this corridor;
- ZF Mgcawu SDF (Siyanda DM 2012) – The Solar Corridor is seen as an initiative that "*should be pursued vigorously.*" The corridor follows the main routes from Prieska to Upington and further along the N10 although the SDF map on p.221 of the SDF the corridor is extended along the N14 west. There are also a number of solar energy projects outside these corridors. Proposal SB7 for Southern Bushmanland relates to solar projects: "*Sensitively place solar projects within the Solar Corridor with due regard to the visual impact of these facilities and the siting principles in Section 6.3.7.*" Siting principles address wind farms rather than solar plants;
- !Kheis Rural SDF (!Kheis Municipality 2014) – Natural scenic beauty of the municipality and production of solar energy are both seen as opportunities based on its existing bio-physical conditions. Tourism opportunities for this municipality potentially relevant to the proposed development include agricultural tourism, landscape tourism and game farms. Solar energy projects are suggested for the remote areas of the municipality although no indication is given where this should be (other than the Solar Corridor);
- Kai !Garib SDF (Kai !Garib Municipality 2012) – Kenhardt and its surrounding rural area is seen as an agricultural region with a scenic environment and important cultural heritage. Dust pollution is seen as a factor that "*must be taken into consideration with future developments.*" Solar projects are mainly located along the Orange River and within the Solar Corridor, but there are projects south-west of Kenhardt indicated on the resources map. This is presumably the Aries solar plant;
- Renewable Energy Development Zones (REDZ) (CSIR 2014) – The Kenhardt PV 3 project is located in REDZ 7 – Upington Solar which was identified by the Strategic Environmental Assessment (SEA) as a potential development zone for solar energy. Landscape and visual specialists were involved in the Scoping Assessments of the Focus Areas.

8.5 IDENTIFICATION OF KEY ISSUES

8.5.1 Key Issues Identified During the Scoping Phase

The potential visual issues identified during the Scoping Phase of this EIA Process include:

- Construction Phase: Visual intrusion of construction activities on existing views of sensitive visual receptors in the surrounding landscape.
- Construction Phase: Visual intrusion of a large area cleared of vegetation on the existing views of sensitive visual receptors;
- Construction Phase: Visual impact of night lighting during the construction phase on the nightscape of the region;
- Operational Phase: Landscape impact of introducing a large solar plant into a remote rural landscape;
- Operational Phase: Visual intrusion of a large solar field on the existing views of sensitive visual receptors;
- Operational Phase: Visual intrusion of tall, relatively large structures on the existing views of sensitive visual receptors; and
- Operational Phase: Visual impact of night lighting of the proposed development on the relatively dark rural nightscape.

The Scoping Report was released for a 30-day comment period which extended from 25 September 2015 to 27 October 2015. The Addendum to the Scoping Report was also released for a 30-day comment period, extending from 6 October 2015 to 5 November 2015. To date, no specific comments have been raised by I&APs that relate to visual impacts. However, the following comments relating to dust generation and potential glare from the PV panels were raised by Transnet Freight Rail on 19 August 2015:

The following immediate concerns are:

- *Possible glare from the solar panels which may influence the Train Drivers and staff travel on the TFR service road.*

It is important to note that the anticipated glare produced by the solar PV panels will not exceed the Standard Industry Norm generally accepted throughout South Africa. The glass used in the manufacture of PV panels is designed to maximize the absorption of light (to improve the energy efficiency of the panels) and minimize reflection and glare. PV panels are less reflective than water and it is therefore not anticipated to influence train drivers and users of the TFR Service Road. Many airports in Europe and the United States of America have installed solar fields on airport building roofs and glare has not been an issue for pilots using these airports.

8.5.2 Identification of Potential Impacts

Features at risk of impact in a VIA are the landscape and sensitive visual receptors in the landscape.

8.5.2.1 Landscape

A landscape impact occurs when a development alters the existing landscape character. If the landscape character is highly sensitive to the development type then the intensity of the impact will be high. A high intensity landscape impact, for instance, will be highly significant if the landscape character type is scarce as well as highly valued by the community (local, regional, national and international). The landscape impact does not depend only on the existing sensitive visual receptors since it can also affect future visual receptors and communities beyond the local or regional context.

As noted above, the existing landscape character of the surrounding region is rural-agricultural with large scale infrastructure such as the Sishen-Saldanha railway and the Eskom Nieuwehoop Substation. The remote sense of place has been severely impacted by the railway, Rugseer Siding and substation. As a result the landscape character has a low sensitivity to the proposed development.

8.5.2.2 Sensitive Visual Receptors

The viewshed map (Figure 8.7) shows that potentially affected sensitive visual receptors are mainly limited to farmsteads, dwellings and viewpoints on farms surrounding the proposed sites. Motorists using the R27 are unlikely to have views of the plant, and the settlement of Kenhardt is located outside the viewsheds. Approximately 6 km of the R383 (approximately 4.5 minutes at 80 km/h) will be within the viewshed. The section of road nearest to the proposed site and within the viewshed is approximately 4 km away. Motorists using the gravel road adjacent to the Sishen-Saldanha railway line will potentially be in the viewshed for 20 km and will pass within 100 m of the solar field (depending on the final layout of the development).

Sensitive visual receptors therefore include:

- Residents and viewpoints on farms surrounding the proposed sites; and
- Motorists using the Transnet Service Road adjacent to the Sishen-Saldanha railway line.

Residents on surrounding farms are highly sensitive to changes in their views since they have an active interest in the landscape. Viewpoints are unlikely to be valued for their scenic views (towards the proposed development) since the landscape has been affected by large structures such as the railway line and substation. Viewpoints on surrounding farms are therefore seen as moderately sensitive.

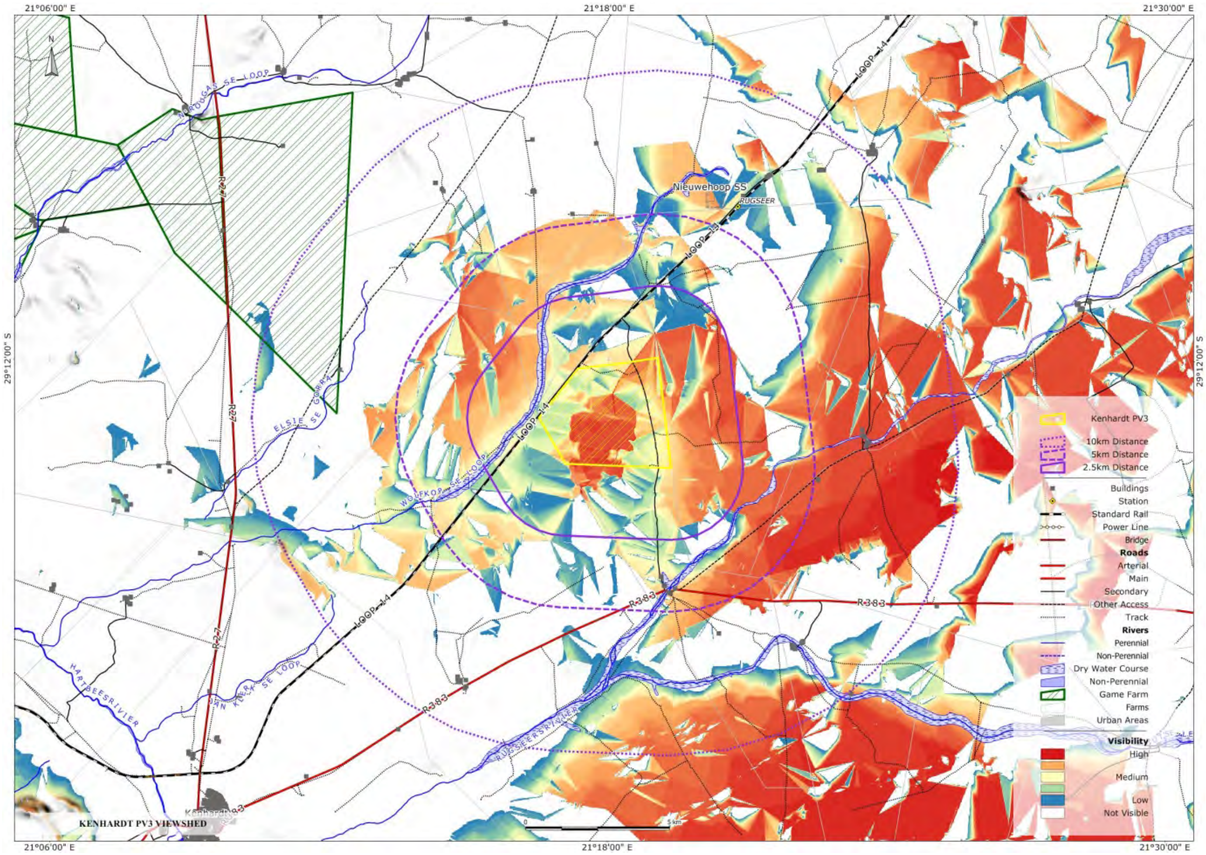


Figure 8.7: Viewshed of the proposed Kenhardt PV 3 facility.

Traffic on the R383 and Loop 14 (i.e. Transnet road adjacent to the Sishen-Saldanha railway line) are very limited and these roads are unlikely to be used often by tourists. Motorists will consist mostly of residents, Transnet employees and workers on farms along the routes. They will be focusing their attention on the road and are seen as low sensitivity visual receptors.

8.5.2.3 Potential Impacts Identified for the Construction Phase

- Potential visual intrusion of construction activities (discussed in Section 8.2.1) on existing views of sensitive visual receptors.

8.5.2.4 Potential Impacts Identified for the Operational Phase

- Potential landscape impact of a large solar energy facility on a rural agricultural landscape;
- Potential visual intrusion of the proposed solar energy facility on the views of sensitive visual receptors; and
- Potential impact of night lighting of a large solar energy facility on the nightscape of the region.

8.5.2.5 Potential Impacts Identified for the Decommissioning Phase

- Potential visual intrusion of decommissioning activities (discussed in Section 8.2.1 on views of sensitive visual receptors.

8.5.2.6 Potential Cumulative Impacts

- Cumulative impact of solar energy generation projects and large scale electrical infrastructure on the existing rural-agricultural landscape; and

- Cumulative visual impact of solar energy generation projects and large scale electrical infrastructure on existing views of sensitive visual receptors in the surrounding landscape.

8.6 VISUAL IMPACT CONCEPTS AND ASSESSMENT CRITERIA

The assessment of potential impacts for the proposed Kenhardt PV 3 project is conducted in the following steps:

- Identification of visual impact criteria (key theoretical concepts);
- Conducting a visibility analysis; and
- Assessment of impacts of the project on the landscape and on receptors (viewers) taking into consideration factors such as viewer sensitivity, visual exposure and visual intrusion.

Potential visual impacts are assessed using a number of criteria which provide the means to measure the intensity or consequence of the impacts. The intensity and other criteria such as spatial extent and duration of the impact are then used to determine its potential significance (Oberholzer, 2005). The visibility of the project is an indication of where in the region the development will potentially be visible from. The rating is based on viewshed area size and is an indication of how much of a region will potentially be visually affected by the development. A high visibility rating does not necessarily signify a high visual impact, although it can if the region is densely populated with sensitive visual receptors. Viewer (or visual receptor) sensitivity is a measure of how sensitive potential viewers of the development are to changes in their views. Visual receptors are identified by looking at the viewshed of the proposed development, and include scenic viewpoints, residents, motorists and recreational users of facilities within the viewshed. Their distance from the development (visual exposure) and the composition of their existing views (visual intrusion) will determine impact intensity/consequence.

8.6.1 Visibility Ratings

Visibility is the geographic area from which the proposed project will be visible, or view catchment area (Figure 8.7). The number of visual receptors in the viewshed has an influence on the visibility rating (Oberholzer, 2005).

- *High* - visible from a large area (e.g. several square kilometres).
- *Moderate* – visible from an intermediate area (e.g. several hectares).
- *Low* – visible from a small area around the project site.

The visibility of the proposed project is high in terms of the definition above since the viewshed area is approximately 55 km^2. The actual viewshed is likely to be similar to the calculated viewshed since existing vegetation in the region is low and will not affect the visibility of the development. However, there are only 20 buildings that will be affected (not all of which are residences) which indicate a low number of potentially affected visual receptors. Visibility for this project is therefore **low**.

8.6.2 Visual Exposure

Visual exposure refers to the relative visibility of a project or feature in the landscape and is related to the distance between the observer and the project (Oberholzer 2005). Exposure and visual impact tend to diminish exponentially with distance since the observed element comprises a smaller part of the view. Visual exposure is classified as follows:

- *High* – dominant or clearly noticeable;
- *Moderate* – recognisable to the viewer; and
- *Low* – not particularly noticeable to the viewer

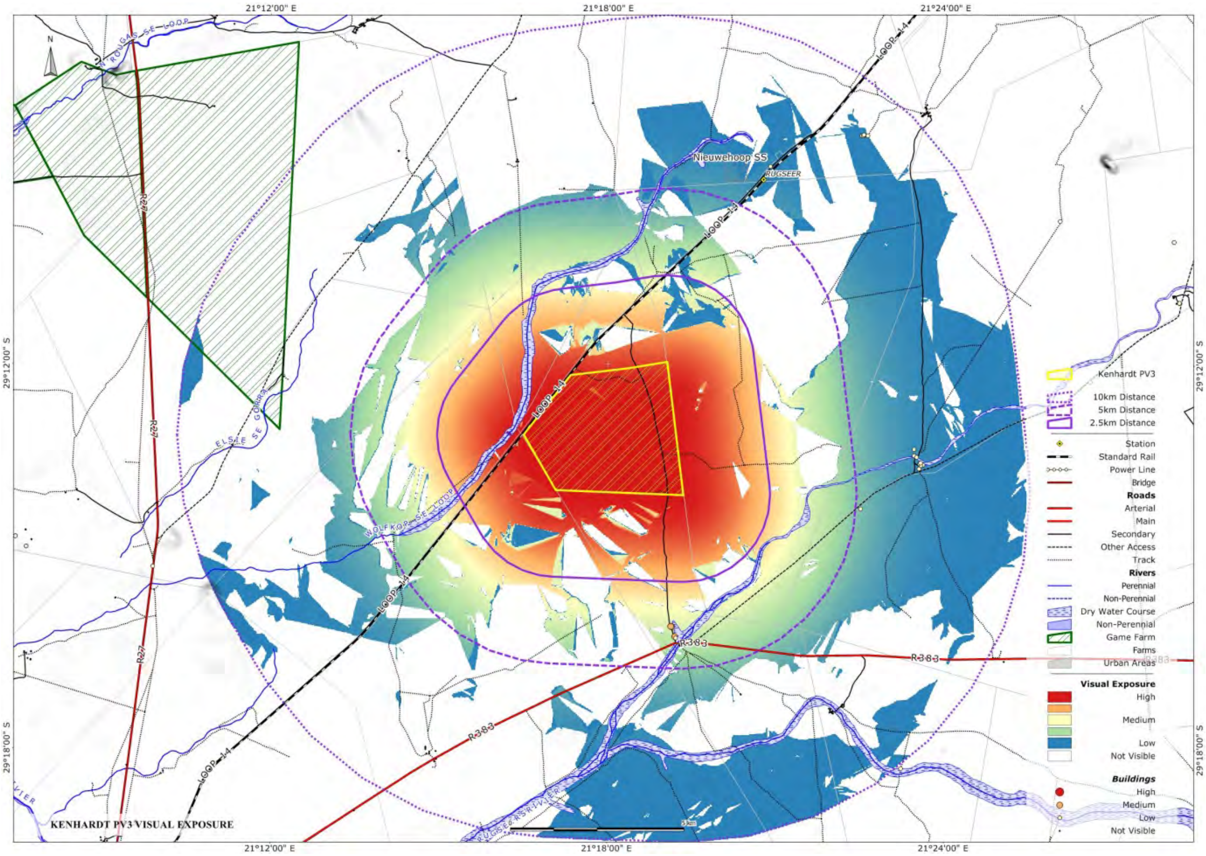


Figure 8.1: Visual exposure for sensitive visual receptors within 10 km of the development.

8.6.2.1 Residents and Viewpoints on Surrounding Farms

There are no buildings that will be highly or moderately exposed to the proposed development and most high visual exposure is limited to parts of the immediately surrounding farms (within 5 km of the development site) (Figure 8.8).

8.6.2.2 Motorists

The R383 is more than 5 km from the development site and motorists using this road will experience low visual exposure to the development when they are in the viewshed. A 10 km (approximately 8 minutes at 80 km/h) section of the Transnet road (Loop 14) will be highly exposed to the development.

8.6.3 Visual Intrusion

Visual intrusion indicates the level of compatibility or congruence of the project with the particular qualities of the area – its *sense of place*. This is related to the idea of context and maintaining the integrity of the landscape (Oberholzer, 2005). It can be ranked as follows:

- *High* – results in a noticeable change or is discordant with the surroundings;
- *Moderate* – partially fits into the surroundings, but is clearly noticeable; and
- *Low* – minimal change or blends in well with the surroundings.

8.6.3.1 Photographic Survey

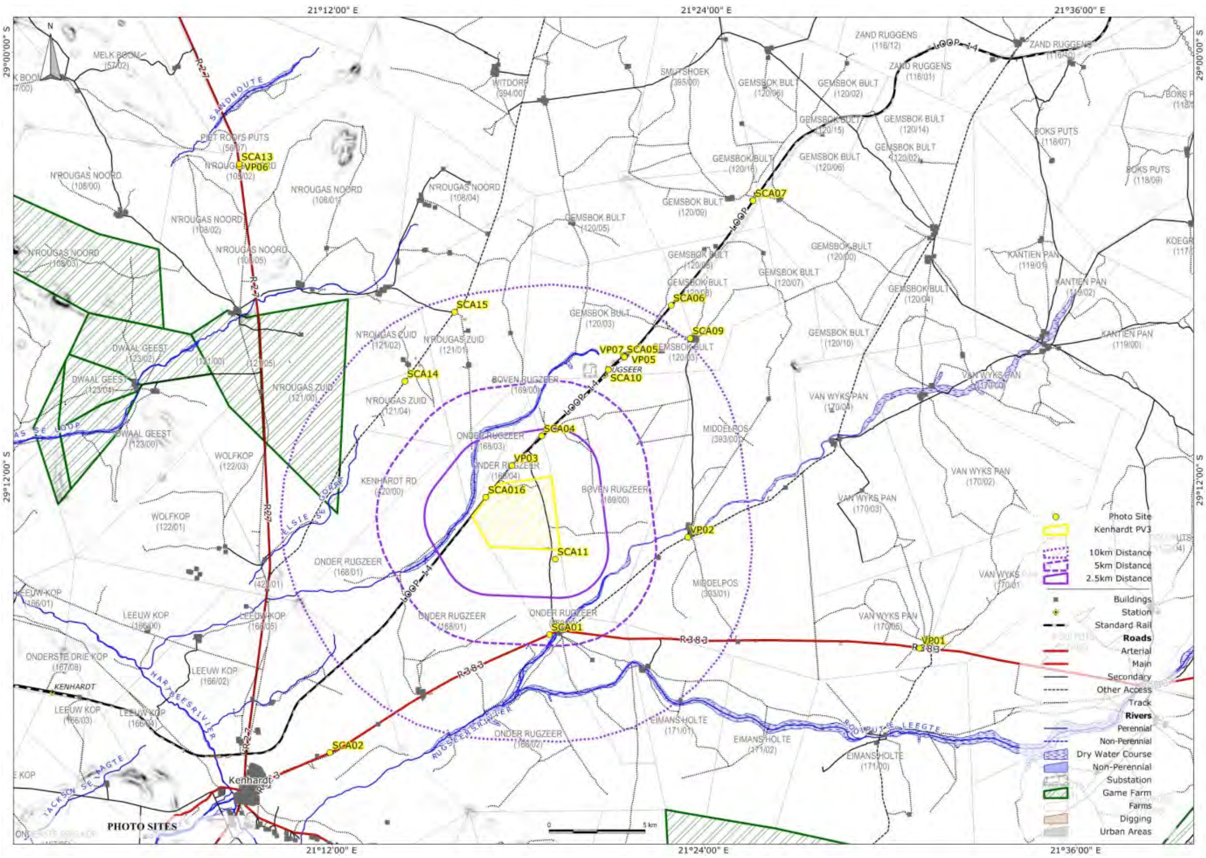


Figure 8.9: Sites visited during photographic survey (SCA - October 2015; VP - June 2014)

Sites from which landscape photographs were taken are shown in Figure 8.9. Sites with the prefix 'VP' refers to a photographic survey done in June 2014 for a different project in the same region, while 'SCA' refers to the survey done in October 2015 for this project. The discussion below refers to photograph sites on the map.

The landscape surrounding the proposed PV plant site is agricultural with sheep farming the predominant land use. As previously mentioned, it is not pristine wilderness and the natural landscape has been affected by grazing as well as a number of man-made structures not normally associated with agricultural landscapes. The proposed solar energy facility will be located adjacent to the Sishen-Saldanha railway line (Figure 8.10). The railway line is an enormous structure and several very long (up to 4 km) ore trains pass through the landscape daily. Rail wagons are 4 m high and locomotives up to 5 m (Figure 8.11). The siding at Rugseer is a relatively large structure and its tower is highly visible in the landscape (Figure 8.12 and Figure 8.13). The Eskom Nieuwehoop Substation is currently under construction. It is also a relatively large structure and is a prominent new element in the landscape (Figure 8.14).

Figure 8.2: View south from viewpoint SCA0163 across the Saldanha-Sishen railway line and the proposed Kenhardt PV 3 site.

Figure 8.3: Empty ore train (Photo site VP03)

Figure 8 12: The tower at the Rugseer Siding as seen from photo site SCA011.

Figure 8.4: View from photo site SCA014 eastwards. The tower at Rugseer Siding is visible on the left and the new substation more towards the centre.

Figure 8.5: Nieuwehoop Substation currently under construction (Photo site SCA010)

8.6.3.2 Residents and Viewpoints on Surrounding Farms

The proximity of the development to the railway line and the substation means that views towards the development are already impacted. The number of highly sensitive visual receptors that will potentially be affected by the facility is very low. They will experience **moderate** visual intrusion on existing views since even though the solar field will be noticeable (due to its size and the contrast in colour and texture) it will partially fit into the surrounding landscape (which already includes large and visible structures).

8.6.3.3 Motorists

Motorists using the R383 are unlikely to notice the development at the distances they will be from it when within its viewshed. Views from Loop 14 will experience **moderate** to **high** visual intrusion due to their proximity to the development and the size of the solar field. The change from agricultural land use to solar field will be highly noticeable at this distance.

Table 8.1: Visual Impact Criteria and Impact Intensity for the Kenhardt PV 3 project

Development Alternative	Sensitive Viewer	Criteria	Rating	Reasoning
Kenhardt PV 3	Residents and viewpoints on surrounding farms.	Visual Sensitivity	High	Residents are actively interested in their surrounding landscape and spend much of their time there.
		Visual Exposure	Low	There are no buildings in moderate or high visual exposure areas of the viewshed.
		Visual Intrusion	Moderate	Visual intrusion will be moderate for visual receptors on surrounding farms since the landscape is already transformed by existing structures, but the plant will be clearly noticeable.
		Impact Consequence	Substantial	Moderate visual intrusion for highly sensitive visual receptors, but low visual exposure.
	Motorists	Visual Sensitivity	Low	They pass through a landscape and their attention will not be focussed on the landscape.
		Visual Exposure	High	For motorists using the gravel road adjacent to the Sishen-Saldanha railway line (Loop 14).
		Visual Intrusion	Moderate	Motorists will potentially pass within 100 m of the solar field.
		Impact Consequence	Moderate	A few motorists will be highly exposed to the development but will experience low visual intrusion on their existing views.

8.7 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

8.7.1 Construction Phase: Potential Visual Intrusion of Construction Activities on Existing Views of Sensitive Visual Receptors

8.7.1.1 Significance Statement

The spatial extent of the impact will be **regiona**l since sensitive visual receptors within 10 km of the proposed development are likely to be affected. The consequence of the impact will be **substantial** since construction will introduce numerous activities and elements that are incongruent with the quiet rural nature of the region. The impact will be of **short to medium term duration** since construction should be possible in 14 months (the Kalkbult 75 MW plant was built in 9 months, however it is understood that the construction period is subject to the final requirements of Eskom and the REIPPPP Request for Proposal provisions at that point in time). The reversibility of the impact is rated as **moderate** since removing the impact will entail further (and similar) activities related to the removal of structures, soil stockpiles and vegetation heaps, and rehabilitation of areas cleared of vegetation. The irreplaceability of the visual resource is **low** since construction activities produce low quality visual resources. The impact status will be **negative** since construction is normally viewed as cluttered and untidy. The probability of the impact occurring is **very likely** since there are sensitive visual receptors that will be affected.

The significance of the impact is **moderate** since the impact is short to medium term and there are very few highly sensitive visual receptors that will be affected, but the consequence is substantial. Mitigation measures could reduce the consequence if it is possible to phase construction activities in such a way as not to disturb the whole solar field area in one phase.

8.7.1.2 Mitigation Measures

Assumptions regarding the management of construction activities are discussed in section 8.1.4.1. Mitigation measures in addition to the best practice guidelines are:

- Preparation of the solar field area (i.e. clearance of vegetation, grading, contouring and compacting) and solar field construction should be phased in a way that makes practical sense in order to minimise the area of soil exposed and duration of exposure;
- Parking areas should be demarcated and strictly controlled so that vehicles are limited to specific areas only;
- Night time construction should be avoided where possible; and
- Night lighting of the construction sites should be minimised within requirements of safety and efficiency.

The significance of the impact after mitigation will be **low** if mitigation measures are successfully implemented to lower the impact intensity/consequence.

8.7.2 Operational Phase: Potential Landscape Impact of a Large Solar Energy Facility on a Rural Agricultural Landscape

8.7.2.1 Significance Statement

The spatial extent of the impact will be **regional** since it will affect the surrounding landscape. The consequence of the impact will be **slight** since the landscape character is impacted by the Sishen-Saldanha railway line and is not a typical rural agricultural landscape of the region. The impact duration will be **long term** and will cease only once the proposed PV plant has been removed from the landscape. The reversibility of the potential impact is rated as **high** – the rural agricultural character will return unless rehabilitation is completely unsuccessful. The irreplaceability of the landscape character type is rated as **low** because it is a compromised landscape and other areas where the rural agricultural landscape is less altered exist in the region. The impact status will be **negative** since the rural sense of place of the region will change. The probability of the impact occurring is **very likely** since the change will be obvious and extensive (i.e. vegetation will be replaced with technologically complex structures).

The significance of the impact before mitigation is very low since the impact is long term and regional in nature but the consequence of the impact is slight.

8.7.3 Operational Phase: Potential Visual Intrusion of the Proposed Solar Energy Facility on the Views of Sensitive Visual Receptors

8.7.3.1 Significance Statement

The spatial extent of the impact will be **regiona**l since sensitive visual receptors within 10 km of the development are likely to be affected. The consequence of the impact will be **substantial** since very few highly sensitive visual receptors will potentially be affected. The impact will be of **long term** duration since it will only end once the project ends and the cleared area has been rehabilitated. The reversibility of the potential impact is rated as **medium** since a large area (250 ha) will be cleared of existing vegetation and rocks, and landscaped to accommodate the proposed solar field and ancillary structures. It is unlikely that this area can be completely rehabilitated to its pre-construction state and due to the aridity of the region; vegetation will take many years to recover. The visual resources of the region are already impacted by stock farming activities, the ore railway line passing through it and the Nieuwehoop Substation. The irreplaceability of the visual resources is therefore seen as **low**. The impact status will be **negative** since highly technological structures will replace natural vegetation and familiar landscape over a relatively large area. The probability of the impact occurring is **likely** since there are very few highly sensitive visual receptors that will be affected.

The significance of the impact before mitigation is **moderate** since very few sensitive visual receptors are likely to be affected by the development. Mitigation measures are aimed at reducing the consequence of the impact by reducing the incongruence of the structures with the surrounding landscape.

8.7.3.2 Mitigation Measures

Solar Arrays

- The project developer should maintain rehabilitated surfaces until a self-sustaining stand of vegetation is established and visually adapted to the undisturbed surrounding vegetation. No new disturbance should be created during operations without approval by the Environmental Officer;
- Restoration of disturbed land should commence as soon after disturbance as possible;
- Dust and noxious weed control should be part of maintenance activities;
- Road maintenance activities should avoid damaging or disturbing vegetation; and
- Painted features should be maintained and repainted when colour fades or paint flakes.

Buildings

- Appropriate coloured materials should be used for structures to blend in with the backdrop of the project where this is technically feasible and the colour or paint will not have a deleterious effect on the functionality of the structures;
- Appropriate colours for smooth surfaces often need to be two to three shades darker than the background colour to compensate for shadows that darken most textured natural surfaces;
- Materials, coatings and paints should be chosen based on minimal reflectivity where possible; and

- Grouped structures should be painted the same colour to reduce visual complexity and contrast.

The significance of the impact after mitigation is **low** since mitigation measures will reduce the consequence from substantial to moderate.

8.7.4 Operational Phase: Potential Impact of Night Lighting of a Large Solar Energy Facility on the Nightscape of the Region

8.7.4.1 Significance Statement

At the time of the photographic survey and site visit (October 2015) the lights at the new Nieuwehoop Substation were not yet operational and the nightscape was very dark, containing only a few lights – at the Rugseer siding as well as railway signal lights. Signal lights are bright and particularly noticeable when they flash. Once the substation lights are operational they will change the nightscape of the region significantly since substations are normally brightly lit. The lighting of the proposed PV plant will mostly be localised and not spread out over the solar field. The lights will not be dissimilar to security lights at farmsteads.

The spatial extent of the impact will be **local** since the lights should resemble lights at a farmstead. The consequence of the potential impact will be **slight** since very few sensitive receptors will be affected and the substation lights (once operational) will be far more prominent. The proposed solar facility lights will contribute little to light pollution. The impact will be of **long term** duration since it will only end once the project ends. The reversibility of the potential impact is rated as **high** since removal of the plant will remove all lights as well. The irreplaceability of the visual resources is seen as **low** since there are already similar lights in the nightscape and not many will be added. The impact status will be **negative** since the lights will reduce the dark nightscape further. The probability of the impact occurring is **likely** since there are sensitive visual receptors that will be affected.

The significance of the impact before mitigation is very **low** since very few sensitive visual receptors are likely to be affected by the development. Mitigation measures will contain the impact and minimise contribution to light pollution in a region known for its dark nightscapes.

8.7.4.2 Mitigation Measures

- A lighting plan that documents the design, layout and technology used for lighting purposes should be prepared, indicating how nightscape impacts will be minimised;
- The lighting plan should include a process for promptly addressing and mitigating complaints about potential lighting impacts;
- Lighting of the facility should not exceed, in number of lights and brightness, the minimum required for safety and security;
- Uplighting and glare (bright light) should be minimised using appropriate screening;
- Low-pressure sodium light sources should be used to reduce light pollution;
- Light fixtures should not spill light beyond the project boundary;
- Timer switches or motion detectors (within safety requirements) should be used to control lighting in areas that are not occupied continuously; and
- Lights should be switched off when not in use whenever it is in line with safety and security.

The significance of the impact after mitigation will remain very low.

8.7.5 Decommissioning Phase: Potential Visual Intrusion of Decommissioning Activities on Views of Sensitive Visual Receptors

8.7.5.1 Significance Statement

The spatial extent of the impact will be **regional** since sensitive visual receptors within 10 km of the development are likely to be affected. The consequence of the impact will be **substantial** since activities similar to those during the construction phase will intrude on the quiet rural nature of the region. The impact duration should be shorter than for the construction phase (i.e. **short-term**). The impact is that of visual intrusion of activities associated with the decommissioning of the PV plant and includes equipment, workers, laydown areas and exposure of soil after removal of structures. It also includes activities related to rehabilitation of cleared areas. High reversibility of this impact implies the halting of decommissioning activities, the removal of workers and equipment and the rebuilding of structures related to the PV plant, which means that construction activities will occur which causes a very similar impact to that of decommissioning activities. The convoluted nature of this argument indicates that reversibility probably does not have a clear meaning in this case. The reversibility is therefore rated as **low** since it seems that reversing the impact will not remove it. Irreplaceability of the visual resource is **low** since decommissioning activities do not result in visual resources of high quality. The impact status will be **negative** since this phase will be perceived as cluttered and untidy. The probability of the impact occurring is rated as **very likely** since there are sensitive visual receptors that will be affected.

The significance of the impact before mitigation is **moderate** since the impact is temporary and there are very few highly sensitive visual receptors that will be affected, but its consequence is substantial.

8.7.5.2 Mitigation Measures

- Disturbed and transformed areas should be contoured to approximate naturally occurring slopes to avoid lines and forms that will contrast with the existing landscapes;
- Stockpiled topsoil should be reapplied to disturbed areas and these areas should be re-vegetated using a mix of indigenous species in such a way that the areas will form as little contrast in form, line, colour and texture with the surrounding undisturbed landscape;
- Edges of re-vegetated areas should be feathered to reduce form and line contrasts with surrounding undisturbed landscape;
- Working at night should be avoided where possible; and
- Night lighting of reclamation sites should be minimised within requirements of safety and efficiency.

If decommissioning of the solar field and rehabilitation of the cleared area is phased in such a way that the exposed soil area is minimized then the consequence of the impact will be lowered to moderate and the significance of the impact will then be **low**.

8.7.6 Cumulative Impact of Solar Energy Generation Projects and Large Scale Electrical Infrastructure on the Existing Rural-Agricultural Landscape

8.7.6.1 Significance Statement

The introduction of a large railway line, siding and tower has changed the landscape character of the region by reducing its sense of remoteness. This is further changing with the addition of a large substation and a network of high-voltage power lines which are highly visible structures due to their height and linear extent. The substation and power lines are being constructed and therefore represent a definite change in landscape character. Several large solar energy facilities (Figure 8.15) are being proposed for the region immediately surrounding the proposed Kenhardt PV 3 project area (within 20 km of the site – see section 8.1.4.1, as well as Chapter 4 of the EIA Report). In the event that some of them are built, large areas of natural vegetation and stock farming land will be transformed into fields covered in thousands of solar panels. Solar fields will become a common feature of the landscape and the rural-agricultural landscape character will have a significant power generation component (as well as large scale electrical infrastructure). The cumulative change in landscape character from rural agricultural/electrical infrastructure to include a large power generation component will have only a **slight consequence** since the original character is not one of high quality and there are other landscapes in the surrounding region with higher quality. These do not include electrical infrastructure of this magnitude and are more representative of rural agriculture in an arid landscape.

The spatial extent of the cumulative impact is **regional** (within 20 km of the proposed Kenhardt PV 3 development). The duration of the impact is rated as **long term** since the cumulative impact will last for as long as the solar fields are in the landscape. The **status** of the impact is neutral since the overall change in landscape character will not affect a highly sensitive, scarce or highly valued landscape character and the probability of it occurring is **likely** since there are a number of large projects proposed for the area.

The significance of this cumulative impact on the landscape is rated as **very low** without the implementation of mitigation measures. Mitigation measures are not recommended in this regard.

8.7.7 Cumulative Visual Impact of Solar Energy Generation Projects and Large Scale Electrical Infrastructure on Existing Views of Sensitive Visual Receptors in the Surrounding Landscape

8.7.7.1 Significance Statement

The original visual resources of the region under assessment were represented by open, long distance views of arid landscape with low hills and sparse vegetation cover. There were limited opportunities for scenic vistas but the sense of place was remote wilderness. Subsequent stock farming practices have reduced the visual resources by impacting on the vegetation and wilderness. The railway line and associated infrastructure (including the new substation and electrical infrastructure), have further altered the sense of place of the region and reduced the opportunities for scenic views. The addition of several large fields of solar arrays (Figure 8.15) and associated electrical infrastructure will affect the existing visual resources but since the visual resources are not of high quality, very few sensitive visual receptors will be affected, and opportunities for scenic views are very limited the consequence of the cumulative visual impact is rated as **moderate**.

It should be noted that the projects currently proposed for the region are all in close proximity to the railway line and new substation (structures with high visibility and visual intrusion). Furthermore, very few highly sensitive visual receptors are likely to be affected even if all of them are eventually built, and at this point Kenhardt lies outside any of the viewsheds. Game farms are mostly outside of the viewsheds (or are further than 10 km from any of the projects indicating at most low visual exposure for areas in any viewsheds). The R27 is more than 10 km from any of the projects and only short sections of this road provide any potential views of solar plants for tourists using this road.

The spatial extent of the cumulative impact is **regional** (within 20 km of the proposed Kenhardt PV 3 development). The duration of the impact is rated as **long term** since the cumulative impact will last for as long as the solar field is in the landscape. The **status** of the impact is negative since the visual resources of the region are reduced, and the probability of it occurring is **likely** since there are highly sensitive visual receptors that will be affected.

The significance of the cumulative impact is rated as **low** without the implementation of mitigation measures. Mitigation measures are not recommended in this regard.

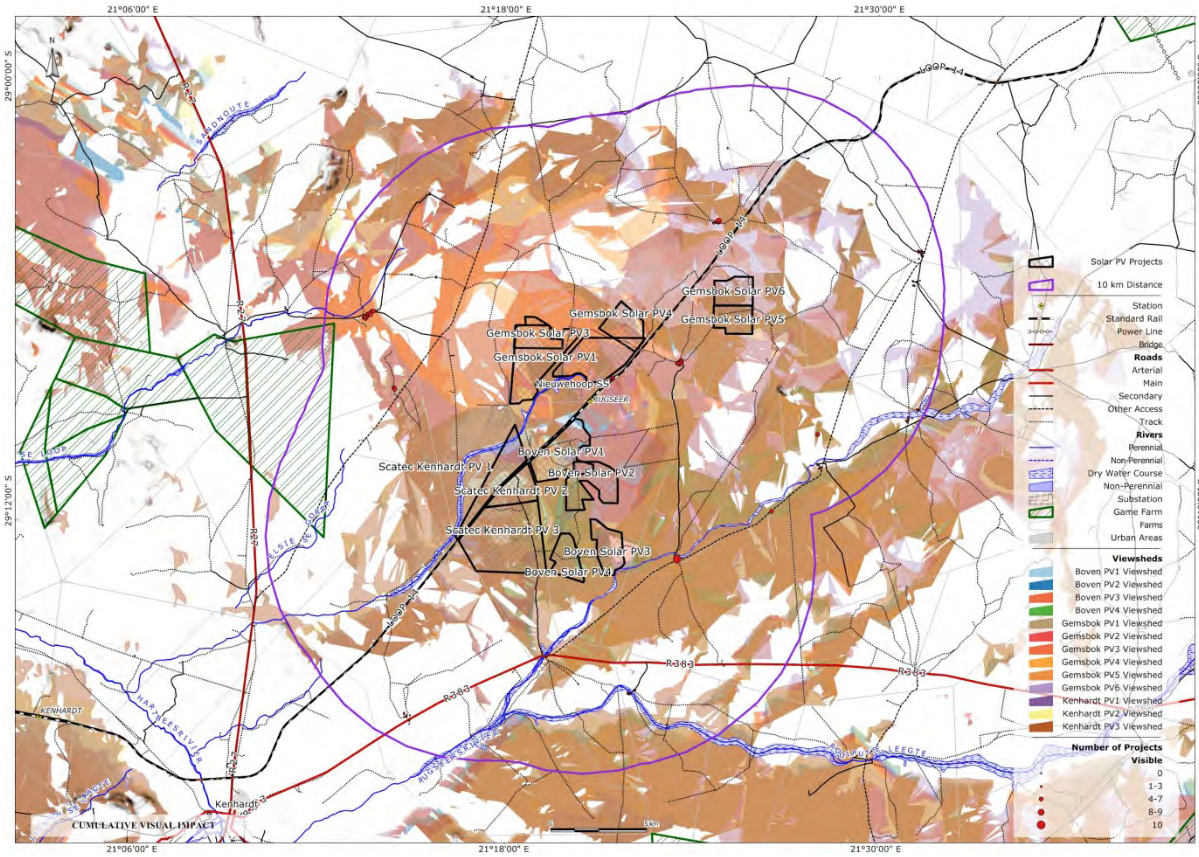


Figure 8.6: Map showing viewsheds for proposed solar energy projects in the region (where data was available). The map also provides an indication of the number of projects that may be visible from buildings within 10 km of a project (views may be of only small parts of a project).

8.8 IMPACT ASSESSMENT SUMMARY

Table 8.3: Impact assessment summary table for the Construction Phase

Construction Phase													
Direct Impacts													
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Duration	Consequence	Proba-bility	Reversibility of Impact	Irreplaceability	Potential Mitigation Measures	Significance of Impact and Risk		Ranking of Residual Impact/ Risk	Confidence Level
										Without Mitigation/ Management	With Mitigation/ Management (Residual Impact/ Risk)		
Visual intrusion of construction activities on existing views of sensitive visual receptors	Loss of visual resources	Negative	Regional	Short to Medium Term	Substantial	Very Likely	Moderate	Low	Phased clearing of the area for solar field in order to reduce the amount and duration of bare soil exposure.	Moderate	Low	4	High

Table 8.4: Impact assessment summary table for the Operational Phase

Operational Phase													
Direct Impacts													
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Duration	Conse-quence	Proba-bility	Reversibility of Impact	Irreplace-ability	Potential Mitigation Measures	Significance of Impact and Risk		Ranking of Residual Impact/ Risk	Confi-dence Level
										Without Mitigation/ Manage-ment	With Mitigation/ Management (Residual Impact/ Risk)		
Potential landscape impact of a large Solar Energy Facility on a rural agricultural landscape	Change of landscape character	Negative	Regional	Long Term	Slight	Very Likely	High	Low	None	Very Low	Very Low	5	High
Visual intrusion of a solar energy facility on views of sensitive visual receptors	Change in existing views of sensitive visual receptors.	Negative	Regional	Long Term	Substanti al	Likely	Medium	Low	Building facades and colours such that they blend in with the landscape background where technically feasible.	Moderate	Low	4	High
Impact of night lighting on the nightscape of the region	Light pollution in a dark nightscape.	Negative	Local	Long Term	Slight	Likely	High	Low	Lighting plan should be prepared which will minimise impacts on the nightscape	Very Low	Very Low	5	High

Table 8.5: Impact assessment summary table for the Decommissioning Phase

Decommissioning Phase													
Direct Impacts													
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Duration	Conse-quence	Probability	Reversibility of Impact	Irreplace-ability	Potential Mitigation Measures	Significance of Impact and Risk		Ranking of Residual Impact/ Risk	Confidence Level
										Without Mitigation/ Management	With Mitigation/ Management (Residual Impact/ Risk)		
Visual impact of decommissioning activities on existing views of sensitive visual receptors	Impact on visual resources.	Negative	Regional	Short Term	Substan-tial	Very Likely	Low	Low	Rehabilitation of areas cleared for solar field	Moderate	Low	4	High

Table 8.6: Cumulative impact assessment summary table

Cumulative Impacts													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Conse-quence**	**Proba-bility**	**Reversibility of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Cumulative impact on the landscape of the region.	Change in landscape character	Neutral	Regional	Long term	Slight	Likely	High	Low	None	Very Low	Very Low	5	High
Cumulative impact on sensitive visual receptors.	Visual intrusion	Negative	Regional	Long Term	Moderate	Likely	High	Low	None	Low	Low	4	High

8.9 INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME

8.9.1 Planning and Design

There are some mitigation measures that require input during the design and planning phase of the project in order to reduce visual intrusion of construction activities. These include plans to minimize fire hazards and dust generation, and rehabilitation plans for areas temporarily cleared for construction purposes. Phased clearing for construction of the solar field should be planned so that construction follows clearing as soon as possible in order to minimize the area of soil exposed and for a minimum duration. A lighting plan is required to minimize light pollution, light trespass and glare during construction, operational and decommissioning phases.

Design of buildings and structures should include appropriate colours to blend into the background landscape and materials, coatings and paints should be chosen based on minimal reflectivity. Grouped structures should be painted the same colours to reduce visual complexity and contrast. These measures exclude structures and buildings for which the choice of paint and colour may have a deleterious effect on the functionality of the building or structure (in other words, those structures for which the paint and colour are pre-determined for optimal functionality are excluded).

8.9.2 Construction Phase

Adherence to the erosion, dust, fire and light plans is necessary to minimise visual intrusion of construction activities and should be monitored regularly by the construction manager. Construction boundaries should be clearly demarcated and monitored, and good housekeeping on site should be maintained. Rehabilitation of temporary cleared areas should commence as soon as possible and the rehabilitation process should be regularly monitored by the Environmental Officer.

8.9.3 Operational Phase

A maintenance plan for buildings and structures should be followed to ensure that structures remain as non-reflective as possible, and buildings remain as unobtrusive as possible. Maintenance of access roads should not cause further disturbance and damage to the surrounding landscape.

8.9.4 Decommissioning Phase

The decommissioning phase of the project will potentially cause similar visual impacts as that during the construction phase and as such similar mitigation measures apply. The successful completion of this phase should leave the project site in a similar condition, visually, as before construction commenced. This can be accomplished by appropriate landscaping and revegetation of disturbed areas.

8.10 CONCLUSION AND RECOMMENDATIONS

The landscape surrounding the proposed site has a rural agricultural character which has been transformed by extensive stock farming and large scale infrastructure in the form of the Sishen-Saldanha ore railway line and the Eskom Nieuwehoop Substation.

The following sensitive visual receptors will potentially be affected by the introduction of a large PV plant into the landscape:

- Residents and viewpoints on farms surrounding the proposed development site. These are highly sensitive visual receptors since they have an active interest in their surrounding landscape; and
- Motorists using the R383 and the Transnet Service Road (Loop 14) adjacent to the ore railway line. Motorists are classified as low sensitivity visual receptors since they pass through the landscape and their attention is mostly focused on the road.

Visual intrusion on the existing views of highly sensitive visual receptors will be moderate since the development will be noticed but the quality of views is already compromised by large existing structures. The significance of the impact is moderate before mitigation and low if mitigation is successful. Mitigation measures should lower the consequence of the impact from substantial to moderate and the significance of the impact to low.

The impact of night lighting of the facility on the nightscape (during the operational phase) is likely to be negligible compared to that of the nearby substation if a lighting plan is prepared which minimises light spill onto adjacent properties and avoids glaring lights which may affect visual receptors in the surrounding landscape.

The significance of cumulative impacts on the surrounding landscape character is very low since the landscape is rapidly changing due to the introduction of large scale and highly visible rail and electrical infrastructure.

The significance of the cumulative visual impact on sensitive visual receptors is low due to the existing and new structures which have severely limited potential scenic views in the region.

The area proposed for this project falls within a renewable development zone (REDZ7 – Upington Solar) as identified in the national SEA for renewable energy developments and is therefore seen on a regional scale as an appropriate area for solar energy developments. On a local scale the visually disturbed landscape surrounding the Nieuwehoop Substation and the low number of highly sensitive visual receptors that will potentially be affected, makes this an ideal area to locate the proposed Kenhardt PV 3 solar energy facility. It is the opinion of the visual specialist that this project should therefore be authorised with adherence to mitigation measures as set out in this report.

The visibility analysis indicates that the significance of the potential visual impacts will not be influenced by the exact location within the surveyed area of the 250 ha required for the facility. The analysis was conducted using maximum heights for structures in order to simulate a worst case scenario.

It is not clear what an acceptable limit should be for the cumulative visual impact of solar energy projects in the region but visual specialists assessing future projects could look at the following aspects of the region to aid in decision making:

- Distance from the railway line since this is a major structure in the landscape which affects views as well as landscape quality;
- Distance from the Nieuwehoop Substation which similarly affects views and landscape quality;
- At the time of this assessment there were no high voltage transmission lines in the surrounding landscape, but at least one was already under construction just outside Kenhardt. Another set of transmission lines are planned from Upington. These lines will meet at the Nieuwehoop Substation and will affect the surrounding landscape and view qualities considerably.

- Kenhardt is currently outside all of the solar energy project viewsheds. Residents are not necessarily highly sensitive visual receptors, but the number of visual receptors that may be affected by a project will increase considerably if Kenhardt falls within a viewshed.
- There are game farms west of the currently proposed projects and south of the R383 but these are either outside any of the viewsheds or are more than 10 km from proposed projects (i.e. low visual exposure).
- The R27 is more than 10 km from any of the proposed projects and is mostly outside all viewsheds. The road is used by tourists travelling from Cape Town to visit tourist attractions along the Orange River and further north.

8.11 REFERENCES

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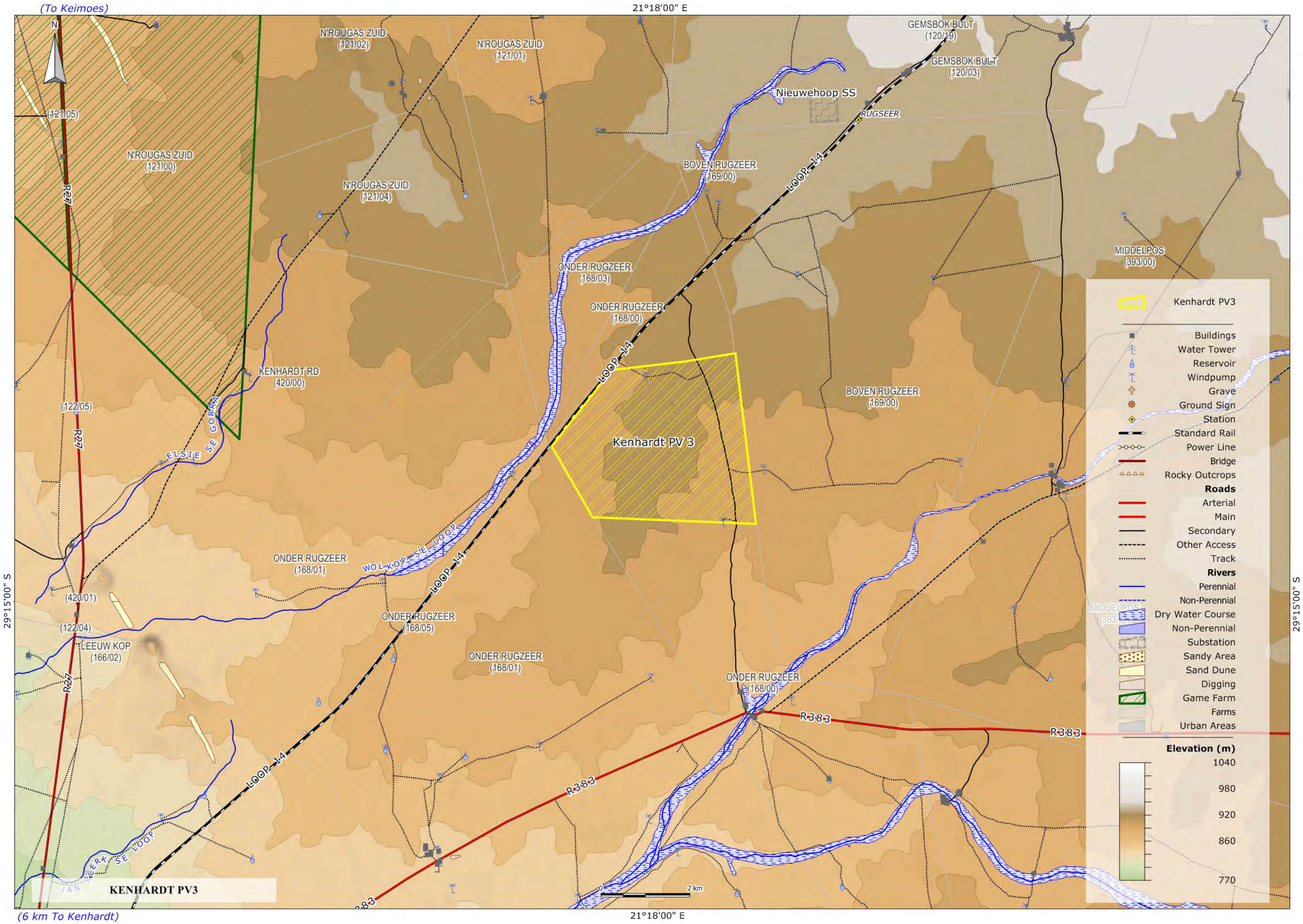
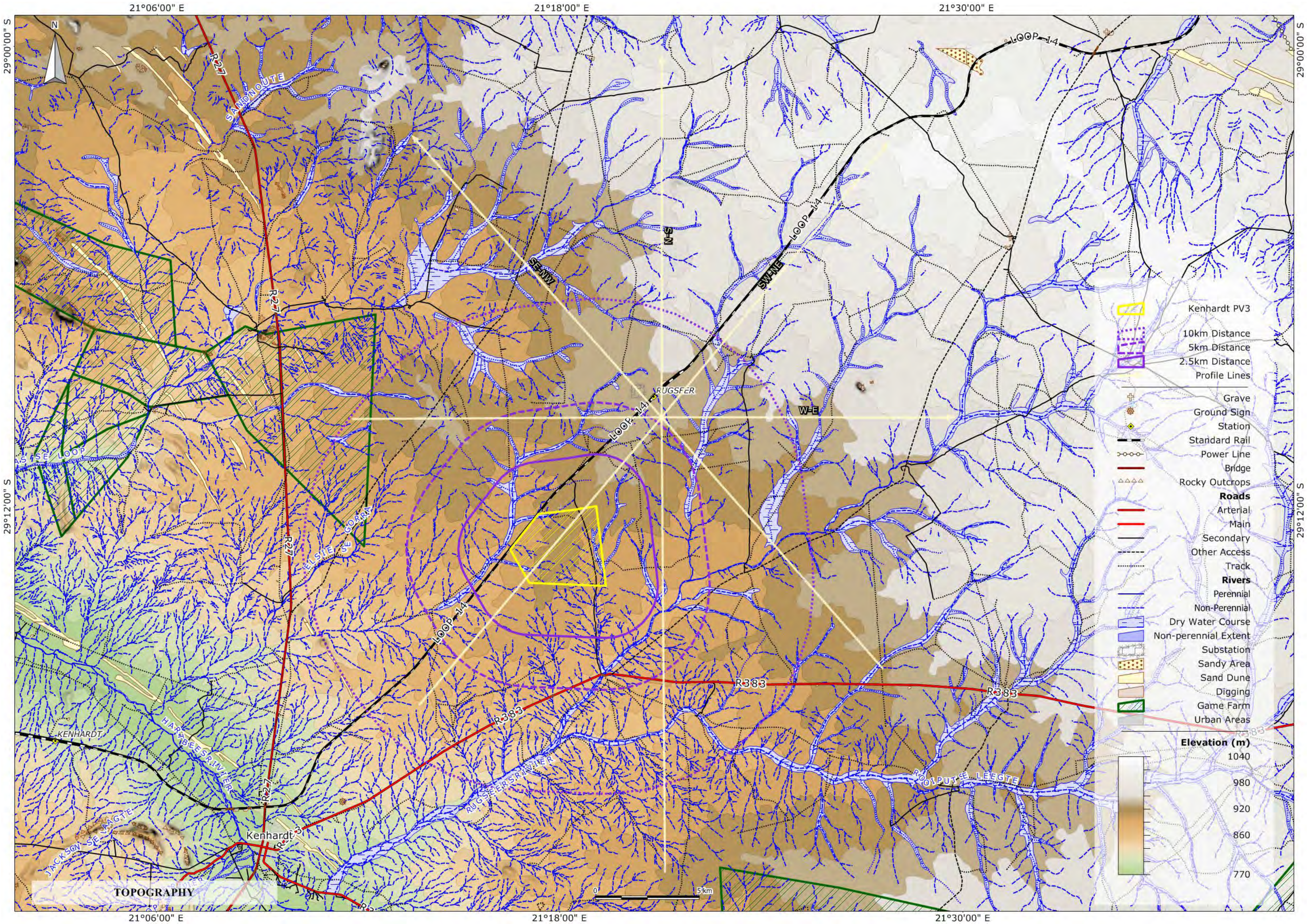
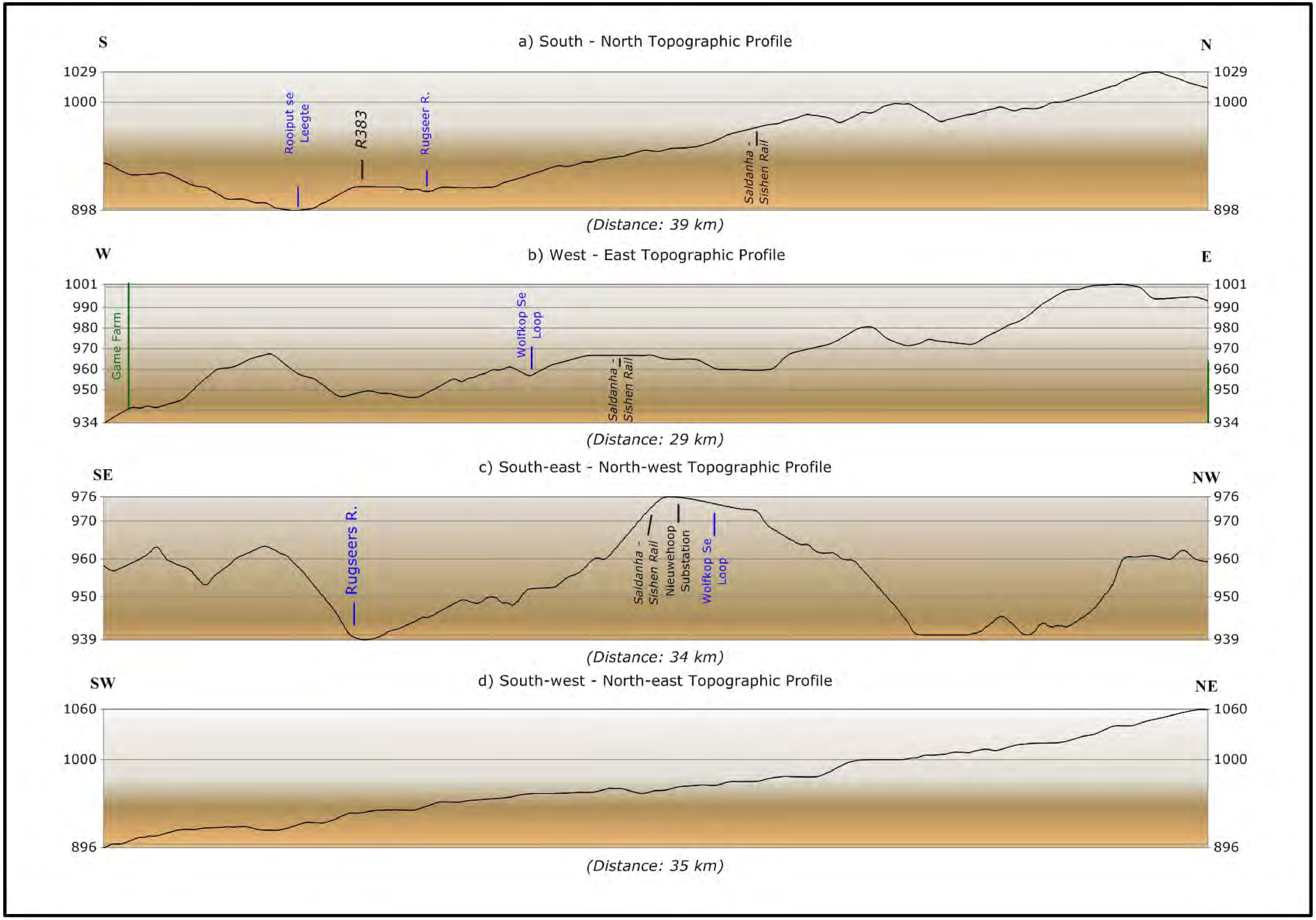
APPENDIX 8.A – MAPS IN A3 FORMAT



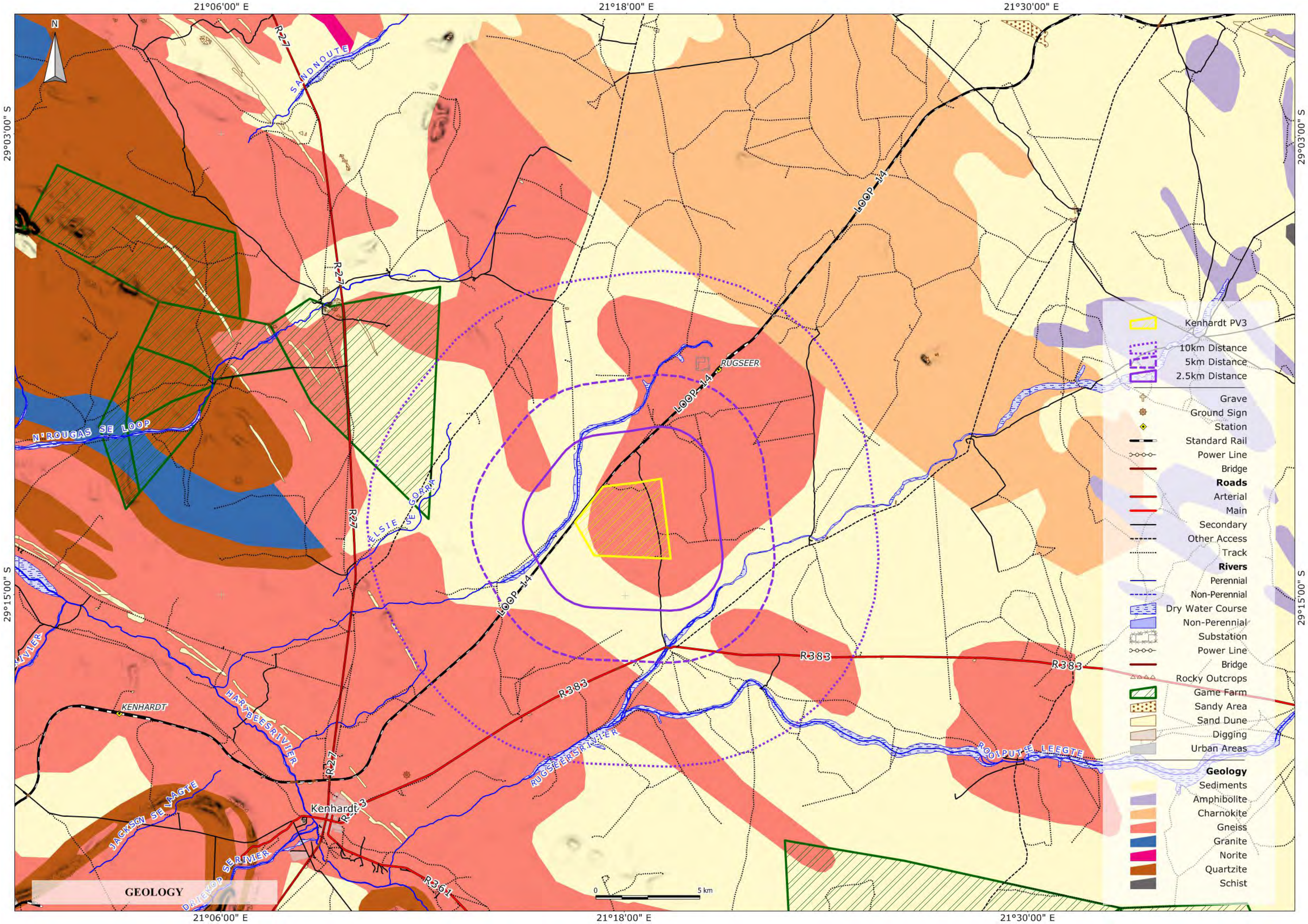
Map 1: Proposed Kenhardt PV 3 solar energy facility site.



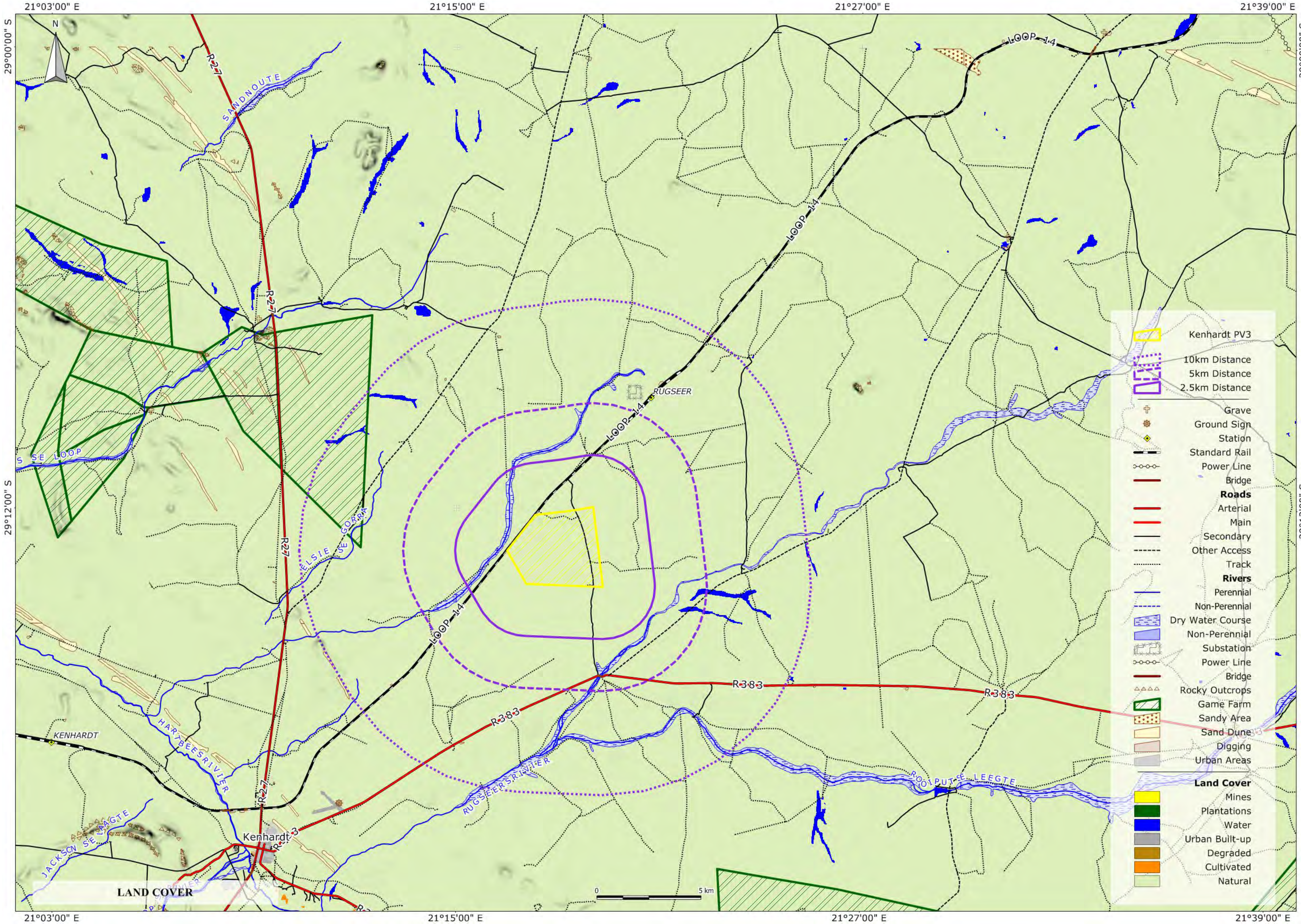
Map 2: Topographic map of the region.



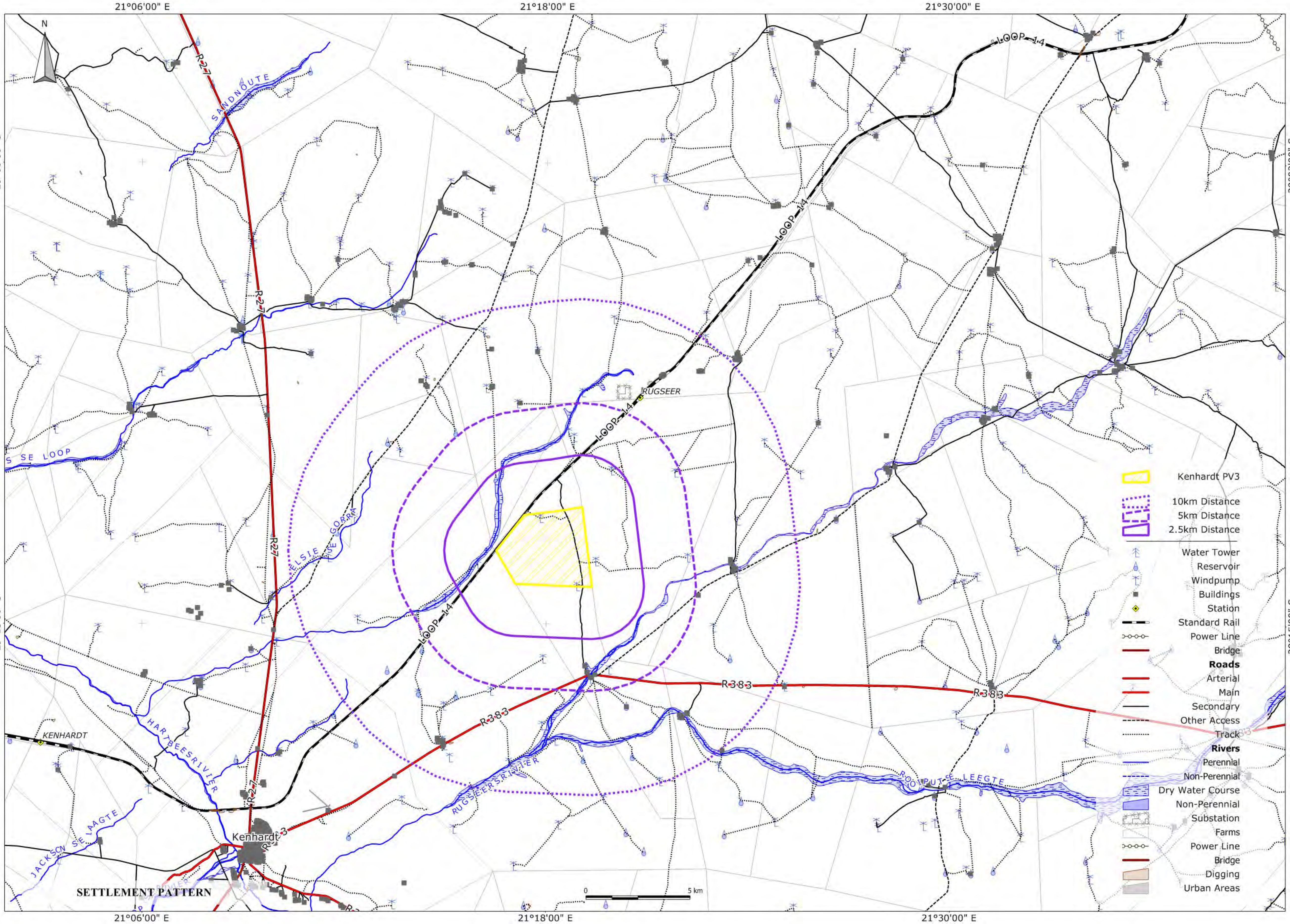
Map 3: a) South-North Topographic Profile, b) East-West Topographic Profile, c) South-east – North-west Topographic Profile, d) South-west – North-east Topographic Profile. Topographic profiles as indicated on the topographic map above.



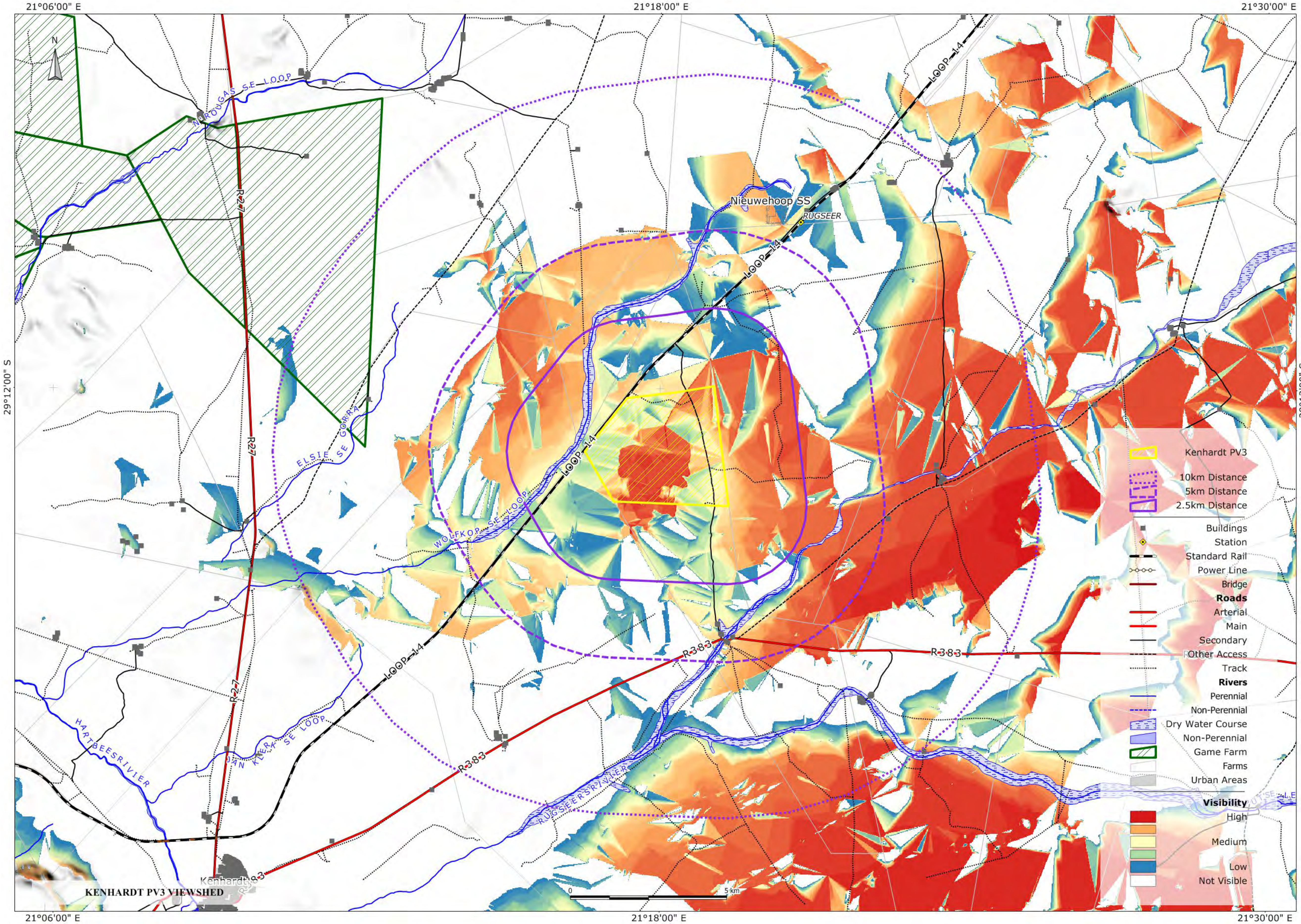
Map 4: Simplified geology of the region.



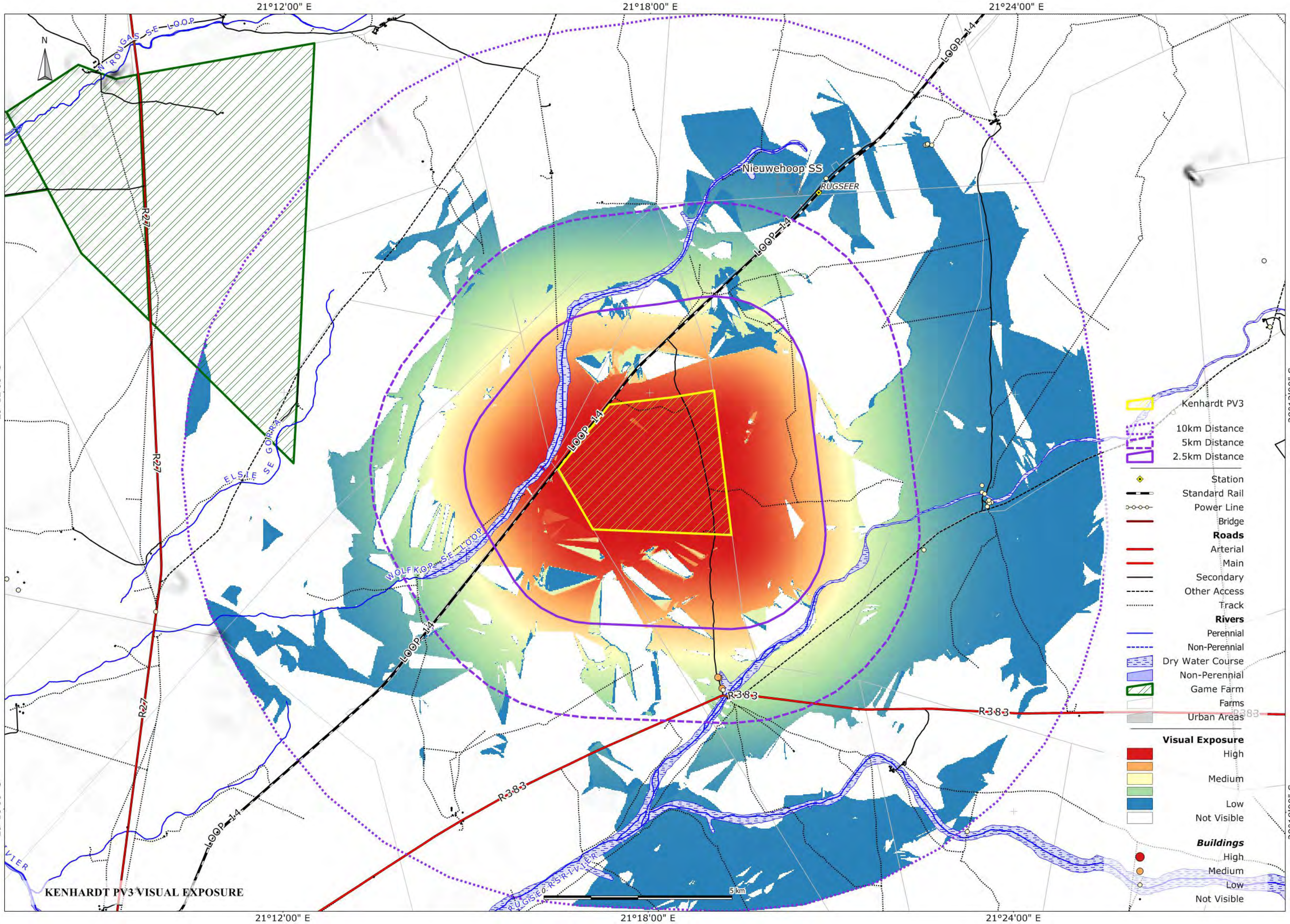
Map 5: Land cover map of the region.



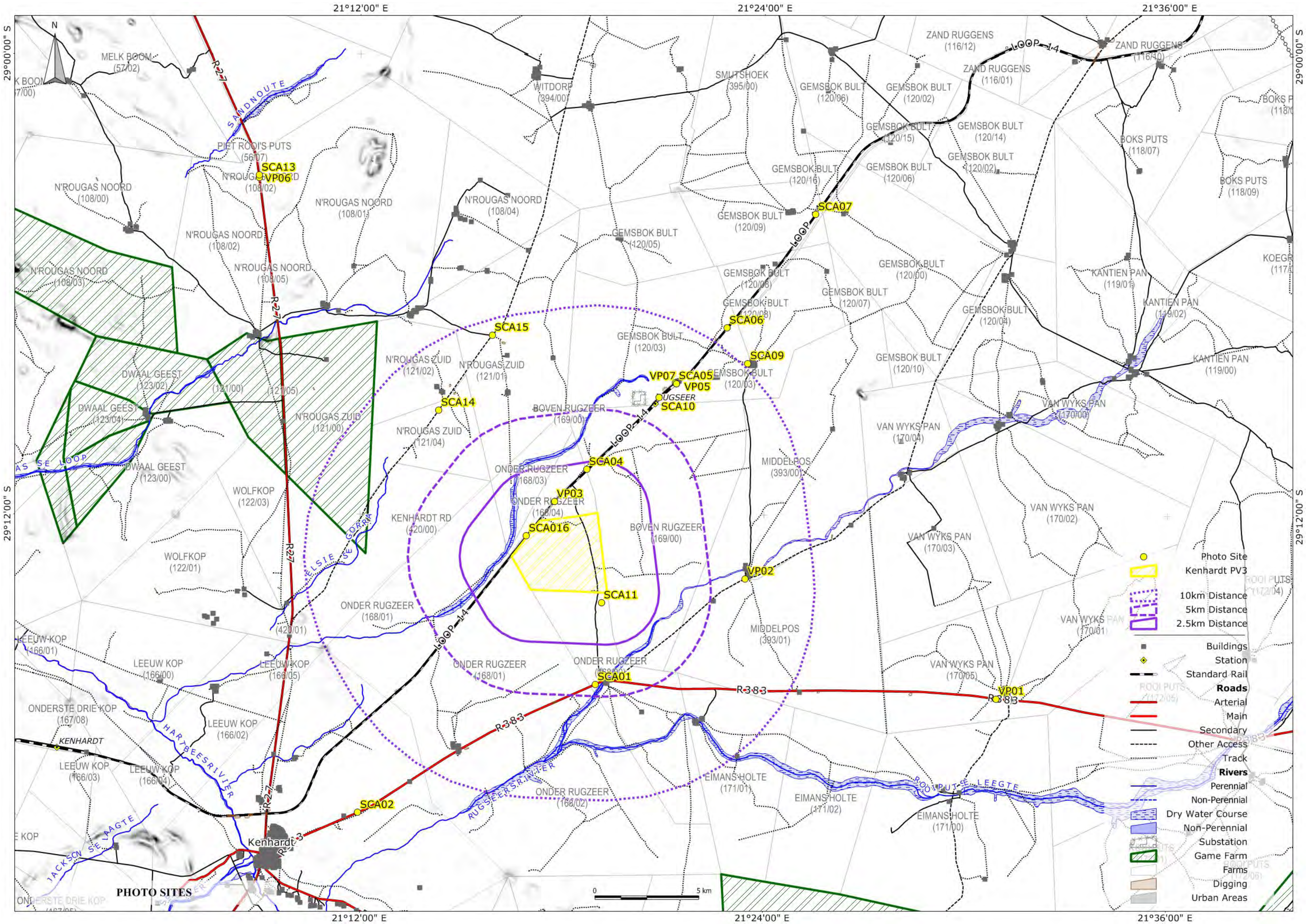
Map 6: Prominent man-made structures and settlement patterns in the landscape.



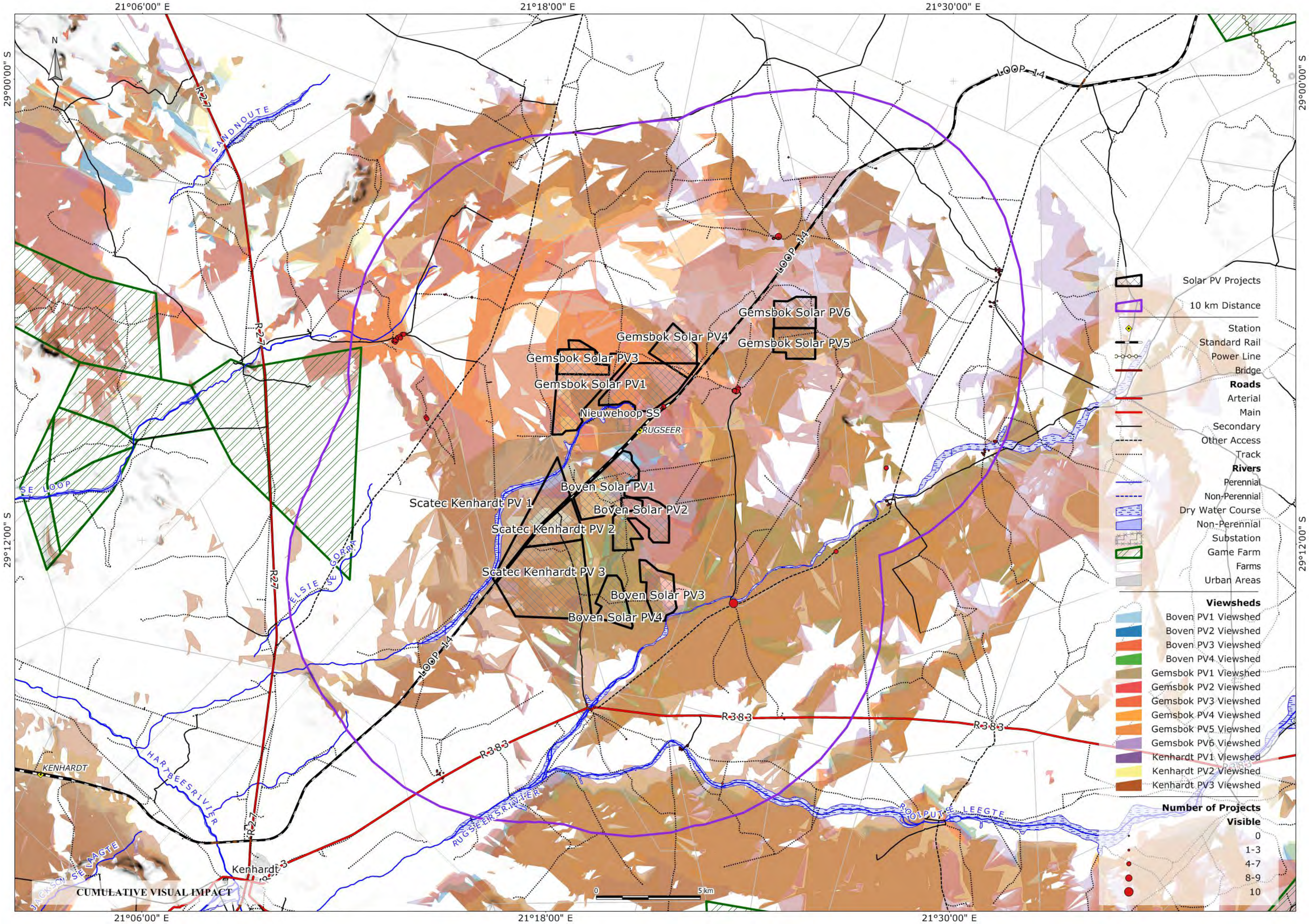
Map 7: Viewshed of the proposed Kenhardt PV 3 facility.



Map 8: Visual exposure for sensitive visual receptors within 10 km of the development.



Map 9: Sites visited during photographic survey (SCA - October 2015; VP - June 2014)



Map 10: Map showing viewsheds for proposed solar energy projects in the region (where data was available). The map also provides an indication of the number of projects that may be visible from buildings within 10 km of a project (views may be of only small parts of a project).

EIA REPORT

CHAPTER 9:

Heritage Impact Assessment (Archaeology and Cultural Landscape)

Scoping and **Environmental Impact Assessment** for the Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province

Report prepared for:

CSIR – Environmental Management Services
P O Box 17001
Congella, Durban, 4013
South Africa

Report prepared by:

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March 2016

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS

Requirements of Appendix 6 – GN R982	**Addressed in the Specialist Report**
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 9.1.4 and Appendix 9.1 of this chapter and Appendix A of the EIA Report
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Section 9.1.5 and Appendix 9.2 of this chapter and Appendix B of the EIA Report.
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 9.1.3
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 9.3.2
e) a description of the methodology adopted in preparing the report or carrying out the specialised process;	Section 9.3
f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;	Section 9.1.1
g) an identification of any areas to be avoided, including buffers;	Sections 9.7, 9.11 & 9.13
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figure 9.8
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 9.3.5
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	Sections 9.7 & 9.8
k) any mitigation measures for inclusion in the EMPr;	Sections 9.7, 9.8 & 9.9
l) any conditions for inclusion in the environmental authorisation;	Section 9.13
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 9.11
n) a reasoned opinion- i. as to whether the proposed activity or portions thereof should be authorised; and ii. if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Sections 9.12 & 9.13
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 9.3.6
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Section 9.3.6
q) any other information requested by the competent authority.	Not applicable

list of abbreviations

ASAPA	Association of Southern African Professional Archaeologists
CCS	Crypto-crystalline Silica
CRM	Cultural Resources Management
CSIR	Council for Scientific and Industrial Research
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
LSA	Later Stone Age
MSA	Middle Stone Age
NEMA	National Environmental Management Act (No. 107 of 1998)
NHRA	National Heritage Resources Act (No. 25) of 1999
PPP	Public Participation Process
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System

glossary

Definitions	
Background Scatter	Artefacts whose spatial position is conditioned more by natural forces than by human agency.
Early Stone Age	Period of the Stone Age extending approximately between 2 million and 200 000 years ago.
Hand-axe	A bifacially flaked, pointed stone tool type typical of the Early Stone Age.
Holocene	The geological period spanning the last approximately 10-12 000 years.
Hominin	a group consisting of modern humans, extinct species of humans and all their immediate ancestors.
Later Stone Age	Period of the Stone Age extending over the last approximately 20 000 years.
Middle Stone Age	Period of the Stone Age extending approximately between 200 000 and 20 000 years ago.
Scraper-adze	a stone tool with 30°-60° retouch on one end and steep retouch and/or damage along the lateral margins.

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9 HERITAGE IMPACT ASSESSMENT

Please note that this chapter (forming part of the EIA Report) is a reformatted version of the original, stand-alone Heritage Impact Assessment report which can be consulted online on the South African Heritage Resources Information System.

9.1 INTRODUCTION

ASHA Consulting (Pty) Ltd (ASHA) was appointed by the Council for Scientific and Industrial Research (CSIR) to conduct an assessment of the potential impacts to heritage resources that might occur through the proposed construction, operation and decommissioning of the 75 Megawatt (MW) Kenhardt PV 3 solar energy facility on the remainder of farm Onder Rugzeer 168 (Figure 9.1). A transmission line across the Remainder of Boven Rugzeer 169 and Portion 4 of Onder Rugzeer 168 will link the facility with the Eskom Nieuwehoop Substation presently under construction on Gemsbok Bult 120/3. As noted in Chapter 1 of the EIA Report, this power line will be assessed in a separate Basic Assessment process. This specialist study only assesses the potential impacts of the Kenhardt PV 3 project (in terms of the preferred site).

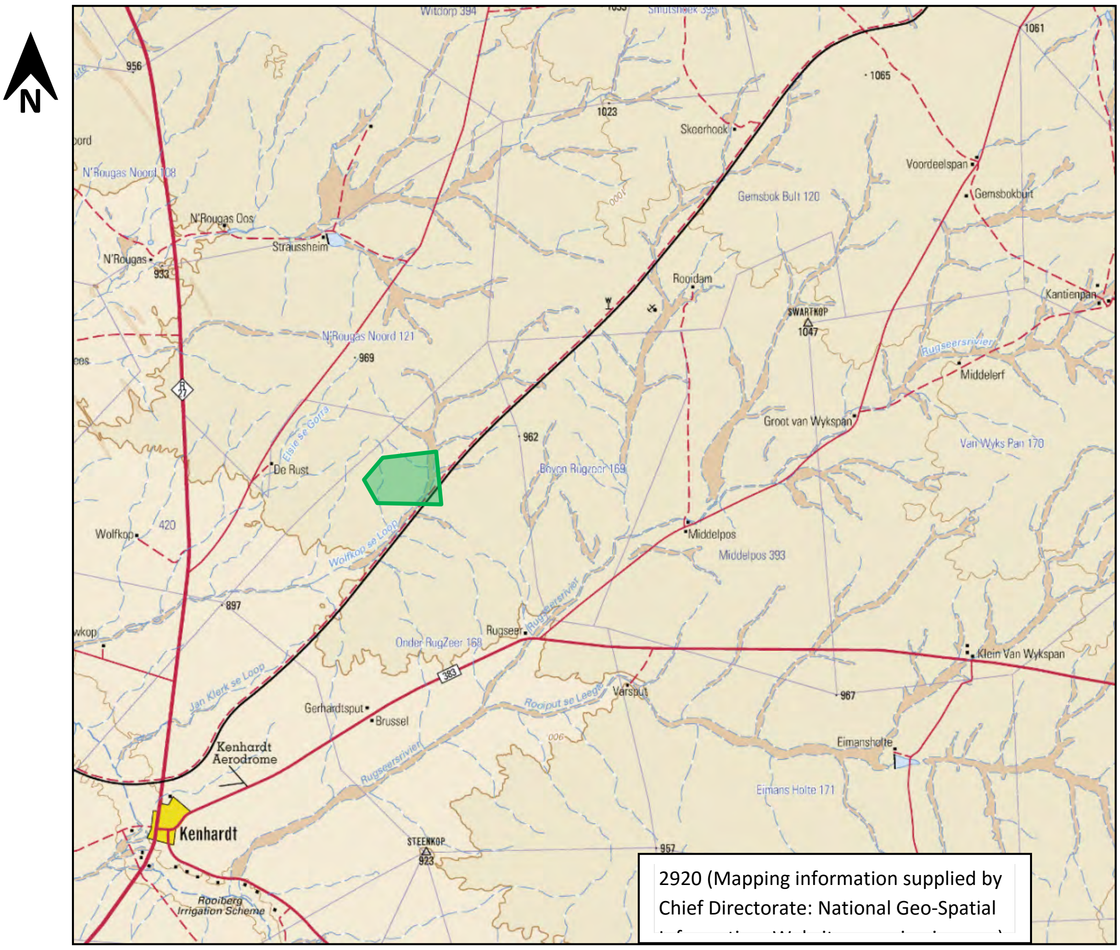

Figure 9.1: Map showing the location of the site (green polygon).

9.1.1 Project Description

This project, referred to as Kenhardt PV 3, is one of three proposed on the same land parcel (Figure 9.2). It will entail construction of the following main components:

- Solar arrays;
- Buildings (offices, operational and maintenance control centre, warehouse/workshop, ablution facilities and converter station);
- Electrical infrastructure (including a transmission line and substation);
- Access Road;
- Internal gravel roads;
- Fencing;
- Operation and maintenance area;
- Laydown area;
- Storm water channels; and
- Water pipelines, if required.

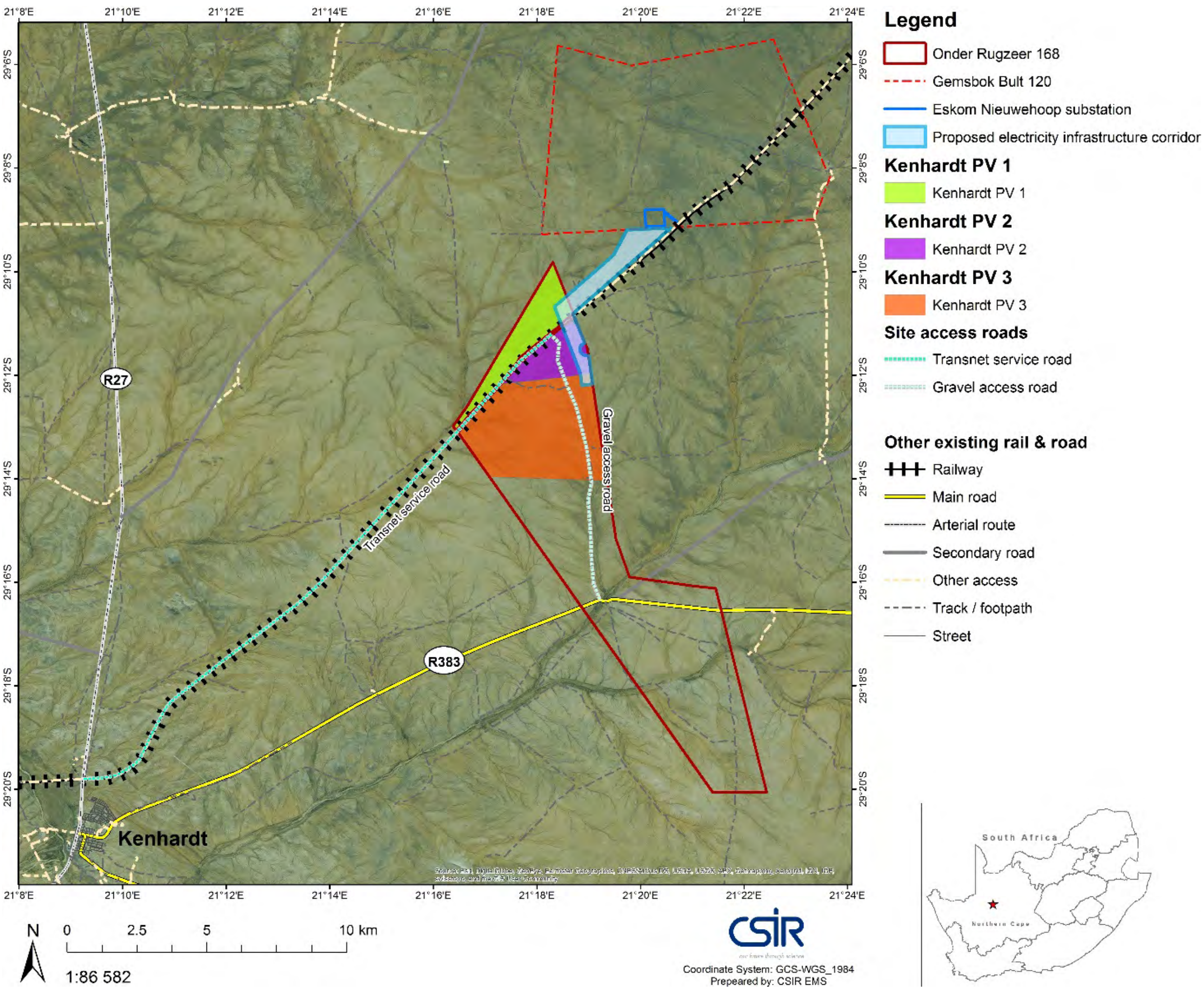

Figure 9.2: Map showing the location of the three proposed facilities. That assessed in the present report is shaded orange.

Although the study area is some 1340 ha in extent, the final constructed footprint of the facility will be approximately 250 ha. The developer will select the final layout area in such a way as to minimise impacts to the natural and cultural environment. A detailed project description is provided in Chapter 2 of the EIA Report.

A detailed description of the transmission line corridor is provided and assessed separately in the Basic Assessment for the Kenhardt PV 3 – Transmission Line project.

Any aspect of the development as proposed might have a negative impact on heritage resources and thus the entire project is relevant to the heritage assessment. Aspects that disturb the ground (e.g. foundations, roads, trenches) may affect archaeology, palaeontology and graves, while all superstructures (e.g. solar panels, buildings, fences) would introduce impacts to the cultural landscape.

9.1.2 Terms of Reference

ASHA was requested to conduct a field study and produce a Heritage Impact Assessment (HIA) that would meet the requirements of the heritage authorities.

During the Scoping Phase the South African Heritage Resources Agency (SAHRA) was notified of the proposed development. They responded requesting an impact assessment that examined archaeology, palaeontology and other aspects of heritage as relevant.

The HIA was based on the following broad Terms of Reference:

- Describe the affected environment and determine the status quo in terms of its heritage sites, heritage features and archaeology.
- Undertake a desktop study on the archaeology, cultural landscape and heritage sites within the proposed project area. Highlight any gaps in the baseline data.
- Based on the project description, define the environmental risks to the archaeology and heritage features.
- Undertake a detailed field examination of the archaeological sites and heritage features within or in the region of the development area. Record sites of archaeological relevance (photos, maps, aerial or satellite images, Global Positioning System (GPS) co-ordinates, and stratigraphic columns).
- Provide a sensitivity map indicating the presence of sensitive areas, "no-go" areas, setbacks/buffers, as well as the identification of red flags or risks associated with heritage and archaeological impacts.
- Evaluate the potential for occurrence of archaeological features within the study area.
- Identify relevant protocols, legal and permit requirements relating to heritage and archaeological impacts likely to be generated as a result of the proposed project.
- Identify and rate potential direct, indirect and cumulative impacts of the proposed project on the archaeological heritage during the construction, operational and decommissioning phases of the project.
- Comply with the requirements of the relevant heritage authority in order to obtain a letter of approval, in terms of the National Heritage Resources Act (Act 25 of 1999).
- Compile a report providing a review of heritage resources within the study area based on the desktop study and data from fieldwork and analysis.
- Provide input to the EMPr, including mitigation and monitoring requirements to ensure that the impacts on the archaeological features and heritage features are limited. Provide recommendations and suggest appropriate mitigation measures (if required), for the recording, sampling and dating of any archaeological sites that could potentially be destroyed as a result of the proposed project.

9.1.3 Scope and Purpose of the Report

An HIA is a means of identifying any significant heritage resources before development begins so that these can be managed in such a way as to allow the development to proceed (if appropriate) without undue impacts to the fragile heritage of South Africa. This HIA report aims to fulfil the requirements of the heritage authorities such that a comment can be issued for consideration by the National Department of Environmental Affairs (DEA) who will review the EIA and grant or withhold authorisation. The HIA report will outline any mitigation requirements that will need to be complied with from a heritage point of view and that should be included in the conditions of authorisation should this be granted.

9.1.4 The author

Dr Jayson Orton has an MA (UCT, 2004) and a D.Phil (Oxford, UK, 2013), both in archaeology, and has been conducting HIAs and archaeological specialist studies in the Western Cape and Northern Cape provinces of South Africa since 2004 (Please refer to the Curriculum Vitae included in Appendix 9.1 of this chapter, as well as Appendix A of the EIA Report). He has also conducted research on aspects of the Later Stone Age in these provinces and published widely on the topic. He is accredited with the Association of Southern African Professional Archaeologists (ASAPA) Cultural Resources Management (CRM) section (Member #233) as follows:

- Principal Investigator: Stone Age, Shell Middens & Grave Relocation; and
- Field Director: Colonial Period & Rock Art.

9.1.5 Declaration of Independence

The declaration of independence by the specialist is provided below with a full declaration included in Appendix 9.2 of this HIA Report chapter, as well as Appendix B of the EIA Report.

DECLARATION OF INDEPENDENCE

I, Dr Jayson Orton, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed Kenhardt PV 3 Project, application or appeal in respect of which I was appointed, other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.

JAYSON ORTON

9.2 HERITAGE LEGISLATION

The National Heritage Resources Act (NHRA) No. 25 of 1999 protects a variety of heritage resources as follows:

- Section 34: structures older than 60 years;
- Section 35: palaeontological, prehistoric and historical material (including ruins) more than 100 years old;
- Section 36: graves and human remains older than 60 years and located outside of a formal cemetery administered by a local authority; and
- Section 37: public monuments and memorials.

Following Section 2, the definitions applicable to the above protections are as follows:

- Structures: "any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith";
- Palaeontological material: "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";
- Archaeological material: a) "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"; b) "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"; c) "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 respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), 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"; and d) "features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found";
- Grave: "means a place of interment and includes the contents, headstone or other marker of such a place and any other structure on or associated with such place"; and
- Public monuments and memorials: "all monuments and memorials a) "erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organisation funded by or established in terms of the legislation of such a branch of government"; or b) "which were paid for by public subscription, government funds, or a public-spirited or military organisation, and are on land belonging to any private individual."

While landscapes with cultural significance do not have a dedicated section in the NHRA, they are protected under the definition of the National Estate (Section 3). Section 3(2)(c) and (d) list "historical settlements and townscapes" and "landscapes and natural features of cultural significance" as part of the National Estate. Furthermore, Section 3(3) describes the reasons a place or object may have cultural heritage value; some of these speak directly to cultural landscapes.

Section 38 (2a) states that if there is reason to believe that heritage resources will be affected then an impact assessment report must be submitted. This report fulfils that requirement.

Under the National Environmental Management Act (No. 107 of 1998; NEMA), as amended, the project is subject to an EIA. Ngwao-Boswa Ya Kapa Bokoni (Heritage Northern Cape; for built environment and cultural landscapes) and SAHRA (for archaeology and palaeontology) are required to provide comment on the proposed project in order to facilitate final decision making by the DEA.

9.3 METHODS

9.3.1 Literature Survey and Information Sources

A survey of available literature was carried out to assess the general heritage context into which the development would be set. This literature included published material, unpublished commercial reports and online material, including reports sourced from the South African Heritage Resources Information System (SAHRIS). The 1:250 000 map was sourced from the Chief Directorate: National Geo-Spatial Information.

9.3.2 Field Survey

The three Kenhardt PV projects and their alternative site locations were assessed together in the field on 28 to 31 October 2015. This was conducted during late Spring, although in this dry area seasonality has no effect on the visibility of heritage resources – visibility was excellent. The survey did not aim to be comprehensive – that would have taken many weeks – but rather sought to conduct a landscape survey where certain landscape features known to be more sensitive were located and searched. Nevertheless, transects through all areas of the site were carried out to ensure that consistent results were being obtained and that the survey methodology was reliable. During the survey the positions of finds were recorded on a hand-held GPS receiver set to the WGS84 datum. Photographs were taken at times in order to capture representative samples of both the affected heritage and the landscape setting of the proposed development.

The survey was conducted by the author in the company of Mr Matthew Shaw, an archaeology Masters student.

The Kenhardt PV 3 (preferred) site and Kenhardt PV 3b (alternative) site were surveyed however, as noted above, this specialist study only assesses the potential impacts related to the preferred site. Furthermore, the final layout of the proposed facility will only occupy 250 ha of this preferred site with the development area being chosen to avoid as many sensitive features as possible..

9.3.3 Impact Assessment

For consistency, the impact assessment was conducted through application of a scale supplied by the CSIR as shown in Chapter 4 of the EIA Report.

9.3.4 Grading

Section 7 of the NHRA provides for the grading of heritage resources into those of National (Grade 1), Provincial (Grade 2) and Local (Grade 3) significance. Grading is intended to allow for the identification of the appropriate level of management for any given heritage resource. Grade 1 and 2 resources are intended to be managed by the national and provincial heritage resources authorities, while Grade 3 resources would be managed by the relevant local planning authority. These bodies are responsible for grading, but anyone may make recommendations for grading.

It is intended that the various provincial authorities formulate a system for the further detailed grading of heritage resources of local significance but this is generally yet to happen. Heritage Western Cape (2012), however, uses a system in which resources of local significance are divided into Grade 3A, 3B and 3C. These approximately equate to high, medium and medium-low local significance, while sites of low or very low significance (and generally not requiring mitigation or other interventions) are referred to as ungradeable. For convenience, the Heritage Western Cape system is employed here.

9.3.5 Assumptions and Limitations

The study is carried out at the surface only and hence any completely buried archaeological sites will not be readily located. Similarly, it is not always possible to determine the depth of archaeological material visible at the surface. Given the nature of the surface geology, neither of these limitations are likely to have affected the outcome of the report.

With regards to cumulative impacts, various other solar energy facilities and electrical transmission lines have been proposed in the immediate area. A new substation is presently under construction and three solar energy facilities have received positive Environmental Authorisations, although it is unknown when/if they will be built. The full list of developments considered in the cumulative impact assessment is provided in Chapter 4 of the EIA Report.

9.3.6 Consultation Processes Undertaken

The NHRA requires consultation as part of an HIA but, since the present study falls within the context of an EIA which includes a public participation process (PPP), no dedicated consultation was undertaken as part of the HIA.

9.4 PHYSICAL ENVIRONMENTAL CONTEXT

9.4.1 Site Context

The PV 3 site is located in a remote area some 20 km northeast of Kenhardt. It is located to the south of the Sishen-Saldanha Railway Line and its gravel service road. Although major power lines are not currently present in the area, a large substation is currently under construction approximately 7 km to the northeast of the site – this is the Eskom Nieuwehoop Substation (Figure 9.3). Three other PV facilities have already been granted authorisation in close proximity to the substation setting a precedent for electrical development in the area. The land is otherwise generally undeveloped and used for small stock grazing. Farm tracks and fences criss-cross the general area and occasional wind pumps occur.

Figure 9.3: View towards the northeast (from the PV 1 site just north of the railway line) of the Nieuwehoop Substation currently under construction.

9.4.2 Site Description

The site is generally quite flat with occasional very low rocky outcrops. The vegetation is sparse and largely less than knee-high; trees are rare. The surface is coated mostly with fine gravel which is a product of the weathering bedrock. Very ephemeral stream beds cross the site, but these are generally only evident because of the elevated vegetation density and slightly larger bushes along their alignments. Because all three sites adjoin one another and were assessed together, the photographs in Figures 9.4 to 9.7 show examples of the landscape in the broader study area across the remainder of Onder Rugzeer 168.

Figure 9.4: View of an ephemeral stream bed with its slightly elevated vegetation density.

Figure 9.5: Example of overgrazed land with very sparse vegetation.

Figure 9.6: Example of gravel surface and one of the few trees in the study area.

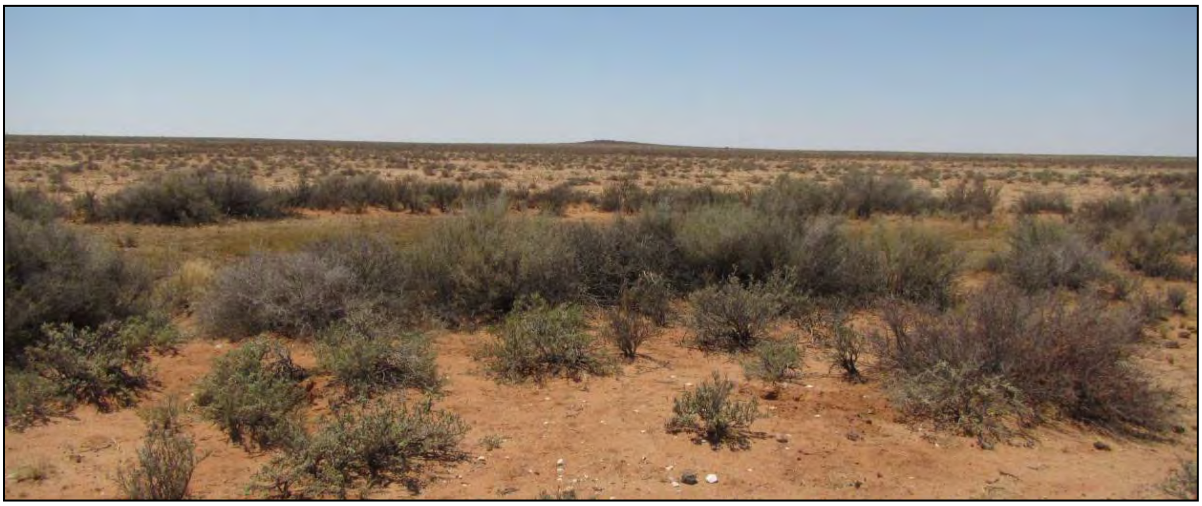

Figure 9.7: View of a small pan in the PV 2 section of the study area (which is assessed in the separate Kenhardt PV 2 report).

9.5 CULTURAL HERITAGE CONTEXT

This section of the HIA contains the desktop study and establishes what is already known about heritage resources in the vicinity of the study area. What was found during the field survey as presented below may then be compared with what is already known in order to gain an improved understanding of the significance of the newly reported resources.

9.5.1 Archaeological Aspects

Bushmanland is well known for the vast expanses of gravel that occur in places and which frequently contain stone artefacts in varying densities (Beaumont et. al 1995). Such material is referred to as 'background scatter' and is invariably of very limited significance. At times, however, the scatter can become very dense and mitigation work is occasionally called for. The artefacts located in these contexts are largely Early Stone Age (ESA) and Middle Stone Age (MSA) and are not associated with any other archaeological materials – these would have long since decomposed and disappeared. Previous experience immediately east of the present site suggests that such dense accumulations of artefacts are unlikely to occur in this area.

Of potentially more significance, however, are Later Stone Age (LSA) sites which are commonly located along the margins of water features in Bushmanland. These features include both pans and ephemeral drainage lines. Such sites were identified to the east of the present study area in association with pans but artefact scatters associated with drainage lines were rare (Orton 2014a, 2014b, 2014c). The drainage lines on the present site, however, are more prominent and perhaps more likely to reveal LSA camp sites. These sites would typically contain mostly stone artefacts, but fragments of ostrich eggshell (used as water containers and also as a food source) and pottery are also found at times, while bone is rare and likely confined to sites that are very recent. Similar LSA sites can also be found in association with rocky outcrops but none appear to occur within the present study area. Because of their positions along water courses and adjacent to rocky areas, such sites are often avoided by development proposals because of the need to avoid the relevant natural features. Despite the increased likelihood of locating archaeology along streams, Morris (2009) noted that a search along the banks of the Hartbees River close to Kenhardt, where he expected elevated frequencies of archaeological material, revealed virtually nothing.

Another kind of archaeological site fairly commonly encountered in Bushmanland is small rock outcrops that have been quarried as a source of stone material for making stone tools. Several such occurrences were noted to the east where quartz outcrops where frequently flaked (Orton 2014a; 2014b; 2014c).

Rock engravings are known from the broader area (Louw Roux Bushmanland 2013). From the limited information available, these appear to be naturalistic images produced by the Bushmen. Geometric images, produced by the Khoekhoen, are not well known from the area (Orton 2013), although David Morris (pers.

comm. 2015) has seen examples in the region. Painted art is also very rare but again, examples are known, particularly on large granite boulders.

9.5.2 Historical Aspects

The Anglo-Boer War was fought across the Northern Cape, but information on the role of Kenhardt appears difficult to locate. The town was occupied by the Boers in late February 1900 after they convinced the magistrate that they had a large gun and would fire on the town if it did not surrender. They later surrendered to the British who occupied the town on 31st March 1900. By mid-1900 there were perhaps 100 Cape Rebels detained in a camp outside of Kenhardt (Grobler 2004). The British raised a local force known as the Border Scouts in Upington in May 1900. Many were mixed-race individuals, some local farmers, others Kalahari hunters, but all disliked the Boers. The scouts were responsible for a large area of the north-western Cape Colony centred on Upington and Kenhardt. They eventually numbered 786 by January 1901 and were under the command of Major John Birbeck (AngloBoerWar.com 2015; Rodgers 2011). At the beginning of 1902 there were 150 Border Scouts stationed at Kenhardt. Two boers, H.L. Jacobs and A.C. Jooste, were accused of treason and executed in the town on 24 July 1901 (Grobler 2004). A memorial stands there to their honour (Green Kalahari n.d.).

No major action appears to have taken place around Kenhardt, although the Boers are known to have attacked a patrol on 17th May 1901, while the British attacked a Boer position on 25th June 1901 (AngloBoerWar.com 2015).

9.5.3 Built Environment

The built environment is sparsely represented in Bushmanland because the farms tend to be so large. The vast majority of structures appear to be quite recent in age (20^{th} century) and are of very limited heritage significance. In any case, the development will not affect any buildings.

9.5.4 Graves

Graves are also very rare. Some older farms may have small graveyards located close to their farm buildings but, again, these are highly unlikely to be included within the areas proposed for development. Unmarked pre-colonial graves can, in theory, be located anywhere, although they are generally more common in sandy areas where excavation of graves was easier and in more productive areas where population densities would have been higher. It is highly unlikely that pre-colonial graves would be encountered in the study area.

9.5.5 Other Aspects

The cultural and natural landscape is also of concern. However, the cultural landscape is very poorly developed in this area with fences, water troughs and wind pumps being the primary features. The natural landscape lacks visually interesting and sensitive features. In addition, the proposed site is a long distance from any important roads (it is 11 km from the R27) and is highly unlikely to be visible to anyone other than local residents making use of the gravel road along the railway line. Solar PV facilities are not very tall and, if an earthy coloured paint is used for the buildings, they can be almost invisible from as little as 1 km away.

9.6 IDENTIFICATION OF KEY ISSUES

9.6.1 Key Issues Identified During the Scoping Phase

Only one potentially significant heritage issue was identified during the Scoping Phase of this EIA Process. This was:

- The potential damage to or destruction of Stone Age archaeological sites occurring in proximity to water courses and pans.

The following comment was also received from SAHRA on 22 September 2015 (via SAHRIS) based on their review of the Background Information Document. It is important to note that only the points relating to Archaeology and Heritage aspects have been extracted from the SAHRA comment and reproduced below:

> *In terms of the National Heritage Resources Act, no 25 of 1999, heritage resources, including archaeological or palaeontological sites over 100 years old, graves older than 60 years, structures older than 60 years are protected. They may not be disturbed without a permit from the relevant heritage resources authority. This means that prior to development it is incumbent on the developer to ensure that a Heritage Impact Assessment is done. This must include the archaeological component (Phase 1) and any other applicable heritage components. Appropriate (Phase 2) mitigation, which involves recording, sampling and dating sites that are to be destroyed, must be done as required.*
>
> *The quickest process to follow for the archaeological component is to contract an accredited specialist (see the web site of the Association of Southern African Professional Archaeologists www.asapa.org.za) to provide a Phase 1 Archaeological Impact Assessment Report. This must be done before any large development takes place.*
>
> *The Phase 1 Impact Assessment Report will identify the archaeological sites and assess their significance. It should also make recommendations (as indicated in section 38) about the process to be followed. For example, there may need to be a mitigation phase (Phase 2) where the specialist will collect or excavate material and date the site. At the end of the process the heritage authority may give permission for destruction of the sites.*
>
> *Any other heritage resources that may be impacted such as built structures over 60 years old, sites of cultural significance associated with oral histories, burial grounds and graves, graves of victims of conflict, and cultural landscapes or viewscapes must also be assessed.*

The present HIA meets the requirements of SAHRA in that it aims to satisfy Section 38(3) of the NHRA, the author is an appropriately accredited CRM Section member of ASAPA and recommendations for further studies as may be required are presented.

9.6.2 Sensitivity of the site in relation to proposed activity

The site is sensitive for the many archaeological artefacts and sites on its surface that would be damaged or destroyed through construction related activities. These include site preparation and all works related to installation of the project components.

9.6.3 Identification of Potential Impacts

The potential impacts identified during the EIA Phase are:

9.6.3.1 Construction Phase

- Damage to or destruction of archaeological resources;
- Damage to or destruction of graves; and
- Impacts to the cultural and natural landscape.

9.6.3.2 Operational Phase

- Impacts to the cultural and natural landscape.

9.6.3.3 Decommissioning Phase

- Impacts to the cultural and natural landscape.

9.6.3.4 Cumulative Impacts

- Damage to or destruction of archaeological resources;
- Damage to or destruction of graves; and
- Impacts to the cultural and natural landscape.

9.7 FINDINGS OF THE HERITAGE STUDY

This section describes the heritage resources recorded in the study area during the course of the project. Besides the landscape itself, all are archaeological in nature and comprise largely of Stone Age remains. These are listed in Table 9.1 and mapped in Figure 9.8.

Table 9.1: List of archaeological resources found during the survey. Note that, even though the alternative site is not formally assessed here, the resources found are still listed for the record. Where the PV number appears in brackets this indicates that the resource is close to but not actually within the footprint area. A number of hours under mitigation is the suggested time required to carry out mitigation excavations.

PV	Waypoint	Co-ordinates	Description	Heritage Significance	Suggested Mitigation
3	208	S29 12 33.8 E21 17 15.8	Flaked quartz outcrop with a few artefacts around it.	Low	
3	210	S29 12 33.0 E21 18 49.6	Flaked quartz outcrop with a few artefacts around it.	Low	
3	212	S29 13 34.3 E21 18 54.4	Flaked quartz outcrop with a few artefacts around it.	Low	
3	213	S29 13 49.7 E21 18 56.0	Single quartzite hand-axe.	Low	
3	220	S29 12 51.8 E21 17 53.5	Half a bored stone. It was square in plan view and the hole is very skew through the stone. The intact side has been used as a hammer stone.	Low	
3	221	S29 12 51.7 E21 17 54.7	A single quartzite hand-axe with retouch on the butt end.	Low	
3	222	S29 12 50.0 E21 17 46.3	A single quartz hand-axe (very short, about 9 cm long).	Low	
3	223	S29 13 11.8 E21 17 24.1	Flaked quartz outcrop with a few artefacts around it. This is part of a larger quartz hill/ridge.	Low	
3	224	S29 13 11.5 E21 17 23.5	On the crest of the above quartz ridge there is a natural hollow of about 2.5 m by 1.5 m. Within this space is a pile of quartz blocks. In the sand and hyrax dung in the hollow there are a number of pieces of bottle glass, a shotgun cartridge, several ostrich eggshell fragments, two retouched cryptocrystalline silica (CCS) artefacts (a scraper and a miscellaneous retouched piece) and many quartz flakes. To the northeast, just below the quartz outcrop, there is a semi-circular 'clearing' amongst the quartz rocks and gravel but there did not appear to be artefacts in it.	Medium	Avoid with a buffer of at least 25 m or conduct archaeological excavations in the hollow to rescue artefacts and data. Test excavate and expand if necessary in 'clearing' and map whole site (schematic scale drawing) (4 hours)
3	225	S29 13 12.6 E21 17 19.7	LSA scatter of quartz, quartzite and ostrich eggshell in a sandy area between quartz gravel patches.	Low	
3	226	S29 13 40.6 E21 17 31.4	Flaked quartz outcrop with a few artefacts around it.	Low	
3	227	S29 13 44.6 E21 17 38.0	Massive quartz outcrop/hill standing at least 3 m above the surrounding land with a small shelter facing east-northeast. The floor has a number of glass fragments and a few quartz artefacts. There is also an area where the outcrop has been flaked.	Low	
3	228	S29 13 37.1 E21 17 34.0	Quartz artefacts scatter in sandy area alongside a river. One quartzite flake also seen.	Low	
3	229	S29 13 36.5 E21 17 33.5	A large scatter of quartz artefacts in a sandy area along a river. Nothing diagnostic seen but presumably it is LSA.	Medium	Avoid with a buffer of at least 25 m or conduct archaeological excavations to rescue artefacts and data (8 hours).

PV	Waypoint	Co-ordinates	Description	Heritage Significance	Suggested Mitigation
3	230	S29 13 43.1 E21 17 27.5	Quartz gravel patch with quartz artefacts in between.	Low	
3	231	S29 13 57.3 E21 17 09.1	Flaked quartz outcrop with a few artefacts around it.	Low	
3	738	S29 12 25.8 E21 17 09.6	Flaked quartz outcrop with a few artefacts around it.	Low	
3	739	S29 13 15.9 E21 16 44.5	Two loose 'mounds' of quartz in a sandy area but close to a quartz gravel patch. These may be graves.	High	Avoid with a buffer of at least 5 m or test excavate to check for human remains and then make a decision to avoid or exhume in line with required process.
3	740	S29 12 44.1 E21 17 20.8	Flaked quartz outcrop with a few artefacts around it.	Low	
3	741	S29 12 28.8 E21 17 26.0	Flaked quartz outcrop with a few artefacts around it.	Low	
3	743	S29 13 22.7 E21 18 49.4	Flaked quartz outcrop with a few artefacts around it.	Low	
3	744	S29 13 35.8 E21 19 05.5	Flaked quartz outcrop with a few artefacts around it.	Low	
3	747	S29 15 15.4 E21 19 18.1	A single quartzite hand-axe. Tip is broken but remaining length is 17 cm.	Low	
3	763	S29 12 32.8 E21 18 08.1	A mixed age scatter of MSA, LSA and historical material along the south side of a pan. It is too mixed to be of much value.	Low	
3	764	S29 12 32.6 E21 18 21.0	Adiagnostic scatter of quartz artefacts. Essentially a high density area of background scatter.	Low	
3	765	S29 13 37.6 E21 18 51.0	Flaked quartz outcrop with a few artefacts around it.	Low	
3B	745	S29 15 19.9 E21 19 08.8	Low density, widespread LSA scatter of quartz and ostrich eggshell fragments spread along the river bank.	Low	
3B	746	S29 15 16.4 E21 19 16.9	A set of about 8 to 11 small mounds of quartz at the edge of an area with much quartz gravel. It seems unlikely to be a graveyard, but yet is certainly not natural.	Unknown	Avoid with a buffer of at least 5 m or test excavation to check if any human remains are present then make a decision to avoid or exhume in line with required process.
3B	748	S29 14 50.3 E21 19 17.9	Cluster of quartz cobbles with a few artefacts in between.	Low	
3B	751	S29 15 15.4 E21 19 09.6	Small, but very dense scatter of ostrich eggshell fragments. One piece is definitely flaked and is quite likely a flask mouth fragment. Probably more than 100 pieces altogether.	Low	
3B	752	S29 15 16.5 E21 19 05.4	Fragment of glass that looks like it is from a case bottle. Although the glass does not look all that old, there are bubbles in the glass.	Low	
3B	753	S29 15 30.5 E21 19 04.6	Light LSA scatter of quartz and ostrich eggshell.	Low	
3B	754	S29 15 29.9 E21 19 08.2	LSA ostrich eggshell scatter with rare quartz artefacts present.	Low	
3B	755	S29 15 33.8 E21 19 11.5	Small cluster of about fifteen quartz rocks with a few pieces of ostrich eggshell.	Low	
3B	756	S29 15 38.8 E21 19 12.1	Scatter of adiagnostic quartz artefacts.	Low	
3B	757	S29 15 14.9 E21 18 53.5	Flaked quartz outcrop with four fragments of bottle glass present. Bottle base has a small nipple on it. Base has been flaked.	Low	
3B	758	S29 14 55.1 E21 18 46.1	Bedrock exposure in stream with a slightly elevated density scatter of quartz around it. A careful search revealed no grinding grooves.	Low	

PV	Waypoint	Co-ordinates	Description	Heritage Significance	Suggested Mitigation
(3)	234	S29 14 00.2 E21 17 37.2	Light LSA scatter of quartz, quartzite, CCS and silcrete located in the sandy outflow area of a pan (northwest side between the pan and the study area). Another site lies on the opposite side of the pan but is further from the study area.	Low-medium	Avoid with a buffer of at least 40 m from the centre of the pan or conduct archaeological excavations to rescue artefacts and data (4 hours).

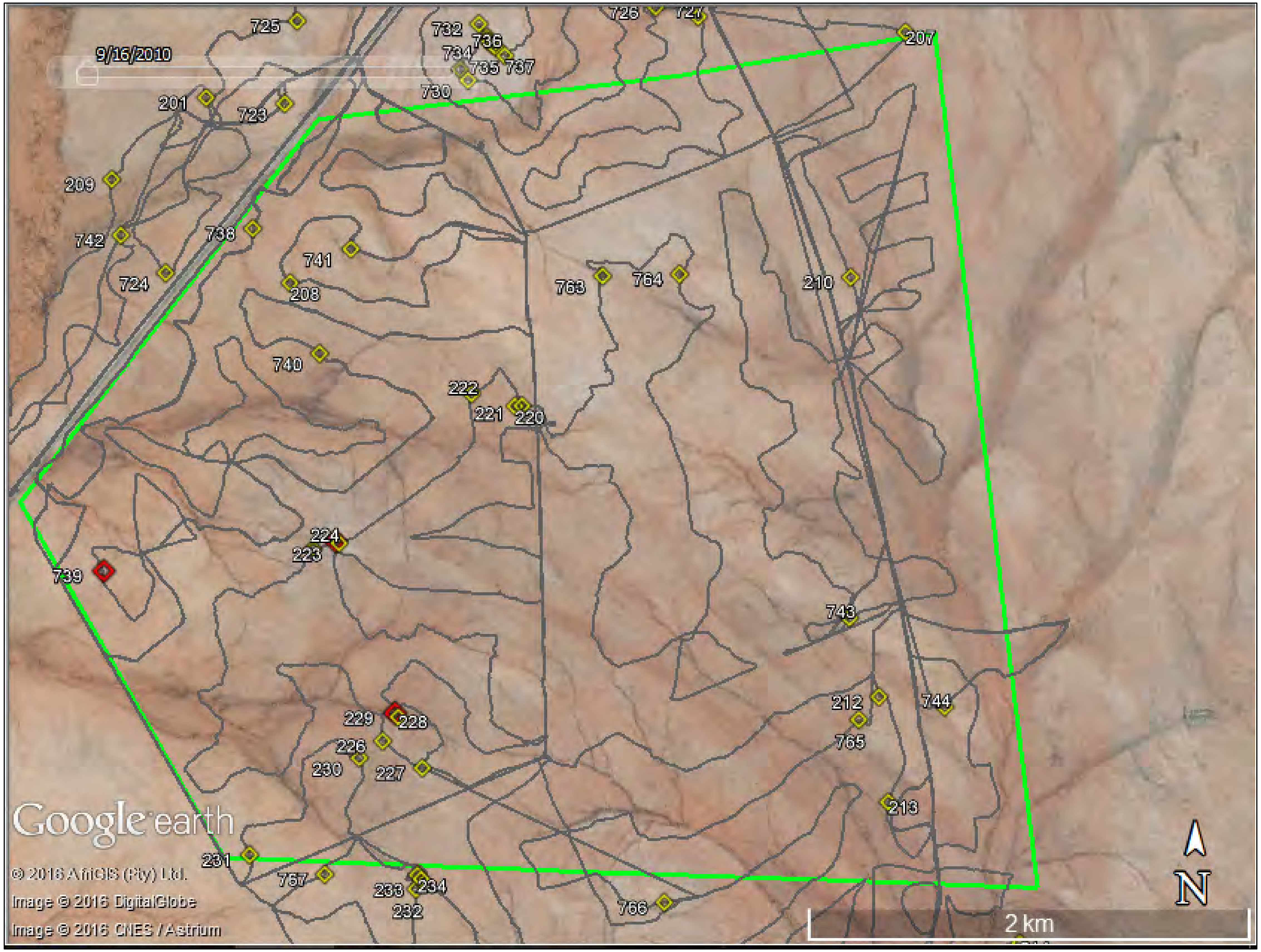

Figure 9.8: Aerial view of the study area (green) with waypoints (numbered symbols) and tracks (grey lines) indicated. The three significant heritage sites in PV 3 are highlighted in red. Waypoints and tracks to the north and south are within the PV 1, PV 2 and alternative site study area.

9.7.1 Archaeological Resources

Many archaeological resources were found in the study area. The most common type of archaeological site encountered was quartz quarries (Figures 9.9 and 9.10). These are natural outcrops of quartz that have been struck in order to remove flakes from them for use elsewhere. They generally have some artefacts scattered around them as well. They have little scientific value. Of more interest, however, are two other archaeological sites found in the study area. One was a large scatter of quartz artefacts located along the margin of an ephemeral water course (waypoint 229). Although the age was uncertain, the site is most likely LSA. The other site was located atop a quartz outcrop. Although a part of the outcrop had been used as a quarry site in the past (waypoint 223), this was not the important part. Further along the ridge there was a section of quartz that had a hollow of about 1.5 m by 2.5 m in it (waypoint 224; Figure 9.9). Within this hollow a cairn of quartz blocks had been built, but this cairn is assumed to be recent (Figure 9.10). Also within the hollow were noted a number of artefacts of quartz and CCS as well as several ostrich eggshell fragments, some glass and a shotgun cartridge. On the north-eastern side of the outcrop there was a small area that appeared to have been cleared of rocks (Figure 9.11) but no artefacts were found within this area.

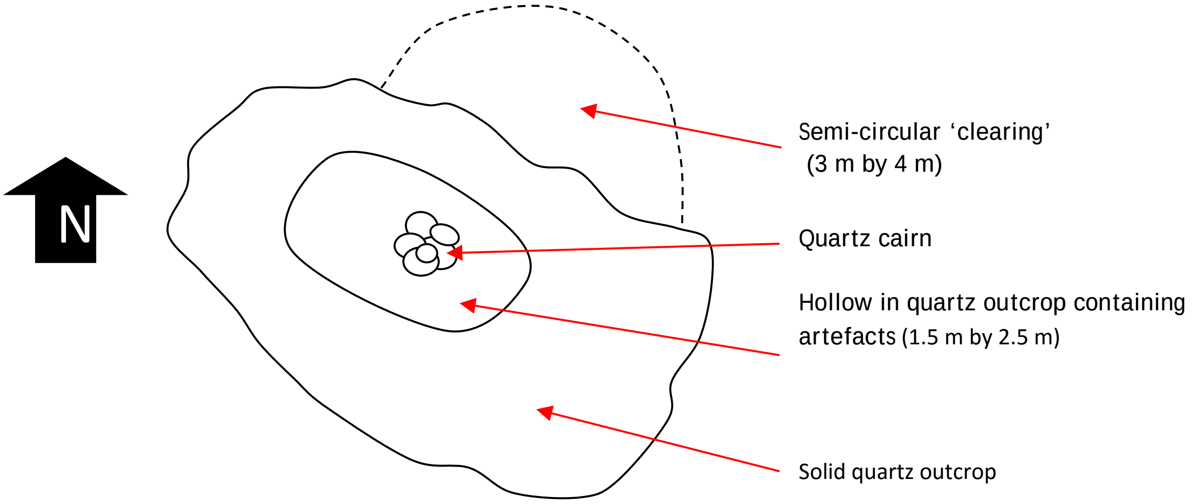

Figure 9.9: Schematic plan of the quartz outcrop at waypoint 224 showing the hollow, the cairn and the small clearing to the northeast.

Figure 9.10: View towards the east showing the cleared the hollow and stone cairn inside it.

Figure 9.11: View towards the east of area alongside the quartz outcrop.

Many isolated artefacts, part of the general background scatter, were noted during the survey. These included an ESA hand-axe, an LSA scraper-adze with scraper retouch on the end and adze working along both lateral margins, and an MSA blade (Figure 12). The most unusual find was a fragment of a bored stone (waypoint 220; Figure 13). It had also been used as a hammer stone, probably prior to its breakage since there were no other associated artefacts in the vicinity.

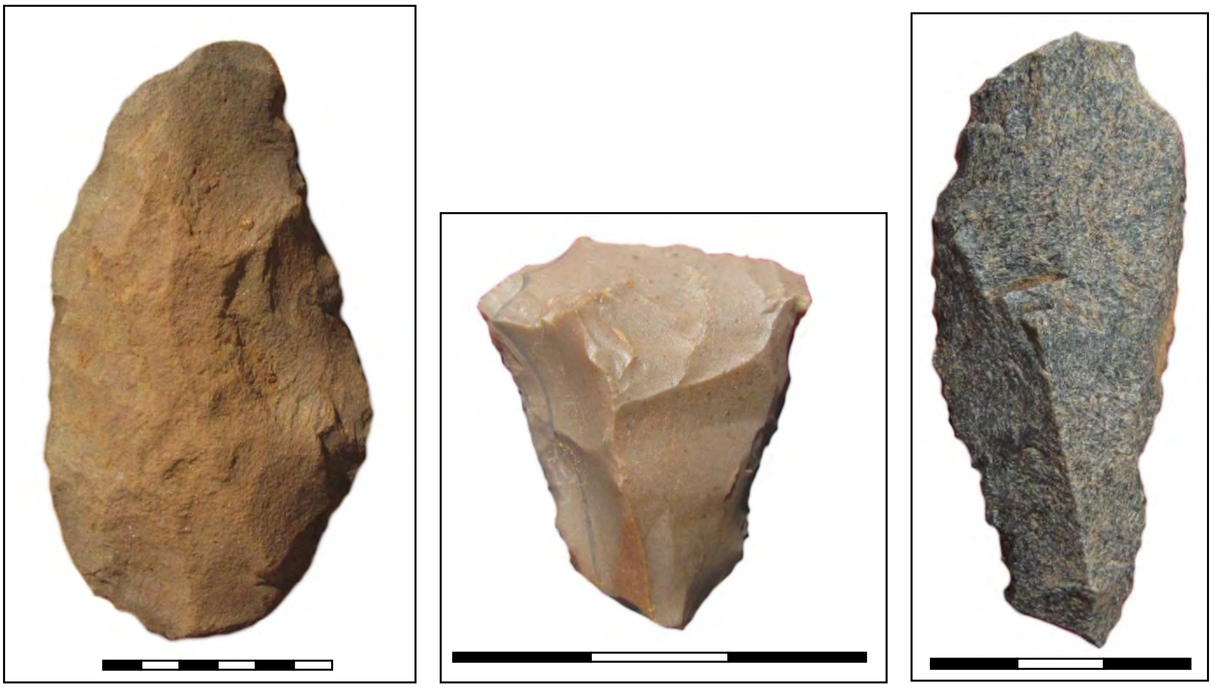

Figure 9.12: Background scatter artefacts. Left: a quartzite hand-axe (waypoint 213); centre: a CCS scraper-adze; and right: an MSA quartzite blade. All scales in 1 cm intervals.

Figure 9.13: Cross-section and plan view of a bored stone fragment. Scale in 1 cm intervals. The inset shows the hammering damage on the outer surface.

9.7.2 Graves

Two or three loose mounds of quartz cobbles that might represent potential graves were found (Figure 9.14). They were located side-by-side at waypoint 739. Although located very close to an area of quartz gravel, the mounds were in a sandy area suggesting that the cobbles were deliberately carried there.

Figure 9.14: The two or three mounds of quartz cobbles at waypoint 739.

9.7.3 Cultural and Natural Landscape

The cultural landscape is rather weakly developed and relates to the keeping of small stock in the region. The landscape is characterised by wide open space with occasional fence lines, farm tracks and wind pumps. In the vicinity of the study area it is compromised by the presence of the railway line and substation.

9.7.4 Statement of Significance

Section 38(3)(b) of the NHRA requires an assessment of the significance of all heritage resources. In terms of Section 2(vi), ''cultural significance'' means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

The archaeological resources are deemed to have medium cultural significance for their scientific value, graves are deemed to have high cultural significance for their social value, while the landscape has low cultural significance for its aesthetic and historical value.

9.7.5 Summary of heritage indicators and provisional grading

Although the potential for human remains means that possible grave sites should be regarded as significant, the nature of the site in the PV 3 study area suggests that a 3C grading is appropriate (i.e. medium-low local significance). The archaeological remains are worthy of no more than a 3C rating, while the cultural landscape has low significance and is not considered gradeable.

9.8 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

9.8.1 Damage to and Destruction of Archaeological Resources (Construction Phase)

The potential impact of damage to and destruction of archaeological resources is predicted to be a negative, direct impact. The impact is rated with a site specific spatial extent and a permanent duration. The consequence and probability of the impact are respectively rated as moderate and likely. The reversibility of the impact and irreplaceability of the resource are respectively rated as non-reversible and high. It is anticipated that any archaeological sites located within the final development footprint would be physically damaged or, more likely, destroyed when the surface is levelled in preparation for construction. Because the consequence of the impact on the two archaeological sites (at waypoints 224 and 229) found within the proposed development area is moderate, the significance of any potential impacts is likely to be low before mitigation. Mitigation would involve an archaeologist conducting excavations to rescue archaeological material from the relevant sites and, once this is complete, the significance of impacts would be reduced to very low. Alternatively, the archaeological sites could be avoided. If this route is chosen then it is suggested that a buffer of 25 m from the centre of the sites be employed. It should also be ensured that all works take place within the authorised footprint so as to avoid impacts to any nearby archaeological sites.

9.8.2 Damage to and Destruction of Graves (Construction Phase)

It is anticipated that any graves located within the final development footprint would be physically damaged or possibly even destroyed when the surface is levelled in preparation for construction. Graves have high cultural significance and it is best to avoid them. Because of the uncertainty that the feature is actually a grave (shown in Figure 9.14 (waypoint 739)) the impact significance before mitigation is rated as high. This potential impact is predicted to be a negative, direct impact, with a site specific spatial extent and a permanent duration. The consequence and probability of the impact are respectively rated as extreme and likely. The reversibility and irreplaceability of the impact are respectively rated as non-reversible and high.

In terms of mitigation, in the event that any graves or potential graves cannot be avoided with a buffer of at least 5 m then an archaeologist should be contracted to conduct a test excavation to determine the status of the feature. If it is determined to be a grave after the test excavation, then exhumation would need to occur with the permission of SAHRA. With mitigation the impact significance would be reduced to very low.

9.8.3 Impacts to the Natural and Cultural Landscape (Construction, Operational and Decommissioning Phases)

The impact of the proposed project on the natural and cultural landscape is expected to occur during the construction, operational and decommissioning phases. These potential impacts are predicted to be negative and direct, with a local spatial extent, and a long-term duration for the construction and operational phases and a short-term duration for the decommissioning phase. The consequence and probability of the impact are respectively rated as moderate and very likely. The reversibility and irreplaceability of the impact are respectively rated as high and moderate.

During the operational phase, the addition of solar panels to the landscape will result in a marked change in its character from a rural landscape to one characterized by electrical infrastructure. Given that the precedent has already been set for electrical development, the significance of these potential impacts is considered to be low. Solar panels are not as visible from a distance as the built aspects of the proposed development would be, but with the use of earthy-coloured paint on the buildings the degree of visual intrusion would be slightly reduced but the impact significance is still rated as being low. No mitigation measures are recommended for the operational and decommissioning phases.

9.8.4 Cumulative Impacts to Archaeological Resources

The development of multiple solar energy facilities will result in many archaeological artefacts and sites being disturbed and /or destroyed over a wide area. Few of the sites recorded in the region have high cultural significance and it is likely that the vast majority of those that do would be protected from harm because of their proximity to water courses and pans. Cumulative impacts would be negative and direct in nature. They would occur at the local level and would be permanent. Because some significant sites were found in the present study area, the cumulative impact consequence is rated as being moderate, while the probability is likely. These ratings result in an overall cumulative impact significance rating of low. With mitigation of those sites that are to be destroyed the cumulative impacts would be reduced to very low significance because scientific data would have been rescued. The impacts are irreversible and the irreplaceability of archaeological resources is high.

9.8.5 Cumulative Impacts to Graves

The development of multiple solar energy facilities may result in a number of graves being disturbed and /or destroyed over a wide area. However, because graves can be very difficult to identify and many may well continue to exist beneath any developments, it is difficult to evaluate any cumulative impacts. The nature of graves as individual and generally isolated heritage resources is such that, although each is significant, the disturbance of multiple examples will not result in a significant cumulative impact. Cumulative impacts would be negative and direct and occur at the local level. They would be permanent in duration. The moderate consequence and likely probability combine to give an impact significance rating before mitigation of low. After mitigation it is expected to be very low. The mitigation measures include avoiding graves with a buffer or at least or testing via excavations to check for human remains. If any are located then exhumation would be required (in line with regulatory requirements).

9.8.6 Cumulative Impacts to the Natural and Cultural Landscape

The development of multiple solar energy facilities will result in significant visual degradation of the local environment. However, it is also worth noting that it is far better, from the cumulative impact point of view, to cluster the facilities rather than to have them spread out over the landscape. The present application is one of a number of applications for solar energy facilities in close proximity to the Nieuwehoop Substation and, because of this clustering, the cumulative impacts are seen as acceptable. They would be direct negative impacts occurring at the local level and with long term duration. The consequence is rated as moderate and, although the impact is very likely to occur, the significance is rated as being low. Although mitigation is suggested (i.e. use earthy-coloured paint on built elements), this will not have much effect overall, therefore the post-mitigation significance is still rated as being low.

9.9 IMPACT ASSESSMENT SUMMARY

The assessment of potential impacts and recommendation of mitigation measures as discussed above are collated in Tables 9.2 to 9.5 below. Note that indirect impacts are not assessed because the nature of the identified heritage resources is such that significant indirect impacts are highly unlikely to occur.

Table 9.2: Impact assessment summary table for the Construction Phase.

Construction Phase													
Direct Impacts													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Con-sequence**	**Probability**	**Reversibility of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Clearing of site	Destruction of archaeological resources	Negative	Site	Permanent	Moderate	Likely	Non-reversible	High	Archaeological excavation to be undertaken by a professional archaeologist or avoid sites with a buffer of 25 m from their mid-points. Ensure that all works occur inside the approved 250 ha development footprint.	Low	Very low	5	High
Clearing of site	Destruction of graves	Negative	Site	Permanent	Extreme	Likely	Non-reversible	High	Avoid grave with a buffer of at least 5 m or test and exhume as required	High	Very low	5	Low
Clearing of site and construction of the proposed facility	Impacts to the natural and cultural landscape	Negative	Local	Long term	Moderate	Very likely	High	Moderate	Use earthy-coloured paint on built elements	Low	Low	4	High

Table 9.3: Impact assessment summary table for the Operational Phase.

Operational Phase													
Direct Impacts													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Con-sequence**	**Probability**	**Reversibility of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	With Mitigation/ Management (Residual Impact/ Risk)		
The presence of the proposed PV facility	Impacts to the natural and cultural landscape	Negative	Local	Long term	Moderate	Very likely	High	Moderate	None required	Low	Low	4	High

Table 9.4: Impact assessment summary table for the Decommissioning Phase.

Decommissioning Phase													
Direct Impacts													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Con-sequence**	**Probability**	**Reversibility of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	With Mitigation/ Management (Residual Impact/ Risk)		
The presence of construction vehicles	Impacts to the natural and cultural landscape	Negative	Local	Short term	Moderate	Very likely	High	Moderate	None required	Low	Low	4	High

Table 9.5: Cumulative impact assessment summary table.

Cumulative Impacts													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Con-sequence**	**Probability**	**Reversibi-lity of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	With Mitigation/ Management (Residual Impact/ Risk)		
Clearing of site	Destruction of archaeological resources	Negative	Local	Permanent	Moderate	Likely	Non-reversible	High	Archaeological excavation to be undertaken by a professional archaeologist or avoid sites with a buffer of 25 m from their mid-points. Ensure that all works occur inside the approved 250 ha development footprint.	Low	Very low	5	High
Clearing of site	Destruction of graves	Negative	Local	Permanent	Moderate	Likely	Non-reversible	High	Avoid grave with a buffer of at least 5 m or test and exhume as required	Low	Very low	5	Low
Clearing of site and construction of the proposed facility	Impacts to the natural and cultural landscape	Negative	Local	Long term	Moderate	Very likely	High	Moderate	Use earthy-coloured paint on built elements	Low	Low	4	High

9.10 PERMIT REQUIREMENTS

The NHRA does not require the developer to obtain permits prior to construction. However, any archaeological mitigation work (i.e. test excavations, sampling, etc.) that may be required (whether as a condition of authorisation or in the event of new archaeological resources or graves of significance being found within the development footprint during construction) would need to be conducted under a permit issued to, and in the name of, the appointed archaeologist. The permit application process allows the heritage authorities to ensure that a suitably qualified and experienced archaeologist undertakes the work and that the proposed excavation/sampling methodology is acceptable.

9.11 INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME

9.11.1 For inclusion in the EMPr

Provision should be made for archaeological mitigation to be carried out, if the sites are not avoided, well in advance of the start of construction, preferably at least 6 months. This will allow the archaeologist time to obtain a permit, conduct the work, analyse the material and obtain a positive comment from SAHRA.

The Environmental Control Officer (ECO) (or Environmental Officer) should meet with workers on site at the start of the construction phase to explain the possibility that graves might be present. During clearing of the surface, all personnel should be vigilant for any unusual stone features and these should be reported to the ECO, who should then report the find(s) to an archaeologist. An alternative to this is to commission an archaeologist to conduct a more detailed examination of the surface of the final development footprint in order to identify any potential issues prior to construction. The feature(s) may need to be tested by an archaeologist to confirm whether they are graves or not. If they are graves then exhumation would be required prior to further work in the area.

Note that there are no specific heritage monitoring requirements for this project but that environmental monitoring by the ECO to ensure compliance with the recommendations has been included in the EMPr.

9.11.2 For inclusion in the Environmental Authorisation

The following points should be included as conditions of authorisation:

- If they cannot be avoided with a buffer of at least 25 m, the two significant archaeological sites should be excavated;
- The potential grave should be avoided with a buffer of at least 5 m or else tested and, if necessary, exhumed prior to construction;
- The construction team should be made aware of the potential to locate more graves and instructed to report any suspicious stone features prior to disturbance;
- The built elements of the facility should be painted in an earthy colour to minimise visual contrast in the landscape; and
- If any archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

9.12 CONCLUSIONS

Only three significant heritage resources were identified – two archaeological sites and a possible grave site (Figure 9.15). It should be easy to avoid the potential grave site since it lies close to the western edge of the study area. One of the archaeological sites is on a quartz hill that is unlikely to be considered a developable area. The other archaeological site lies in the southern part of the study area but because the area is so big it is likely to be avoidable by the final development footprint. Either way, the archaeological sites should be avoided or mitigated and the grave either avoided or tested and exhumed if necessary. Care should be taken to identify any further possible graves prior to the commencement of construction. Should these measures be complied with then no further significant impacts are expected and there is no heritage-related reason why the proposed development should not be allowed to proceed within the identified study area.

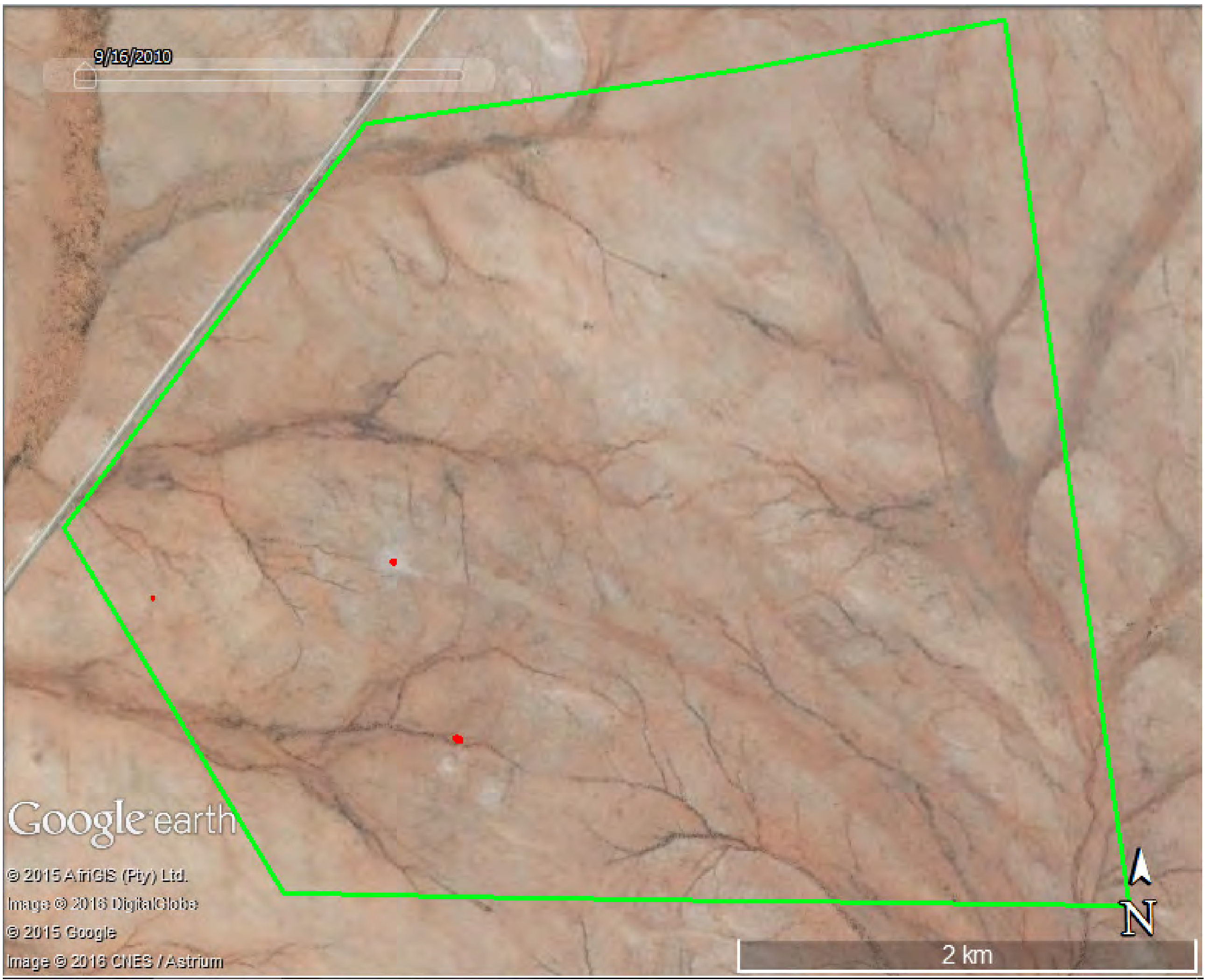

Figure 9.15: Aerial view of the PV 3 study area showing the three significant heritage sites (red) in the western part.

9.13 RECOMMENDATIONS

Because the impacts are few and entirely manageable, it is recommended that the proposed project be allowed to continue but subject to the following conditions:

- If they cannot be avoided with a buffer of at least 25 m, the two significant archaeological sites should be excavated;
- The potential grave should be avoided with a buffer of at least 5 m or else tested and, if necessary, exhumed prior to construction;
- The construction team should be made aware of the potential to locate more graves and instructed to report any suspicious stone features prior to disturbance;
- The built elements of the facility should be painted in an earthy colour to minimise visual contrast in the landscape; and
- If any archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

9.14 REFERENCES

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APPENDIX 9.1 - Curriculum Vitae

Jayson David John Orton

ARCHAEOLOGIST AND HERITAGE CONSULTANT

Contact Details and personal information:

Address: 6A Scarborough Road, Muizenberg, 7945
Telephone: (021) 788 8425
Cell Phone: 083 272 3225
Email: jayson@asha-consulting.co.za

Birth date and place: 22 June 1976, Cape Town, South Africa
Citizenship: South African
ID no: 760622 522 4085
Driver's License: Code 08
Marital Status: Married to Carol Orton
Languages spoken: English and Afrikaans

Education:

SA College High School	Matric	1994
University of Cape Town	B.A. (Archaeology, Environmental & Geographical Science)	1997
University of Cape Town	B.A. (Honours) (Archaeology)*	1998
University of Cape Town	M.A. (Archaeology)	2004
University of Oxford	D.Phil. (Archaeology)	2013

*Frank Schweitzer memorial book prize for an outstanding student and the degree in the First Class.

Employment History:

Spatial Archaeology Research Unit, UCT	Research assistant	Jan 1996 – Dec 1998
Department of Archaeology, UCT	Field archaeologist	Jan 1998 – Dec 1998
UCT Archaeology Contracts Office	Field archaeologist	Jan 1999 – May 2004
UCT Archaeology Contracts Office	Heritage & archaeological consultant	Jun 2004 – May 2012
School of Archaeology, University of Oxford	Undergraduate Tutor	Oct 2008 – Dec 2008
ACO Associates cc	Associate, Heritage & archaeological consultant	Jan 2011 – Dec 2013
ASHA Consulting (Pty) Ltd	Director, Heritage & archaeological consultant	Jan 2014 –

Memberships and affiliations:

South African Archaeological Society Council member	2004 –
Assoc. Southern African Professional Archaeologists (ASAPA) member	2006 –
ASAPA Cultural Resources Management Section member	2007 –
UCT Department of Archaeology Research Associate	2013 –
Heritage Western Cape APM Committee member	2013 –
UNISA Department of Archaeology and Anthropology Research Fellow	2014 –
Fish Hoek Valley Historical Association	2014 –

Professional Accreditation:

ASAPA membership number: 233, CRM Section member
Principal Investigator: Coastal shell middens (awarded 2007)
Stone Age archaeology (awarded 2007)
Grave relocation (awarded 2014)
Field Director: Rock art (awarded 2007)
Colonial period archaeology (awarded 2007)

Fieldwork and project experience:

Extensive fieldwork as both Field Director and Principle Investigator throughout the Western and Northern Cape, and also in the western parts of the Free State and Eastern Cape as follows:

Phase 1 surveys and impact assessments:

- Project types
  - Notification of Intent to Develop applications (for Heritage Western Cape)
  - Heritage Impact Assessments (largely in the Environmental Impact Assessment or Basic Assessment context under NEMA and Section 38(8) of the NHRA, but also self-standing assessments under Section 38(1) of the NHRA)
  - Archaeological specialist studies
  - Phase 1 test excavations in historical and prehistoric sites
  - Archaeological research projects

- Development types
  - Mining and borrow pits
  - Roads (new and upgrades)
  - Residential, commercial and industrial development
  - Dams and pipe lines
  - Power lines and substations
  - Renewable energy facilities (wind energy, solar energy and hydro-electric facilities)

Phase 2 mitigation and research excavations:

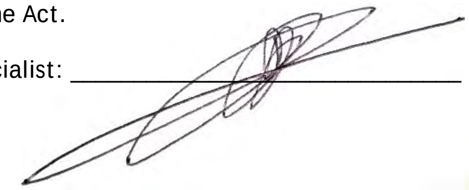
- ESA open sites
  - Duinefontein, Gouda
- MSA rock shelters
  - Fish Hoek, Yzerfontein, Cederberg, Namaqualand
- MSA open sites
  - Swartland, Bushmanland, Namaqualand
- LSA rock shelters
  - Cederberg, Namaqualand, Bushmanland
- LSA open sites (inland)
  - Swartland, Franschhoek, Namaqualand, Bushmanland
- LSA coastal shell middens
  - Melkbosstrand, Yzerfontein, Saldanha Bay, Paternoster, Dwarskersbos, Infanta, Knysna, Namaqualand
- LSA burials
  - Melkbosstrand, Saldanha Bay, Namaqualand, Knysna
- Historical sites
  - Franschhoek (farmstead and well), Waterfront (fort, dump and well), Noordhoek (cottage), variety of small excavations in central Cape Town and surrounding suburbs
- Historic burial grounds
  - Green Point (Prestwich Street), V&A Waterfront (Marina Residential), Paarl

APPENDIX 9.2 – Specialist Declaration

I, Jayson Orton, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist: ______________________



Name of Specialist: _____JAYSON ORTON_________________

Date: _________30 DECEMBER 2015____________________

EIA REPORT

CHAPTER 10:

Desktop Palaeontological Impact Assessment

Scoping and **Environmental Impact Assessment** for the Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province

Report prepared for:

CSIR – Environmental Management Services
P O Box 17001
Congella, Durban, 4013
South Africa

Report prepared by:

Dr John Almond - Natura Viva cc
P.O. Box 12410
Mill Street, Cape Town, 8010
South Africa

March 2016

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS

Requirements of Appendix 6 – GN R982	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Appendix A of the EIA Report
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix B of the EIA Report and Section 10.1.6 of this chapter
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 10.1.1
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Not Applicable
e) a description of the methodology adopted in preparing the report or carrying out the specialised process;	Section 10.1.1 and 10.1.3
f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;	Section 10.1.3
g) an identification of any areas to be avoided, including buffers;	Not Applicable
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 10.3
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 10.1.4
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	Section 10.5, 10.6, 10.7 and 10.8
k) any mitigation measures for inclusion in the EMPr;	Section 10.7 and Section 10.8
l) any conditions for inclusion in the environmental authorisation;	Not Applicable
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 10.8
n) a reasoned opinion- i. as to whether the proposed activity or portions thereof should be authorised; and ii. if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 10.9
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Not Applicable
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Section 10.5.1
q) any other information requested by the competent authority.	Not applicable

list of abbreviations

DEA	Department of Environmental Affairs
EIA	Environmental Impact Assessment
PIA	Palaeontological Impact Assessment
SAHRA	South African Heritage Resources Agency
Ma / mya	Million years ago

glossary

Definitions	
Basement Rocks	Ancient igneous and metamorphic rocks (usually unfossiliferous) underlying the sedimentary cover rocks in a given region
Calcrete	Pedogenic limestone (*i.e.* limestone generated by soil processes within soils and surface rock debris), generally associated with seasonally arid climates.
Fossiliferous	Containing fossil remains
Igneous Rocks	Rocks that have crystallised from a molten state (magma / lava); *e.g.* granite.
Metamorphic	Rocks that have recrystallized under conditions of altered (usually highly elevated) temperature and pressure; *e.g.* gneiss.
Precambrian	Older than 541 million years old (mya).
Pleistocene Epoch	Time period between *c*. 2.6 mya and 10 000 years ago (associated with a series of major glaciations in the northern hemisphere).

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10 DESKTOP PALAEONTOLOGICAL IMPACT ASSESSMENT

This chapter presents the findings of the Palaeontological Impact Assessment that was prepared by Dr. John Almond (of Natura Viva cc) as part of the Environmental Impact Assessment (EIA) for the proposed Kenhardt PV 3 project within the Northern Cape Province.

10.1 INTRODUCTION AND METHODOLOGY

10.1.1 Scope and Objectives

The proposed Kenhardt PV 3 75 MW Solar Photovoltaic (PV) Facility project area overlies potentially fossiliferous sedimentary rocks. A desktop Palaeontological Impact Assessment - or at least a letter of exemption from a palaeontologist to indicate that this is unnecessary – has been requested by the South African Heritage Resources Agency (SAHRA) Archaeology, Palaeontology and Meteorites Unit for this development (Case ID: 8206, letter of September 22, 2015).

Linked to the above, this present report provides a desktop assessment of potential impacts on local palaeontological (*i.e.* fossil) heritage within the study area for the proposed Kenhardt PV 3 75 MW Solar PV Facility on the remaining extent of Onder Rugzeer Farm 168, situated *c*. 20 km north-east of Kenhardt, Northern Cape Province. The report contributes to the EIA for this alternative energy development and includes recommendations for inclusion in the EMPr (Part B of the EIA Report).

The overall objectives of the specialist study are to:

- Determine the current conditions in sufficient detail so that there is a baseline against which impacts can be identified and measured.
- Identify potential impacts that may occur during the construction, operational and decommissioning phases of the proposed development, as well as impacts associated with future environmental changes if the “no-go” option is implemented (both positive and negative).
- Assess the impacts in terms of direct, indirect and cumulative impacts.
- Provide recommendations with regards to potential monitoring programmes.
- Determine mitigation and/or management measures which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts.
- Incorporate and address all issues and concerns raised in relation to palaeontological impacts.

10.1.2 Terms of Reference

The Terms of Reference for the present study, as defined by the CSIR, are as follows:

1. Review detailed information relating to the project description and precisely define the environmental risks to palaeontological heritage, and consequences thereto.
2. Conduct a review of available information pertaining to the study area.
3. Draw on desktop information sources, the knowledge of local experts, information published in the scientific press and information derived from relevant EIAs and similar specialist studies previously conducted within the surrounding area.
4. Prepare and undertake a desktop study on the palaeontology and fossil heritage within the proposed project area, based on:

- a review of all relevant palaeontological and geological literature, including geological maps and previous reports,
- location and examination of fossil collections from the study area (*e.g.* museums), and
- data on the proposed development (*e.g.* location of footprint, depth and volume of bedrock excavation envisaged).

5. Describe the type and location of known fossil heritage sites in the study area, and characterize all items that may be affected by the proposed project.
6. Describe the baseline environment and determine the *status quo* in terms of palaeontological heritage.
7. Note fossils and associated sedimentological features of palaeontological relevance (photos, maps, aerial or satellite images, and stratigraphic columns).
8. Analyse the stratigraphy, age and depositional setting of fossil-bearing units.
9. Evaluate the potential for occurrence of palaeontological heritage features within the study area.
10. Incorporate relevant information from other specialist reports/findings, if required.
11. Identify and rank the highlights and sensitivities to development of fossil heritage within study area.
12. Identify and rate potential direct, indirect and cumulative impacts of the proposed project on the palaeontology and fossil heritage during the construction, operational and decommissioning phases of the project. Study the cumulative impacts of the project by considering the impacts of existing industries / solar PV plants within the area (as well as those PV plants that are proposed), together with the impact of the proposed project.
13. Provide recommendations and suggestions regarding fossil heritage management on site, including conservation measures, as well as promotion of local fossil heritage (*e.g.* for public education, schools) to ensure that the impacts are limited.
14. Provide input to the EMPr, including mitigation and monitoring requirements to ensure that the impacts on the archaeological features and heritage features are limited.
15. Provide specific recommendations for further palaeontological mitigation (if any).
16. Compile an illustrated, fully-referenced review of palaeontological heritage within study area based on desktop study.

10.1.3 Approach and Methodology

In preparing a palaeontological desktop study the potentially fossiliferous rock units (groups, formations etc.) occurring and represented within the study area are determined from geological maps and satellite images. The known fossil heritage within each rock unit is inventoried from the published scientific literature, previous palaeontological impact studies in the same region, and the author's field experience and palaeontological database (consultation with professional colleagues as well as examination of institutional fossil collections may play a role here). This data is then used to assess the palaeontological sensitivity of each rock unit to development (provisional tabulations of palaeontological sensitivity of all formations in the Western, Eastern and Northern Cape have already been compiled by J. Almond and colleagues (*e.g.* Almond & Pether 2008). The likely impact of the proposed development on local fossil heritage is then determined on the basis of (1) the palaeontological sensitivity of the rock units concerned and (2) the nature and scale of the development itself, most significantly the extent of fresh bedrock excavation envisaged. When rock units of moderate to high palaeontological sensitivity are present within the development footprint, a Phase 1 field assessment study by a professional palaeontologist is usually warranted to identify any palaeontological hotspots and make specific recommendations for any mitigation required before or during the construction phase of the development. However, due to the low palaeontological sensitivity of the present study area a Phase 1 field assessment is not required and a desktop assessment is being undertaken instead (i.e. this study).

On the basis of the desktop and Phase 1 field assessment studies, the likely impact of the proposed development on local fossil heritage and any need for specialist mitigation are then determined. Adverse palaeontological impacts normally occur during the construction rather than the operational or decommissioning phase. Phase 2 mitigation by a professional palaeontologist –

normally involving the recording and sampling of fossil material and associated geological information (*e.g.* sedimentological data) may be required (a) in the pre-construction phase where important fossils are already exposed at or near the land surface and / or (b) during the construction phase when fresh fossiliferous bedrock has been exposed by excavations. To carry out mitigation, the palaeontologist involved will need to apply for a palaeontological collection permit from the relevant heritage management authorities for the Northern Cape, *i.e.* SAHRA (Contact details: Mrs Colette Scheermeyer, P.O. Box 4637, Cape Town 8000, Tel: 021 462 4502, Email: cscheermeyer@sahra.org.za). It should be emphasized that, providing appropriate mitigation is carried out, the majority of developments involving bedrock excavation can make a positive contribution to our understanding of local palaeontological heritage.

10.1.4 Assumptions and Limitations

The accuracy and reliability of palaeontological specialist studies as components of Heritage Impact Assessments are **generally** limited by the following constraints:

1. Inadequate database for fossil heritage for much of South Africa, given the large size of the country and the small number of professional palaeontologists carrying out fieldwork here. Most development study areas – including the Scatec Solar project area - have never been surveyed by a palaeontologist.

2. Variable accuracy of geological maps which underpin these desktop studies. For large areas of terrain these maps are largely based on aerial photographs alone, without ground-truthing. The maps generally depict only significant ("mappable") bedrock units as well as major areas of superficial "drift" deposits (alluvium, colluvium) but for most regions give little or no idea of the level of bedrock outcrop, depth of superficial cover (soil etc.), degree of bedrock weathering or levels of small-scale tectonic deformation, such as cleavage. All of these factors may have a major influence on the impact significance of a given development on fossil heritage and can only be reliably assessed in the field.

3. Inadequate sheet explanations for geological maps, with little or no attention paid to palaeontological issues in many cases, including poor locality information.

4. The extensive relevant palaeontological "grey literature" - in the form of unpublished university theses, impact studies and other reports (e.g. of commercial mining companies) - that is not readily available for desktop studies.

5. Absence of a comprehensive computerized database of fossil collections in major South African institutions which can be consulted for impact studies. A Karoo fossil vertebrate database is now accessible for impact study work.

In the case of palaeontological desktop studies without supporting Phase 1 field assessments these limitations may variously lead to either:

(a) underestimation of the palaeontological significance of a given study area due to ignorance of significant recorded or unrecorded fossils preserved there, or

(b) overestimation of the palaeontological sensitivity of a study area, for example when originally rich fossil assemblages inferred from geological maps have in fact been destroyed by tectonism or weathering, or are buried beneath a thick mantle of unfossiliferous "drift" (soil, alluvium *etc.*).

Since most areas of South Africa have not been studied palaeontologically, a palaeontological desktop study usually entails inferring the presence of buried fossil heritage within the study area from relevant fossil data collected from similar or the same rock units elsewhere, sometimes at localities far away. Where substantial exposures of bedrocks or potentially fossiliferous superficial sediments are present in the study area, the reliability of a palaeontological impact assessment may be significantly enhanced through field assessment by a professional palaeontologist.

In the case of the Scatec Solar project area near Kenhardt in the Northern Cape, bedrock exposure is limited due to extensive cover by superficial deposits (*e.g.* alluvium, soils, surface gravels), especially in areas of low relief, as well as by pervasive *bossieveld* vegetation. For this reason, as well as the low palaeontological sensitivity of the sedimentary rocks mapped in the project area, a desktop-level rather than field-based assessment was considered appropriate for this study. Despite the lack of palaeontological field data from the project area itself, confidence levels in the conclusions reached in the desktop study are moderately high because of the author's field experience of the sedimentary rocks represented in the wider Bushmanland region (See reference list for previous palaeontological assessments in the area; *e.g.* Almond 2009, 2011, 2014a, 2014b, 2014c, 2014d). Recent palaeontological heritage assessments for several other alternative energy developments in the region have been taken into consideration (*e.g.* the Nieuwehoop Solar Park just to the east of the proposed project area).

In terms of the impact assessment, the methodology adopted is outlined in Chapter 4 of the EIA Report, which also notes the developments within a 20 km radius that have been considered in order to assess cumulative impacts.

10.1.5 Sources of Information

The information used in this desktop study was based on the following sources:

1. A detailed project outline supplied by the CSIR - Environmental Management Services
2. Previous desktop palaeontological assessment reports for study areas in the Kenhardt region by the author (Almond 2009, 2011, 2014a, 2014b, 2014c, 2014d).
3. A review of the relevant scientific literature, including published geological maps (e.g. 1: 250 000 scale geological map sheet 2920 Kenhardt published by the Council for Geoscience, Pretoria) and accompanying sheet explanations (e.g. Slabbert *et al*. 1999)
4. The author's previous field experience with the formations concerned and their palaeontological heritage (cf Almond and Pether 2008; SAHRIS website).

10.1.6 Declaration of Independence of Specialists

Refer to Appendix A of this EIA Report for the Curriculum Vitae of Dr. John Almond, which highlights his experience and expertise. The declaration of independence by the specialist is provided in Box 10.1 below and included in Appendix B of this EIA Report.

BOX 10.1: DECLARATION OF INDEPENDENCE

I, John Almond, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed Kenhardt PV 3 Project, application or appeal in respect of which I was appointed, other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.

JOHN ALMOND

10.2 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO PALAEONTOLOGICAL HERITAGE IMPACTS

As noted above, the Scatec Solar project area near Kenhardt is located in a region of Bushmanland that is underlain by potentially fossiliferous sedimentary rocks of Late Tertiary or Quaternary age as well as by unfossiliferous basement rocks (as discussed in Section 10.3 of this chapter). The construction phase of the proposed development will entail substantial excavations into the superficial sediment cover and locally into the underlying bedrock as well. These include, for example, surface clearance operations, excavations for the solar array footings, underground cables, access and internal gravel roads, 132 kV transmission line towers (which is being subjected to a separate Basic Assessment Process), on-site substation, laydown areas, stormwater channels, water pipelines (if required) and foundations for buildings (offices, operational control centre, warehouse/workshop). All these developments may adversely affect potential, legally-protected fossil heritage resources within the study area by destroying, disturbing or permanently sealing-in fossils at or beneath the surface of the ground that are then no longer available for scientific research or other public good.

The planning, operational and decommissioning phases of the proposed solar energy facility are very unlikely to involve additional adverse impacts on local palaeontological heritage, however.

A detailed description of the proposed project is included in Chapter 2 of the EIA Report. A detailed description of the transmission line corridor is provided and assessed separately in the Basic Assessment for the Kenhardt PV 3 – Transmission Line project.

10.3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

In this section of the report an outline of the geology of the proposed Kenhardt PV 3 project area is first given, based on the relevant geological maps and scientific literature. This is followed by a brief review of fossil heritage that has previously been recorded from the sedimentary rock units that are represented within the project area.

10.3.1 Geological Context

As mentioned above, the study area for the proposed Kenhardt PV 3 project, located on the Farm Onder Rugzeer 168 located some 20 km northeast of Kenhardt, Northern Cape, is situated within the semi-arid Bushmanland region between *c.* 950 to 900 m amsl, with a general slope towards the south. It is drained by a dendritic network of shallow, southwest-flowing tributary streams of the Hartbeesrivier, such as the Rugseersrivier in the south and the Wolfkop se Loop in the north. The geology of the study area is shown on 1: 250 000 geology sheet 2920 Kenhardt (Council for Geoscience, Pretoria) (Figure 10.1). The entire area is underlain at depth by a variety of Precambrian basement rocks that are *c*. 2 billion years old and are assigned to the **Namaqua-Natal Province**. These ancient igneous and high-grade metamorphic rocks - mainly granites and gneisses - crop out at surface as small patches and are entirely unfossiliferous. The Precambrian crustal rocks are transected by a NW-SE trending fault zone and lie to the north of the major Wolfkop Fault. The basement rock units represented in the PV 3 study area belongs to the **Keimoes Suite** (Elsie se Gorra Granite). These rock units are described in the Kenhardt 1: 250 000 sheet explanation by Slabbert *et al.* (1999) and placed in the context of the Namaqua-Natal Province by Cornell *et al.* (2006). However, they are entirely unfossiliferous and so will not be discussed further here.

A large proportion of the basement rocks in the proposed project area are mantled by a range of superficial sediments of Late Caenozoic age, some of which are included within the **Kalahari Group**. These predominantly thin, unconsolidated deposits include small patches of calcretes (soil limestones), gravelly to sandy river alluvium, pan sediments along certain watercourses, surface gravels, colluvium (scree) as well as – especially – Quaternary to Recent aeolian (wind-blown) sands of the Gordonia Formation (Kalahari Group). The basement rocks in the PV 3 study area is largely mantled by aeolian sands of the **Gordonia Formation** ("Kalahari sands") as well as Late Caenozoic alluvial deposits.

The geology of the Late Cretaceous to Recent Kalahari Group is reviewed by Thomas (1981), Dingle *et al.* (1983), Thomas & Shaw (1991), Haddon (2000) and Partridge *et al.* (2006). The thickness of the unconsolidated Kalahari sands in the Bushmanland area is variable and often uncertain. The Gordonia Formation dune sands are considered to range in age from the Late Pliocene/Early Pleistocene to Recent, dated in part from enclosed Middle to Late Stone Age stone tools (Dingle *et al*., 1983, p. 291). Note that the recent extension of the Pliocene - Pleistocene boundary from 1.8Ma back to 2.588 Ma would place the older Gordonia Formation sands entirely within the Pleistocene Epoch. A number of older Kalahari formations underlie the young wind-blown surface sands in the main Kalahari depository to the north of the study area. However, at the latitude of the study area near Kenhardt (*c*. 29° S) Gordonia Formation sands less than 30 m thick are likely to be the main or perhaps only Kalahari sediments present (*cf* isopach map of the Kalahari Group, Figure 6 *in* Partridge *et al*., 2006). These unconsolidated sands will be locally underlain by thin subsurface gravels along the buried palaeosurface and perhaps by calcretes of Pleistocene or younger age (*cf* Mokalanen Formation).

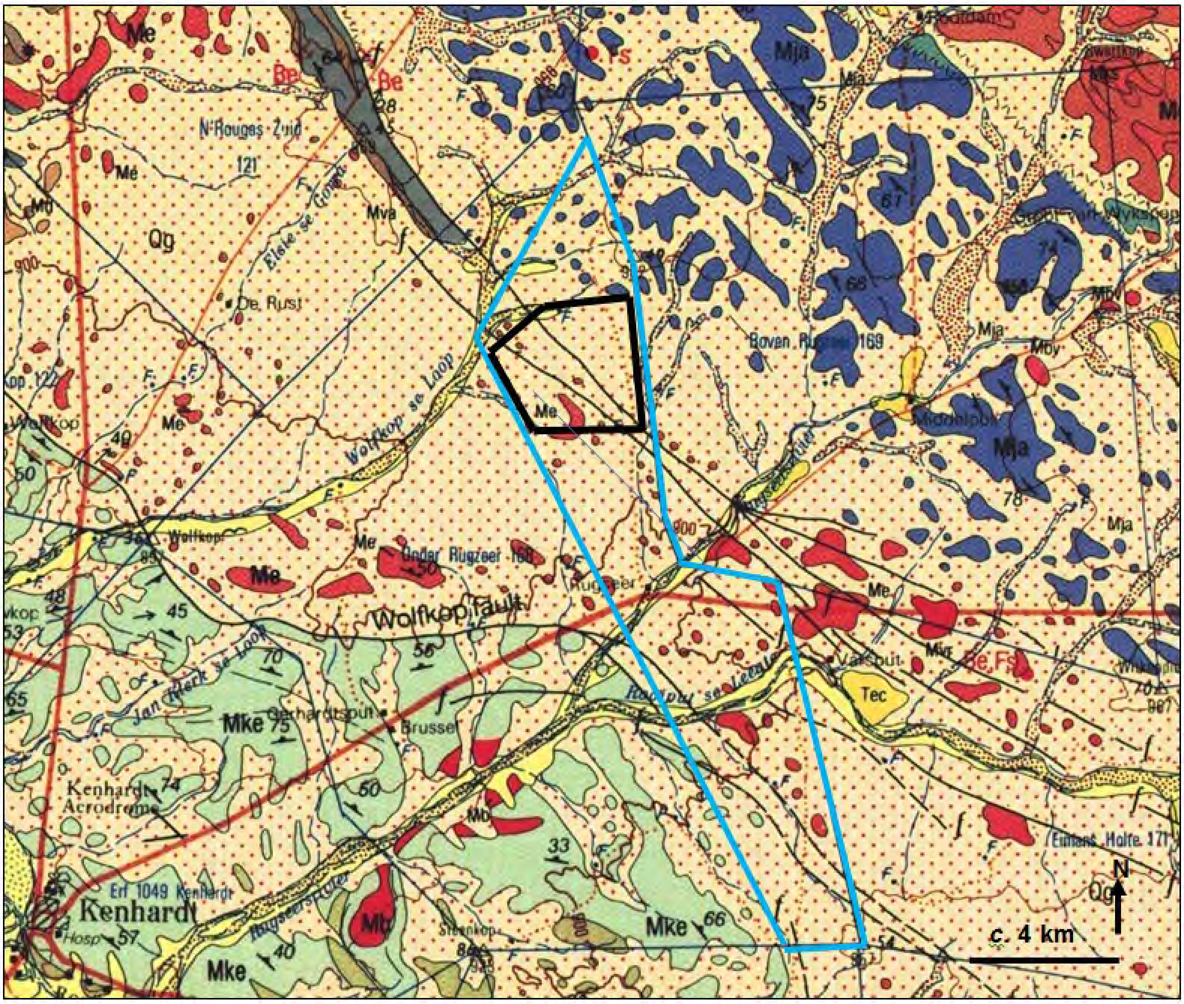

Figure 10.1: Extract from 1: 250 000 scale geological map sheet 2920 Kenhardt (Council for Geoscience, Pretoria) showing the geology of the Scatec Solar PV Facility study area on Farm Onder Rugzeer 168 (blue polygon) situated *c*. 20 km to the NE of Kenhardt, Northern Cape. The PV 3 study site is approximately indicated by the black polygon in the north.

Linked to Figure 10.1 above, the main geological units represented within the broader Scatec Solar project area include:

PRECAMBRIAN BASEMENT ROCKS:

KEIMOES SUITE:
- Red (Me) = Elsie se Gorra Granite

KORANNALAND SUPERGROUP:
- Brown (Mva) = Valsvlei Formation, Biesje Poort Group
- Grey (Msa) = Sandputs Formation, Biesje Poort Group
- Blue (Mja) = Sandnoute Formation, Jacomyns Pan Group

VYFBEKER METAMORPHIC SUITE:
- Pale blue-green (Mke) = Kenhardt Migmatite

LATE CAENOZOIC SUPERFICIAL SEDIMENTS:
- Pale yellow with sparse red stipple (Qg) = aeolian sands of the Gordonia Formation (Kalahari Group)
- Pale yellow with dense red stipple = alluvial and pan sediments
- Dark yellow (Tec) = calcrete

10.3.2 Palaeontological Heritage

The Precambrian basement rocks represented within the study area are igneous granitoids or high grade metamorphic rocks that were last metamorphosed some 1 billion years ago and are entirely unfossiliferous. The sparse fossil record of Late Caenozoic superficial sediments in the Bushmanland region are briefly reviewed here (Refer also to Table 10.1). Note that, to the author’s knowledge, there are no fossil records from the broader Scatec Solar project area itself and no palaeontological fieldwork has been undertaken here.

The diverse superficial deposits within the South African interior, including Bushmanland, have been comparatively neglected in palaeontological terms. However, sediments associated with ancient drainage systems, springs and pans may occasionally contain important fossil biotas, notably the bones, teeth and horn cores of mammals as well as remains of reptiles like tortoises (*e.g.* Skead 1980, Klein 1984, Brink, 1987, Bousman *et al.* 1988, Bender & Brink 1992, Brink *et al.* 1995, MacRae 1999, Meadows & Watkeys 1999, Churchill *et al.* 2000, Partridge & Scott 2000, Brink & Rossouw 2000, Rossouw 2006, Almond *in* Macey *et al.* 2011). Other late Caenozoic fossil biotas that may occur within these superficial deposits include non-marine molluscs (bivalves, gastropods), ostrich egg shells, trace fossils (e.g. calcretised termitaria, coprolites, invertebrate burrows, rhizocretions), and plant material such as peats or palynomorphs (pollens) in organic-rich alluvial horizons (Scott 2000) and diatoms in pan sediments. In Quaternary deposits, fossil remains may be associated with human artefacts such as stone tools and are also of archaeological interest (*e.g*. Smith 1999 and references therein). Ancient solution hollows within extensive calcrete hardpans may have acted as animal traps in the past. As with coastal and interior limestones, they might occasionally contain mammalian bones and teeth (perhaps associated with hyaena dens) or invertebrate remains such as snail shells.

Diverse fossils associated with the ancient Tertiary drainage systems of the Karoo and Bushmanland region have been summarized by Almond *in* Macey *et al.* (2011. See also articles by Cooke 1949, Wells 1964, Butzer et al. 1973, Helgren 1977, Klein 1984, Macrae 1999). They include remains of fish, reptiles, mammals, freshwater molluscs, petrified wood and trace fossils (*e.g.* De Wit 1990, 1993, De Wit & Bamford 1993, Bamford 2000, Bamford & De Wit 1993, Senut *et al.* 1996).

In the Brandvlei area to the southwest of Kenhardt lies the north-south trending Geelvloer Palaeo-valley, a Mid Tertiary palaeodrainage system that links up with the Commissioners Pan – Koa Valley system to the northwest. Here calcretised basal alluvial facies contain bones of hippopotamus-like artiodactyls called anthracotherids indicating a Miocene age (De Wit 1993, 1999, De Wit *et al.* 2000). Anthracotherids are an extinct group of amphibious mammalian herbivores only distantly related to true hippos that were widespread in the Miocene of Africa (Schneider & Marais 2004). Early to Mid-Miocene silicified woods from Brandvlei are referable to a number of extant tree families, including the Dipterocarpaceae that mainly inhabit tropical forests in Africa and Asia today. The fossil woods and associated sediments indicate that warm, tropical to subtropical climates prevailed in the Mid-Miocene and that perennial, low-sinuousity braided river systems supported lush riparian forests (De Wit & Bamford 1993, Bamford & De Wit 1993, Bamford 2000). Wet, weakly seasonal climates are suggested by the structure (indistinct growth rings) and dimensions (trunk diameters of over 50 cm) of the fossil woods (Bamford 2000).

Abraded Plio-Pleistocene fossil woods from relict alluvial terraces of the Sak River just north of Brandvlei include members of the Family Polygalaceae and also indicate humid growth conditions (Bamford & De Wit 1993). These terraces were formed by meandering rivers during intermittent pluvial (i.e. wetter), but still semi-arid, episodes following the onset of generally arid conditions in the western portion of southern Africa towards the end of the Miocene. So far fossils have not been recorded from the Sakrivier system closer to Kenhardt.

Pan sediments in Bushmanland have also recently yielded interesting Pleistocene mammalian faunas in association with age-diagnostic archaeological material. Important fossil mammalian remains assigned to the Florisian Mammal Age (*c*. 300 000 – 12 000 BP; MacRae 1999) have recently been documented from stratigraphic units designated Group 4 to Group 6 (i.e. calcrete hardpan and below) at Bundu Pan, some 22 km northwest of Copperton (Kiberd 2006 and references therein). These are among very few Middle Pleistocene faunal records from stratified deposits in the southern Africa region (Klein 1980, 1984a, 1984b, 2000) and are therefore of high palaeontological significance. Characteristic extinct Pleistocene species recorded at Bundu Pan are the giant Cape Horse or Zebra (*Equus capensis*) and the Giant Hartebeest (*Megalotragus priscus*). Other extant to extinct taxa include species of warthog, blesbok, black wildebeest, springbok and baboon. There is additionally trace fossil evidence for hyaenids (tooth marks) as well as ostrich egg shell. Preliminary dating and the inferred ecology of the fossil taxa present suggests the presence of standing water within a grassy savanna setting during the 200 - 300 000 BP interval when the Bunda Pan faunal assemblage accumulated. A sequence of Earlier, Middle and Later Stone Age (ESA, MSA and LSA, respectively) artefact assemblages is also recorded from this site. Stratigraphic Groups 4 to 6 (*i.e.* calcrete hardpan and below) contain a Final Acheulian or transitional ESA/MSA artefact assemblage, while Groups 2 - 3 above the calcrete horizon contain a MSA artefact assemblage. Orton (2012) recorded a single fossil equid tooth associated with a rich MSA artefact assemblage from gravels overlying a calcrete hardpan on the farm Hoekplaas near Copperton. This horizon is probably equivalent to Group 3 of Kiberd's stratigraphy at Bundu Pan, and therefore somewhat younger than the Florisian mammal fauna reported there.

The fossil record of the Kalahari Group as a whole is generally sparse and low in diversity; no fossils are recorded here in the Kenhardt geology sheet explanation by Slabbert *et al.* (1999). The Gordonia Formation dune sands were mainly active during cold, drier intervals of the Pleistocene Epoch that were inimical to most forms of life, apart from hardy, desert-adapted species. Porous dune sands are not generally conducive to fossil preservation. However, mummification of soft tissues may play a role here and migrating lime-rich groundwaters derived from underlying lime-rich bedrocks may lead to the rapid calcretisation of organic structures such as burrows and root casts. Occasional terrestrial fossil remains that might be expected within this unit include calcretized rhizoliths (root casts) and termitaria (*e.g. Hodotermes*, the harvester termite), ostrich egg shells (*Struthio*), tortoise remains and shells of land snails (*e.g. Trigonephrus*) (Almond in Macey *et al.* 2011, Almond & Pether 2008). Other fossil groups such as freshwater bivalves and gastropods (*e.g. Corbula, Unio*), ostracods (seed shrimps), charophytes (stonewort algae), diatoms (microscopic algae within siliceous shells) and stromatolites (laminated microbial limestones) are associated with local watercourses and pans. Microfossils such as diatoms may be blown by wind into nearby dune sands (Du Toit 1954, Dingle *et al.,* 1983). These Kalahari fossils (or subfossils) can be expected to occur sporadically but widely, and the overall palaeontological sensitivity of the

Gordonia Formation is therefore considered to be low. Underlying calcretes might also contain trace fossils such as rhizoliths, termite and other insect burrows, or even mammalian trackways. Mammalian bones, teeth and horn cores (also tortoise remains, and fish, amphibian or even crocodiles in wetter depositional settings) may be expected occasionally expected within Kalahari Group sediments and calcretes, notably those associated with ancient alluvial gravels (See Koa River Valley above). The younger (Pleistocene to Recent) fluvial and alluvial sands and gravels within the proposed development area are unlikely to contain many, if any, substantial fossil or subfossil remains.

Table 10.1: Fossil heritage recorded from the major rock units that are represented within the broader Scatec Solar study area near Kenhardt

GEOLOGICAL UNIT	ROCK TYPES AND AGE	FOSSIL HERITAGE	PALAEONT-OLOGICAL SENSITIVITY
LATE CAENOZOIC SUPERFICIAL SEDIMENTS, especially ALLUVIAL AND PAN SEDIMENTS	fluvial, pan, lake and terrestrial sediments, including diatomite (diatom deposits), pedocretes (*e.g.* calcrete), colluvium (slope deposits such as scree), aeolian sands (Gordonia Formation, Kalahari Group) LATE TERTIARY, PLEISTOCENE TO RECENT	bones and teeth of wide range of mammals (*e.g.* mastodont proboscideans, rhinos, bovids, horses, micromammals), fish, reptiles (crocodiles, tortoises), ostrich egg shells, fish, freshwater and terrestrial molluscs (unionid bivalves, gastropods), crabs, trace fossils (*e.g.* calcretised termitaria, horizontal invertebrate burrows, stone artefacts), petrified wood, leaves, rhizoliths, stromatolites, diatom floras, peats and palynomorphs.	GENERALLY LOW BUT LOCALLY HIGH (*e.g.* Tertiary alluvium associated with old river courses)
Basement granites and gneisses NAMAQUA-NATAL PROVINCE	Highly-metamorphosed sediments, intrusive granites MID-PROTEROZOIC (*c*.1- 2 billion years old)	None	ZERO

10.4 APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

All South African fossil heritage, including palaeontological sites and specimens, is protected by law (National Heritage Resources Act (Act25 of 1999) and fossils cannot be collected, damaged, destroyed or disturbed without a permit from SAHRA or the relevant Provincial Heritage Resources Agency.

As previously mentioned, where palaeontological mitigation of a development project is required, the palaeontologist concerned with mitigation work would need a valid fossil collection permit from SAHRA and any material collected would have to be curated in an approved depository (e.g. museum or university collection). All palaeontological specialist work should conform to international best practice for palaeontological fieldwork and the study (e.g. data recording fossil collection and curation, final report) should adhere as far as possible to the minimum standards for Phase 2 palaeontological studies recently developed by SAHRA (2013).

The present palaeontological heritage assessment falls under Sections 35 and 38 (Heritage Resources Management) of the National Heritage Resources Act (Act 25 of 1999), and it will also inform the Environmental Management Programme for this project.

The various categories of heritage resources recognised as part of the National Estate in Section 3 of the National Heritage Resources Act include, among others:

- geological sites of scientific or cultural importance;
- palaeontological sites; and
- palaeontological objects and material, meteorites and rare geological specimens.

According to Section 35 of the National Heritage Resources Act (Act 25 of 1999), dealing with archaeology, palaeontology and meteorites:

1) The protection of archaeological and palaeontological sites and material and meteorites is the responsibility of a provincial heritage resources authority.
2) All archaeological objects, palaeontological material and meteorites are the property of the State.
3) Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.
4) No person may, without a permit issued by the responsible heritage resources authority—
    i. destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
    ii. destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
    iii. trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or
    iv. bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.
5) When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedure in terms of section 38 has been followed, it may-
    a) serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;
    b) carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary;
    c) if mitigation is deemed by the heritage resources authority to be necessary, assist the person on whom the order has been served under paragraph (a) to apply for a permit as required in subsection (4); and
    d) recover the costs of such investigation from the owner or occupier of the land on which it is believed an archaeological or palaeontological site is located or from the person proposing to undertake the development if no application for a permit is received within two weeks of the order being served.

10.5 IDENTIFICATION OF KEY ISSUES

10.5.1 Key Issues Identified During the Scoping Phase

The only key issue identified by the specialist during the Scoping Phase is the potential loss of palaeontological heritage resources (fossils, fossil sites including their geological context) through surface clearance and excavations into sedimentary rocks during the construction phase of the project.

The Scoping Report was released for a 30-day comment period which extended from 25 September 2015 to 27 October 2015. The Addendum to the Scoping Report was also released for a 30-day comment period, extending from 6 October 2015 to 5 November 2015. To date, only one comment was raised by the SAHRA regarding impacts on palaeontological heritage posed by the proposed Scatec Solar development.

No further comments have been received in relation to palaeontological impacts.

The following comment was received from the SAHRA on 22 September 2015 (via SAHRIS) based on the review of the Background Information Document. It is important to note that only the points relating to palaeontological aspects have been extracted from the SAHRA comments and noted below:

- *The PalaeoSensitivity Map on SAHRIS (http://www.sahra.org.za/sahris/map/palaeo) indicates moderate palaeontological sensitivity for the proposed area. Therefore, the SAHRA Archaeology, Palaeontology and Meteorites Unit requires a desktop Palaeontological Impact Assessment to be undertaken to assess whether or not the development will impact upon palaeontological resources - or at least a letter of exemption from a Palaeontologist is needed to indicate that this is unnecessary. If the area is deemed sensitive, a full Phase 1 Palaeontological Impact Assessment will be required and if necessary a Phase 2 rescue operation might be necessary.*

As noted above, based on the low palaeontological sensitivity of the area, this desktop Palaeontological Impact Assessment is being undertaken during the EIA Phase (i.e. prior to the commencement of construction of the Kenhardt PV 3 project (subject to the issuing of an Environmental Authorisation)). As mentioned above, this specialist assessment is conducted by Dr. John Almond in order to assess the significance of potential impacts of the proposed project on palaeontological resources (which is discussed in Section 10.6 of this chapter).

10.5.2 Identification of Potential Impacts

The potential impacts identified during the EIA Phase are:

10.5.3 Construction Phase

- Potential loss of palaeontological heritage resources through disturbance, damage or destruction of fossils and fossil sites (including associated geological contextual data) through surface clearance and excavation activities during the construction phase.

10.5.4 Operational Phase

No significant impacts on palaeontological heritage are anticipated during the operational phase of the development.

10.5.5 Decommissioning Phase

No significant impacts on palaeontological heritage are anticipated during the decommissioning phase of the development.

10.5.6 Cumulative impacts

- Potential cumulative loss of palaeontological heritage resources through disturbance, damage or destruction of fossils and fossil sites (including associated geological contextual data) through surface clearance and excavation activities during the construction phase of several alternative energy facilities within the broader Kenhardt region and other key electrical infrastructure developments within a 20 km radius of the proposed project site.

10.6 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

In this section of the report potential impacts of the construction, operational and decommissioning phases of the proposed PV solar facility development on palaeontological heritage are outlined and recommendations for any necessary monitoring or mitigation are provided. Possible cumulative impacts in the light of other alternative energy development proposals in the Kenhardt region are also evaluated.

10.6.1 Potential Impact 1: Construction Phase

The construction phase of the proposed solar energy facility will entail substantial surface clearance and shallow excavations into the superficial sediment cover (aeolian sands, surface gravels, stream alluvium *etc.*), which may contain fossil remains, and in some cases also into the underlying unfossiliferous bedrock. These include, for example, surface clearance operations, excavations and foundations (which will likely be drilled and concreted into the ground) for the solar array footings, underground cables, access and internal gravel roads, 132 kV transmission line towers (which is being subjected to a separate Basic Assessment Process), on-site substation, laydown areas, stormwater channels, water pipelines and foundations for buildings (offices, operational control centre, warehouse/workshop). As a result, fossils at the ground surface or buried beneath it may be disturbed, damaged, destroyed or sealed-in while their scientifically informative sedimentary context will also be disturbed or destroyed.

Desktop analysis of the fossil records of the various rock units underlying the proposed project area indicates that the majority of these units are of zero to low palaeontological sensitivity (as discussed in Section 10.3.2 and Table 10.1 of this chapter). The basement rocks are entirely unfossiliferous while the overlying Late Caenozoic superficial sediments (wind-blown sands, alluvium, gravels *etc.*) are of low to very low palaeontological sensitivity. Construction of the solar panel arrays, overhead power lines, buildings and associated infrastructure is therefore unlikely to entail significant impacts on local fossil heritage resources.

The inferred impact of the proposed solar facility development on local fossil heritage is assessed in Table 10.2 below. This assessment applies only to the construction phase of the development since further impacts on fossil heritage during the operational and decommissioning phases of the solar energy facility are not anticipated.

The destruction, damage or disturbance out of context of fossils and fossil sites preserved at the ground surface or below ground represents a *direct negative* impact that is confined to the development footprint (*site specific*). Such impacts are made only during the construction period, and can usually be partially mitigated but cannot be fully rectified; *i.e.* they are *non-reversible* and of *permanent* duration. Since several of the sedimentary units represented within the study area do contain fossils of some sort, some level impact on fossil heritage is probable (*likely*). However, because of the generally very sparse occurrence of well-preserved, scientifically-valuable fossils within the superficial sediments, and because most of the fossils encountered are likely to be of widespread occurrence (low irreplaceability) the consequence of these impacts is rated as *slight*.

No previously recorded areas or sites of exceptional fossil heritage sensitivity or significance have been identified within the proposed project area as a whole. Due to the inferred scarcity of exceptional fossil remains within the study area, the overall impact significance of the construction phase of the proposed solar energy project is assessed as *VERY LOW* (without mitigation). Due to the paucity of palaeontological field studies within this part of Bushmanland, confidence levels for this desktop palaeontological heritage assessment are only moderate (medium).

Specialist palaeontological monitoring and mitigation for this project are not recommended, pending the discovery of new fossil sites during development, given its low impact significance. The Environmental Control Officer responsible for the construction phase of the project should be aware of the necessity of conserving fossils and should monitor all substantial excavations into sedimentary rocks for fossil remains. Proposed mitigation of chance fossil finds during the construction phase involves safeguarding of the fossils (preferably *in situ*) by the responsible Environmental Control Officer, reporting of finds to the SAHRA and, where appropriate, judicious sampling and recording of fossil material and associated geological data by a qualified palaeontologist (as discussed in Section 10.8 of this chapter). Should these recommended mitigation measures be fully implemented, the impact significance of the development would remain *VERY LOW* but small residual negative impacts (*e.g.* loss of undetected fossils) would remain. However, these negative impacts would be partially offset through the improved scientific understanding of local palaeontological heritage in a hitherto poorly-studied region of South Africa which would be considered as a significant *positive* outcome.

There are no fatal flaws in the proposed development proposal as far as fossil heritage is concerned.

10.6.2 Potential Impacts (Operational and Decommissioning Phases)

No significant impacts on fossil heritage resources are anticipated during the operational and decommissioning phases of the proposed solar energy facility.

10.6.3 Cumulative Impacts

The palaeontological heritage impact significance of all three solar energy developments and associated electrical infrastructure proposed by Scatec Solar, as well as other proposed solar facilities and electrical infrastructure (discussed in Chapter 4 of the EIA Report) near Kenhardt (within a 20 km radius of the proposed project) are rated equally as very low. The potentially fossiliferous sedimentary rock units represented within the broader project area are of widespread occurrence and this is also likely to apply to most of the fossils they contain. It is concluded that the cumulative impact on fossil heritage resources posed by the proposed solar facilities and associated electrical infrastructure to the northeast of Kenhardt is of a low significance.

Given the generally low palaeontological sensitivity of the basement and overlying sedimentary rocks in the broader eastern Bushmanland region, significant cumulative impacts on fossil heritage are not anticipated here as a result of the various alternative energy and other infrastructure developments that have been proposed here (refer to the several recent palaeontological impact assessments undertaken by the author for projects near Kenhardt that are listed in the references).

10.7 IMPACT ASSESSMENT SUMMARY

The assessment of impacts on palaeontological heritage resources as well as recommended mitigation and monitoring measures, as discussed above, are collated in Tables 10.2 and 10.3 below. The no-go option (no solar developments) will have a neutral impact on local palaeontological heritage resources.

Table 10.2: Impact assessment summary table for the Construction Phase

Construction Phase													
Direct Impacts													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Conse-quence**	**Probabi-lity**	**Reversibi-lity of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Surface clearance and excavations into superficial sediments	Loss of fossil heritage at or beneath ground surface	Negative	Site	Permanent	Slight	Likely	Non-reversible	Low	• Undertake monitoring of all substantial excavations into sedimentary rocks for fossil remains and safeguard any finds in situ. • Appoint a professional palaeontologist to record and sample any chance fossil finds	Very low	Very low	5	Medium

Table 10.3: Cumulative impact assessment summary table

Cumulative Impacts													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Conse-quence**	**Probab-ility**	**Reversibi-lity of Impact**	**Irreplace-ability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Surface clearance and excavations into superficial sediments	Loss of fossil heritage at or beneath ground surface	Negative	Site	Permanent	Slight	Likely	Non-reversible	Low	• Undertake monitoring of all substantial excavations into sedimentary rocks for fossil remains and safeguard any finds in situ. • Appoint a professional palaeontologist to record and sample any chance fossil finds	Very low	Very low	5	Medium

10.8 INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME

Given the low palaeontological sensitivity of the proposed project area, as determined from desktop analysis, as well as the inferred very low impact significance of the alternative energy projects for fossil heritage conservation, no specialist palaeontological monitoring or mitigation is recommended here, pending the discovery of substantial new fossil remains during construction.

During the construction phase all substantial bedrock excavations should be monitored for fossil material by the responsible Environmental Control Officer. Should significant fossil remains - such as vertebrate bones and teeth, plant-rich fossil lenses, petrified wood or dense fossil burrow assemblages - be exposed during construction, the responsible Environmental Control Officer should safeguard these, preferably *in situ*. The SAHRA should be alerted as soon as possible (Contact details: Mrs Colette Scheermeyer, P.O. Box 4637, Cape Town 8000, Tel: 021 462 4502, Email: cscheermeyer@sahra.org.za), so that appropriate action can be taken by a professional palaeontologist, at the developer's expense. Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (*e.g.* stratigraphy, sedimentology, taphonomy) by a professional palaeontologist.

The palaeontologist concerned with mitigation work will need a valid fossil collection permit from SAHRA and any material collected would have to be curated in an approved depository (*e.g.* museum or university collection). All palaeontological specialist work should conform to international best practice for palaeontological fieldwork and the study (*e.g.* data recording fossil collection and curation, final report) should adhere as far as possible to the minimum standards for Phase 2 palaeontological studies recently developed by SAHRA (2013).

No monitoring of mitigation is required during the operational and decommissioning phases of the development.

These mitigation recommendations (as summarised in Part B of the EIA Report) should be incorporated into the Environmental Management Programme for each Solar PV energy facility proposed by Scatec Solar.

10.9 CONCLUSION AND RECOMMENDATIONS

The preferred project area for the PV facility is underlain at depth by Precambrian basement rocks (c. 1-2 billion years old) assigned to the Namaqua-Natal Province. These ancient igneous and high-grade metamorphic rocks - mainly granites and gneisses of the Keimoes Suite and Jacomynspan Group - crop out at surface in small areas and are entirely unfossiliferous. A large proportion of the basement rocks are mantled by a range of superficial sediments of Late Caenozoic age that may contain sparse fossil remains. These predominantly thin, unconsolidated deposits include small patches of calcretes, gravelly to sandy river alluvium, pan sediments, surface gravels, colluvium (scree) as well as Pleistocene to Recent wind-blown sands of the Gordonia Formation (Kalahari Group). Most of these younger rock units are of widespread occurrence and low palaeontological sensitivity. Scientifically important vertebrate fossil remains (*e.g.* Pleistocene mammalian bones and teeth) have been recorded within older stratified pan and river sediments elsewhere in the Bushmanland region where they are often associated with stone artefacts, while a limited range of trace fossils (*e.g.* plant root casts, termitaria and other invertebrate burrows) may be found within calcrete horizons.

No previously recorded areas or sites of exceptional fossil heritage sensitivity or significance have been identified within the Scatec Solar project area as a whole. Due to the inferred scarcity of scientifically important fossil remains within the PV 3 study area, the overall impact significance of the construction phase of the proposed solar energy project is assessed as VERY LOW (before and after mitigation). No significant impacts on fossil heritage are anticipated during the operational and decommissioning phases of the proposed solar energy facility. The potentially fossiliferous sedimentary rock units represented within the study area (*e.g.* Gordonia sands, calcrete) are of widespread occurrence and this is also likely to apply to most of the fossils they contain. It is concluded that the cumulative impacts on fossil heritage resources posed by the known alternative energy and other infrastructural developments (as explained in Chapter 4 of the EIA Report) in the region is of very low significance. There are no fatal flaws in the proposed solar facility development, nor are there objections to its authorisation as far as fossil heritage conservation is concerned, since significant impacts on scientifically valuable fossils or fossil sites are not anticipated here. The only proposed condition to accompany environmental authorisation is that the recommendations for monitoring and mitigation included in the EMPr are fully complied with. The no-go option (no solar developments) will have a neutral impact on local palaeontological heritage resources.

Given the low palaeontological sensitivity of the eastern Bushmanland region, as determined from desktop and field-based studies, as well as the inferred very low impact significance of the Kenhardt PV 3 75 MW Solar PV Facility for fossil heritage conservation, no specialist palaeontological monitoring or mitigation is recommended here, pending the discovery of substantial new fossil remains during construction. Mitigation measures and monitoring recommendations for inclusion in the EMPr are discussed in Sections 10.6 and 10.8 of this report.

In this report the entire site (preferred) for Kenhardt PV 3 75 MW Solar PV Facility on the remaining extent of Onder Rugzeer Farm 168 has been assessed based on the worst case scenario. From a palaeontological heritage impact point of view, the applicant can select any 250 ha area within the surveyed area to build the PV plant, provided that the recommended mitigation measures are implemented as applicable.

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EIA REPORT

CHAPTER 11:

Geohydrological Assessment

Scoping and **Environmental Impact Assessment** for the Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province

Report prepared for:	*Report prepared by*:
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March 2016

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS

Requirements of Appendix 6 - GN R982	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Appendix A of the EIA Report
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix B of the EIA Report and Section 11.1.1.7 of this chapter.
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 11.1.2 and Section 11.1.3
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 11.6.1
e) a description of the methodology adopted in preparing the report or carrying out the specialised process;	Section 11.1.2, Section 11.1.3 and Section 11.6.1
f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;	Section 11.2 and Section 11.3
g) an identification of any areas to be avoided, including buffers;	Section 11.3
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Appendix 11.A
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 11.1.5
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	Section 11.6
k) any mitigation measures for inclusion in the EMPr;	Section 11.6, Section 11.7 and Section 11.8
l) any conditions for inclusion in the environmental authorisation;	Section 11.9
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 11.6, Section 11.7 and Section 11.8
n) a reasoned opinion- i. as to whether the proposed activity or portions thereof should be authorised; and ii. if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 11.9
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 11.6
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Sections 11.5 and 11.6
q) any other information requested by the competent authority.	Not applicable at this stage

list of abbreviations

Bh	borehole
ch	collar height
EC	electrical conductivity
EIA	environmental impact assessment
GEOSS	Geohydrological & Spatial Solutions International (Pty) Ltd.
GIS	geographic information system
Ha	hectare
L/s	liters per second
m	meters
mm/a	millimetres per annum
mS/m	millisiemens per meter
MAP	mean annual precipitation
mbch	metres below collar height
mbgl	metres below ground level
mg/L	millgrams per metre
mV	millivolts
NGA	national groundwater achieve
ORP	oxygen reduction potential
TDS	total dissolved solids
temp	temperature
WL	water level
WP	wind pump

glossary

Definitions	
Aquifer	A geological formation that has structures or textures that hold water or permit appreciable water movement through them.
Borehole	includes a well, excavation, or any other artificially constructed or improved groundwater cavity which can be used for the purpose of intercepting, collecting or storing water from an aquifer; observing or collecting data and information on water in an aquifer; or recharging an aquifer [from National Water Act (Act No. 36 of 1998)].
DRASTIC	An acronym for a groundwater vulnerability assessment methodology: D = depth to groundwater / R = recharge/ A = aquifer media type / S = soil type / T = topography / I = impact of the unsaturated zone / C = hydraulic conductivity. The methodology uses a rating and weighting approach and was developed by the Environmental Protection Agency (USA)
Fractured aquifer	Fissured and fractured bedrock resulting from decompression and/or tectonic action. Groundwater occurs predominantly within fissures and fractures.
Groundwater	Water found in the subsurface in the saturated zone below the water table or piezometric surface i.e. the water table marks the upper surface of groundwater systems.
Intergranular Aquifer	Generally unconsolidated but occasionally semi-consolidated aquifers. Groundwater occurs within intergranular interstices in porous medium. Typically occur as alluvial deposits along river terraces.
Intergranular and fractured aquifers	Largely medium to coarse grained granite, weathered to varying thicknesses, with groundwater contained in intergranular interstices in the saturated zone, and in jointed and occasionally fractured bedrock.
Vulnerability	The tendency or likelihood for contaminants to reach a specified position in the ground-water system after introduction at some location above the uppermost aquifer (National Research Council, 1993).

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11 GEOHYDROLOGICAL ASSESSMENT

This chapter presents the findings of the Geohydrological Assessment that was prepared by Mr. Julian Conrad and Mr. Charles Peek (Geohydrological and Spatial Solutions International (PTY) Ltd (GEOSS)) as part of the EIA for the proposed KENHARDT PV 3 project within the Northern Cape Province, South Africa.

11.1 INTRODUCTION AND METHODOLOGY

11.1.1 Introduction

As noted in Chapter 1 of this EIA Report, the proposed project includes the development of a 75 Megawatt (MW) Solar Photovoltaic (PV) Facility (referred to as KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168. The farm is located 30 km north-east of Kenhardt and 80 km south of Upington within the Kheis Local Municipality, Northern Cape Province (**Map 1, Appendix 11.A** of this chapter).

As explained in Chapter 1 of this EIA Report, the Project Applicant is proposing to develop:

- a 75 MW Solar PV power generation facility (KENHARDT PV 3) and associated electrical infrastructure (including a transmission line for the 75 MW facility); and
- the connection points to the Eskom Nieuwehoop Substation on the remaining extent of Portion 3 of Gemsbok Bult Farm 120.

The Project Applicant is also proposing to construct two other proposed 75 MW Solar PV facilities adjacent to the Kenhardt PV 3 facility, referred to as Kenhardt PV 1 and Kenhardt PV 2. These facilities are subject to separate EIA Processes.

As mentioned in Chapter 1 of this EIA Report, the proposed transmission line which will extend from the KENHARDT PV 3 plant to the Eskom Nieuwehoop Substation, as well as associated electrical infrastructure at the substation (including but not limited to an additional feeder bay(s), Busbar(s), transformer bay and extension to the platform at the substation), will be subject to a separate Basic Assessment Process, referred to as KENHARDT PV 3 – Transmission Line. A separate Geohydrological Assessment has been completed for the KENHARDT PV 3 – Transmission Line Basic Assessment project. The transmission lines and electrical infrastructure for the Kenhardt PV 1, PV 2 and PV 3 projects will be constructed within a single electrical corridor which will range from 300 m wide to 1 000 m wide extending from the Kenhardt PV 3 area all the way to the Eskom Nieuwehoop Substation. **It should be noted that the maps included in Appendix 11.A of this chapter show the KENHARDT PV 3 (preferred) site, as well as the proposed corridor of the transmission line for purpose of completeness. This specialist study (included as Chapter 11 of this EIA Report) only assesses the impact of the proposed KENHARDT PV 3 project (preferred site).**

Furthermore, the information regarding the proposed transmission line is indicatively indicated provided in this report. A detailed description of the transmission line corridor is provided and assessed separately in the Basic Assessment for the Kenhardt PV 3 – Transmission Line project.

The farm Onder Rugzeer 168 is situated alongside the farm Boven Rugzeer (Remaining Extent of Farm 169) and the proposed Eskom Nieuwehoop Substation, currently under construction.

The 75 MW Solar PV facility will cover an approximate area of 250 hectares (ha) and will be constructed in the vicinity of two other proposed 75 MW Solar PV facilities (i.e. Kenhardt PV 1 and

Kenhardt PV 2) (with a collective footprint of approximately 750 ha and a combined power generation capacity of 225 MW), also proposed by Scatec Solar.

An alternative site for the proposed KENHARDT PV 3 project (referred to as KENHARDT PV 3b) was considered during the Scoping Phase however only the preferred site (KENHARDT PV 3) has been assessed as part of this EIA Phase.

11.1.2 Scope and Objectives

As explained in Chapters 2 and 4 of this EIA Report, the Project Applicant intends to make use of existing boreholes to source groundwater (if available and if suitable) for the solar panel cleaning process. As a result, water pipelines may need to be constructed in order to transfer groundwater from existing boreholes to the proposed solar facility. The groundwater will be stored on site in suitable containers or reservoir tanks (or similar) during the operational phase.

One of the objectives of this Geohydrological Assessment is to confirm whether the groundwater is in fact sufficient and suitable for use (i.e. in terms of quality and quantity (i.e. borehole yields)). This study is therefore aimed at providing a clear indication of groundwater availability and suitability from existing boreholes. The outcome of this study will recommend whether pipelines are required for the transfer of water from the boreholes to the site.

The overall scope of this Geohydrological Assessment is to determine the impact of the proposed project on the surrounding geohydrology and any geohydrological features, as well as to recommend mitigation measures to reduce the significance of potential negative impacts.

For this specialist study, a desktop study was conducted based on existing maps and reports of the geology and geohydrology. Groundwater data, including groundwater level and groundwater quality data, was obtained from the National Groundwater Archive (NGA) for the area surrounding the proposed area. This was followed by a detailed field work component to inform this Geohydrological Assessment.

11.1.3 Terms of Reference

The Scope of Work is based on the following broad Terms of Reference, which have been specified for this specialist study on groundwater (i.e. this Geohydrological Assessment):

- Identify significant features or disturbances within the proposed project area and define any environmental risks in terms of geohydrology and the proposed project infrastructure;
- Conduct a desktop study and describe the existing environment in terms of geohydrology (including hydrogeological characterisation of aquifers (types, sensitivity, vulnerability), and groundwater (quality, quantity, use, potential for industrial or domestic use) in the area surrounding the proposed development;
- Conduct a fieldwork assessment to determine the location of any boreholes and to collect groundwater samples (where possible) to ascertain the water quality);
- Develop a sensitivity map indicating the presence of sensitive areas, "no-go" areas, setbacks/buffers, as well as the identification of red flags or risks associated with geohydrological impacts;
- Highlight any gaps in baseline data and provide a description of confidence levels;
- Assess potential direct, indirect and cumulative impacts resulting from the construction, operational and decommissioning phases of the proposed project on the surrounding geohydrology;
- Identify any relevant legal and permit requirements that may be required in terms of groundwater/geohydrological impacts likely to be generated as a result of the proposed project;

- Provide mitigation, monitoring and management measures in order to minimize any negative geohydrological impacts and enhance the positive impacts;
- Assess the consequences and significance of potential groundwater contamination; and
- If necessary, recommend groundwater management and monitoring for the proposed site.

11.1.4 Approach and Methodology

The specialist study was completed as follows:

Task 1: A desktop study and relevant literature review pertaining to the site was completed. Borehole data was searched for on the NGA and a project GIS was established.

Task 2: A site visit was completed on 28th and 29th September 2015. The field work included a hydrocensus, which extended to 1 km from the outline of the property boundaries. The objective of this task was three-fold:

1. To locate the NGA boreholes and complete a borehole assessment.
2. To locate boreholes not yet recorded on the NGA and complete assessments.
3. To collect anecdotal information from the land owners in the area as well as from discussions with the Department of Water and Sanitation (DWS) geohydrologists. It was essential to collect as much information as possible relating to groundwater quality, groundwater levels and borehole yields.

Task 3: All the data obtained from the desktop review and fieldwork was assessed and the impacts relating to the site evaluated.

Task 4: The findings of the investigation, potential risks, any potential mitigation measures, monitoring requirements as well as relevant recommendations have been included in a report. The impacts were assessed based on the methodology indicated in Chapter 4 of the EIA Report.

11.1.5 Assumptions and Limitations

The geohydrological appraisal is based on previous studies and available literature for the study area. The main assumptions are based on 1: 500 000 regional scale Geographic Information System (GIS) datasets and that the previous hydrogeological work completed was correct. However field work was carried out to assess the accuracy of the regional data sets. The main limitation is that no drill records or yield test data exists for boreholes or wind pumps drilled within the study area. It was also difficult to obtain the depth of the groundwater level in the area. Nonetheless these limitations have not negatively impacted the accuracy of the findings of this project.

In addition, for the geohydrological study, no cumulative impacts are anticipated (as this assessment recommends that groundwater is not suitable or sufficient for use) and this also takes into account other related projects in the area).

11.1.6 Source of Information

The geological information has been obtained from geological maps produced by the Council for Geoscience and Slabbert *et al*, 1999.

The groundwater related data and maps were obtained from the 1: 500 000 Hydrogeological map series of the Republic of South Africa (Department of Water Affairs and Forestry (DWAF), 2002).

The report compiled by GEOSS (2014) as part of the EIA for the adjacent Nieuwehoop Development was also reviewed and relevant information has been used in this report, as applicable.

From the field visit (completed on the 28th and 29th September 2015) the existing data sets were assessed and new data sourced. Data was collected on borehole/wind pump positions; depth to groundwater levels; and field chemistry (i.e. pH; temperature; electrical conductivity (EC); total dissolved solids (TDS); salinity and oxygen reduction potential (ORP)). The field data obtained from the site visit was useful as it enabled the assessment of the more regional existing data sets and provides valuable insights into the geohydrology of the area.

11.1.7 Declaration of Independence of Specialists

Refer to Appendix A of this EIA Report for the Curriculum Vitae of Mr. Julian Conrad and Mr. Charles Peek, which highlights their experience and expertise. The declaration of independence by the specialist is provided in **Box 11.1** below, with a complete declaration included in **Appendix B** of this EIA Report.

BOX 11.1: DECLARATION OF INDEPENDENCE

I, Julian Conrad, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed KENHARDT PV 3 Project, application or appeal in respect of which I was appointed, other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.

JULIAN CONRAD

11.2 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO GEOHYDROLOGICAL IMPACTS

It is important to note that a complete, detailed project description is provided in Chapter 2 of the EIA Report. As explained above, the Project Applicant intends to make use of existing boreholes to source groundwater (if available and if suitable) for the solar panel cleaning process. As a result, water pipelines may need to be constructed in order to transfer groundwater from existing boreholes to the proposed solar facility. In addition groundwater will need to be stored on site in suitable containers or reservoir tanks during the construction and operational phases.

Broadly speaking groundwater can be impacted two ways, namely:

- Over-abstraction (where groundwater abstraction exceeds recharge rates) which can result in the alteration of groundwater flow directions and gradients and even aquifer collapse.
- Quality deterioration (i.e. from anthropogenic activities negatively impacting groundwater quality).

For the proposed development of a 75 MW Solar PV Facility (KENHARDT PV 3), it is recommended that the **groundwater not be used (i.e. abstracted) within the study area**. This recommendation is based on the reasoning that the groundwater within the area is very limited and is saline. The groundwater quality does not meet SANS241-1: 2015 quality guidelines for cleaning of solar panels or human consumption. To verify this finding of the authors a cost – benefit analysis should be completed by the client (outside of this EIA Process).

There is currently limited groundwater abstraction taking place within the study area in the form of shallow boreholes installed mainly with wind pumps. However there is one borehole equipped with an electric submersible solar pump (see Appendix 11.B). The groundwater is being used in the region for livestock watering only. The low rainfall and high evapotranspiration rates within the study area are a limiting factor for the recharge of the aquifer underling the study area (which is described in Section 11.3 of this chapter). Over abstraction of groundwater during the construction phase and operational phase may lead to a decrease in groundwater levels and impacting of the aquifer. The groundwater within the study area is not suitable for use (i.e. in terms of quality).

For the operation of the proposed plant 4 to 6 million litres of water is required per annum for the panel washing process. This equates to 0.13 to 0.19 L/s (pumped on a continuous basis). This demand can possibly be met by drilling 4 to 6 additional boreholes. However the assurance of yield is low. In addition the groundwater will have to be desalinated prior to use and brine disposal is always problematic as it is considered hazardous waste (even though the quantities will be very small). The brine either has to be removed to a hazardous landfill or disposed of in evaporation ponds constructed with expensive multi-layered impermeable lining. Thus a cost-benefit analysis will be provide the final answer, however it is of the authors opinion that the use of groundwater is not a viable option. Therefore, water should be sourced from the municipality instead. Water tanks will need to be used to store the water from the municipality. In this regard, there will be generally about 5 to 10 x 10,000 litre tanks per site. If the Municipality supplies water then the following logistics are anticipated to apply:

- Construction - 1 trip every 2 days for 7 months; and
- Operations – 2 trips a month.

As such, pipelines do not need to be constructed for the transfer of water from the boreholes to the site, as groundwater abstraction is not proposed.

The proposed project (KENHARDT PV 3) and its associated activities can potentially impact the groundwater quality of the aquifer, although the probability of this occurring is extremely low. Possible contamination sources include contaminated storm water outflows, vehicle oil spillage and fuel leakage, and from the construction of temporary labour accommodation.

11.3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

11.3.1 Rainfall and Temperature

Kenhardt normally receives approximately 70 mm of rain per year, with most rainfall occurring mainly during autumn. **Figure 11.1a** shows the average rainfall values for Kenhardt per month. It typically receives the lowest rainfall (0 mm) in June and the highest (23 mm) in March. The monthly distribution of average daily maximum temperatures (**Figure 11.1b**) shows that the average midday temperatures for Upington range from 19°C in June to 33°C in January. The region is the coldest during June and July.

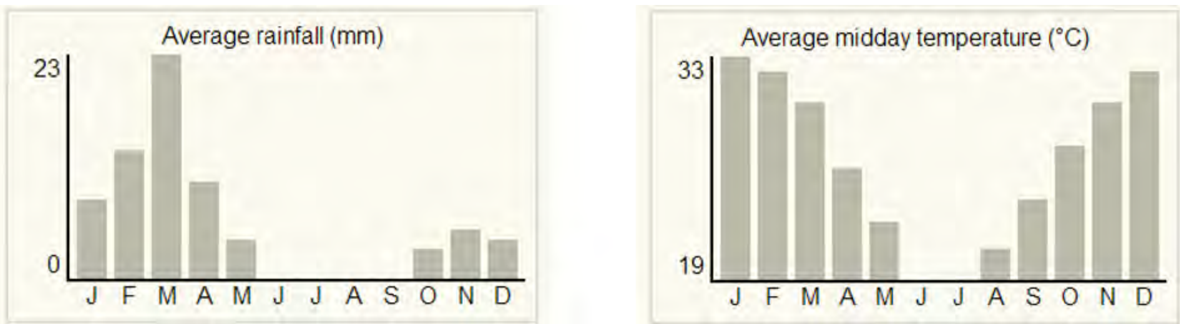

Figure 11.1a and 11.1b: Rainfall and average midday temperature for Kenhardt
(http://www.saexplorer.co.za)

The monthly distribution of rainfall and evaporation for the remaining extent of Onder Rugzeer Farm 168 is shown in **Figure 11.2.** The area receives approximately 71 mm of rainfall per year and because it receives most of its rainfall during autumn it has a semi-arid to arid climate. It receives the lowest rainfall between July to September (0 mm) and the highest in March (autumn). The long-term average annual evapo-transpiration rate is in approximately 2 790 mm/a. The relevance of this information is that the rainfall occurs whilst temperatures are quite high and therefore associated evaporation rates will be high. This implies that groundwater recharge will be very low. **Figure 11.2** shows the long term monthly rainfall and evapo-transpiration distribution respectively.

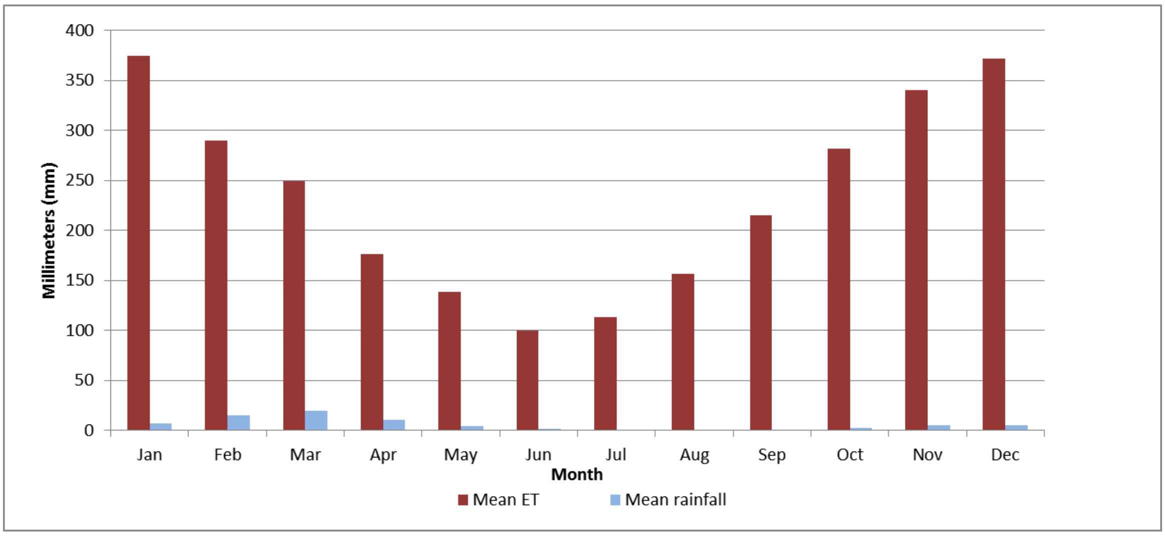

Figure 11.2: Long term average rainfall and evapo-transpiration (ET) (Schulze *et al*., 2008)

11.3.2 Regional Geology

The Geological Survey of South Africa (now the Council for Geoscience) has mapped the area at 1:250 000 scale (2920 - Kenhardt). The geological setting is shown in **Map 3** (**Appendix 11.A**). The main geology of the area is listed in **Table 11.1**. The formations occurring within the study area are indicated shaded in **Table 11.1**.

The oldest rocks in the area comprise of metamorphic gneisses (altered granite) which belong to the Jacomyns Pan Formation (Mja). The Jacomyns Pan Formation is also part of the Jacomyns Pan Group. These rocks mainly occur in the northern and central portion of the study area and are presumed to be bedrock. The study area is both overlain by wind-blown sand (Qg) of the Gordonia Formation. The Gordonia Formation is part of the Kalahari Group. The stream channels are filled with alluvial material (Slabbert et al., 1999).

Two structural features are indicated as faults on the map sheet that trend in a north-west to south-east direction. The structural features intersect the study area for KENHARDT PV 3 (preferred site) on the south-west border.

Table 11.1: Geological description of the geological formations found within the study area

SYMBOL	NAME	GROUP	DESCRIPTION
Qg	Gordonia Formation	Kalahari	Wind-blown dunes
Mks	Klip koppies granite	Keimoes suite	Grey, fine to medium grained porphyritic granite
Mb	Brussel granite	Keimoes suite	Grey, fine to medium grained porphyritic granite
Me	Elsie se goria granite	Keimoes suite	Grey, medium grained granite, well-foliated.
Mva	Valsvei	Biesje poort	Yellow weathered, medium grained quarzitic gneiss with lenses of calc-silcate politic gneiss
Msa	Sandputs	Biesje poort	Grey to brown, fine grained weather calc-bearing quartzite
Mja	Jacomyns pan	Jacomyns pan	Pelitic gneisses with quartzite, leuco-gneiss, amphibolite and calc-silcate rocks.
Mke	Kenhardt migmatiet	Metamorphic suite	Migmatitic biotite gneiss, amphibolite, leucogneiss and porphyroblastic biotite.

11.3.3 Regional Hydrogeology

According to the 1:500 000 scale groundwater map of Prieska (2920) the entire study area does host an intergranular and fractured aquifer (i.e. the wind-blown sands and river alluvium as well as fractures within the bedrock constitutes an aquifer) with an average borehole yield of 0.1 L/s to 0.5 L/s (**Map 4, Appendix 11.A**).

With such a low rainfall in the area, and thus associated low groundwater recharge conditions, it is anticipated that the groundwater quality will be poor. The regional 1:500 000 groundwater quality maps (**Map 5, Appendix 11.A**) indicate, using Electrical Conductivity (EC) as a groundwater quality indicator, that the EC ranges from 300 – 1 000 milliSiemens per meter (mS/m) within the study area. In terms of domestic supply this is classified as "poor" to "completely unacceptable". It cannot be used for irrigation or for the washing down of solar panels (unless treated (i.e. desalinated)) as it will leave a salty deposit on the panels. It is recommended that the groundwater not be used (i.e. abstracted) within the study area as a result of its saline nature and unsuitable quality. This is not considered a fatal flaw, as it simply means that alternate water supply needs to be sourced to fulfil the construction and operational water requirements. As noted in Chapter 2 of this EIA Report, the panel washing process will require approximately 4 million to 6 million litres of water per year during operations. As noted in Chapter 2 of this EIA Report, if the groundwater is not sufficient or suitable for use, water will then be sourced from the municipal supply (i.e. delivery via water tankers).

The national scale groundwater vulnerability map, which was developed according to the DRASTIC methodology (Aller et al, 1987) and modified to South African conditions (Parsons and Conrad, 1993 and DWAF, 2005), classifies the area as essentially having a "medium" vulnerability to surface based contaminants (**Map 6**, **Appendix 11.A**). The DRASTIC method (Aller et al, 1987) takes into account the following factors:

D	=	depth to groundwater	(5)
R	=	recharge	(4)
A	=	aquifer media	(3)
S	=	soil type	(2)
T	=	topography	(1)
I	=	impact of the vadose zone	(5)
C	=	conductivity (hydraulic)	(3)

The vulnerability index is based on a rating and weighting approach. The number indicated in parenthesis at the end of each factor description is the weighting or relative importance of that factor.

However this assessment is based on national scale mapping. Based on the local conditions at the study area there is a very low risk of surface to groundwater contamination in this area. The surface to groundwater is relatively deep and the rock type is classified a poor aquifer media (low porosity).

From a groundwater perspective there are no areas that need to be avoided during the construction and operational phases of this project. The fact that no-go areas and associated buffers are not applicable to this project is due to the very limited occurrence of groundwater within the study area. There are no clearly defined recharge or discharge areas and no groundwater dependent ecosystems occur within the area. In addition there is currently limited groundwater abstraction within the study area, so protection zones do not need to be defined.

11.4 APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

If no groundwater abstraction is planned, no approvals or legislation is required in terms of this specific water use.

If a more detailed study is required by the client (outside the scope of this specialist study) to quantify groundwater characteristics of the area, then yield testing of current boreholes and a geophysical exploration study to locate additional areas of interest of groundwater potential will have to be completed. If the study concludes that groundwater abstraction from the secondary aquifer should be pursued and successful boreholes are drilled, and the resultant yield proven to be viable, a Water Use Licence will be required from the DWS (in terms of Section 21a of the National Water Act (Act 36 of 1998)), if the General Authorisation is exceeded.

11.5 KEY ISSUES

11.5.1 Key Issues Identified During the Scoping Phase

The potential groundwater issues identified during the Scoping Phase of this EIA Process included:

- Limited groundwater availability and potential usage;
- Poor groundwater quality; and
- Medium groundwater vulnerability to surface based contaminants as a result of construction and operational activities.

The Scoping Report was released for a 30-day comment period which extended from 25 September 2015 to 27 October 2015. The Addendum to the Scoping Report was also released for a 30-day comment period, extending from 6 October 2015 to 5 November 2015. To date, no comments and issues have been raised by I&APs in relation to groundwater resources or geohydrological impacts. The issues noted above were included in the Scoping Phase for consideration in the EIA Phase.

11.5.2 Identification of Potential Impacts

The following potential impacts (stated in no particular order) of the proposed project activities on groundwater and geohydrological resources are predicted and assessed in Section 11.6:

- Potential impact on the groundwater as a result of the construction of storage facilities and temporary labour accommodation during the construction phase;
- Potential impact of increased storm water outflows during the construction and operational phase; and
- Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages during the construction, operational and decommissioning phases.

Any construction activities such as the excavation and installation of foundations and piling (narrow diameter holes for foundation purposes) will have no impact on the groundwater of the site or region, as the groundwater level is approximately 12 mbgl.

The potential impacts identified during the EIA Phase are:

11.5.3 Construction Phase

- Potential impact on the groundwater as a result of the construction of storage yards and temporary labour accommodation;
- Potential impact of increased storm water outflows; and
- Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages.

11.5.4 Operational Phase

- Potential impact of increased storm water outflows; and
- Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages.

11.5.5 Decommissioning Phase

- Potential impact on groundwater quality as a result of accidental oil spillages and fuel leakages.

11.5.6 Cumulative impacts

- As it is not recommended (based on the findings of this study) to make use of the groundwater, this proposed development will have no cumulative impacts on groundwater.

11.6 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

11.6.1 Results of the Field Study

An initial desktop hydrocensus was completed using the NGA and a 1 km search radius was used for the boundaries. The NGA database indicated no boreholes are present within the study area.

Despite the findings of the desktop hydrocensus using the NGA data, during the field hydrocensus (conducted on 28 and 29 September 2015), the locations of the ten boreholes were identified within the study area (**Table 11.2**) (**Map 2, Appendix 11.A**). The site visit was completed a dry time of the year and in the spring season. Please note that groundwater conditions do not vary significantly in this region and a once-off visit is sufficient to characterize the groundwater conditions of the area. Consultation with the land owners is always important for site specific data and anecdotal information. Mr Strauss (the occupier of the site) was very helpful in this regard. No further comments have been received regarding the geohydrological study. As it has been stated there is limited seasonal variation (as explained in Section 11.3.1) and thus limited variation in groundwater levels occurs. The groundwater information can therefore be gathered indeterminate of the season.

The locations of ten boreholes identified within this study area are listed in **Table 11.2**. The borehole positions are shown in **Map 2 (Appendix 11.A**). Please note that the boreholes located during the September 2015 visit are referred to as “BH” (i.e. borehole).

Nine of the ten boreholes where found to be wind pumps and the groundwater was piped into storage dams. A Solar Pump was found to be installed at BH7 and the groundwater was piped to a storage dam. Groundwater levels where measured, where possible, and groundwater samples were collected and tested in the field to characterise the groundwater quality. The hydrocensus boreholes were found to be dry or to have very low yields (hence the use of wind pumps).

For the boreholes that could be sampled, the groundwater quality is classified as poor with EC measurements exceeding 300 mS/m according to the DWAF (1998) drinking water guidelines. Borehole BH7 was found to contain an EC of 1 030.8 mS/m, which is classified as “completely unacceptable”.

Also please note that GEOSS has previously worked in the area and groundwater data from that work (GEOSS, 2014) is also applicable to this project. Relevant information regarding borehole yields, borehole and groundwater depths and groundwater quality was also obtained from the landowner/occupier during a previous site visit conducted by GEOSS in 2014. It has been reported that borehole depths are typically between 60 – 120 m deep and fractures occur within the highly metamorphic rocks between two zones of 15 – 30 m and 100 – 120 m below ground (GEOSS, 2014). Please note that the GEOSS (2014) boreholes located are referred to as “HBH” (i.e. hydrocensus borehole) and the 2015 boreholes are referred to as “BH” (i.e. borehole) to differentiate between the data sets from the two site visits in 2014 and 2015.

A list of the boreholes locations and field chemistry from the 28th and 29th September 2015 visit is provided in **Table 11.2**.

Table 11.2: Hydrocensus boreholes (28 - 29 September 2015)

ID	Latitude	Longitude	WL (mbgl)	pH	Temp (C°)	EC (mS/m)	TDS (mg/L)	Salinity (mg/L)	ORP (mV)	Type	Comment
BH1	-29.20409	21.29679	Closed	7.49	19.3	300.2	2203	1780	145.6	WP	-
BH2	-29.20409	21.29679	Closed	7.78	17.8	300.1	2281	1850	147.9	WP	-
BH3	-29.223047	21.32389	Closed	7.8	17.9	350.2	2632	2160	118.1	WP	-
BH4	-29.233219	21.3153	Closed	7.99	18.5	296.3	2197	1780	73.9	WP	-
BH5	-29.270519	21.31655	Closed	-	-	-	-	-	-	WP	Pipe disappears underground – cannot find outlet
BH6	-29.27061	21.31848	Closed	-	-	-	-	-	-	WP	Pipe disappears underground – cannot find outlet
BH7	-29.27132	21.31855	12.102	7.13	25	1030.8	6669	5700	90.2	BH	Solar panel
BH8	-29.268721	21.32003	Closed	-	-	-	-	-	-	WP	Abandoned
BH9	-29.22345	21.26583	Closed	7.65	27	390.1	2385	1950	299	WP	Livestock
BH10	-29.187158	21.27478	Closed	-	-	-	-	-	-	WP	Inaccessible

It is important to note that the impacts documented in the following section relate to the preferred site (KENHARDT PV 3).

11.6.2 Groundwater impact as a result of the construction of storage yards and labour accommodation (Construction Phase)

Even if different positions are selected for the storage yards and housing facilities across the study area, the significance ratings provided will be the same for the construction phase. The reason for this is that the groundwater conditions, occurrence and importance essentially remains the same across the site for Kenhardt PV 3. The direct and indirect impacts are listed in Table 11.3.

These potential impacts are only applicable during the construction phase and possibly the decommissioning phase; however they are not applicable to the operational phase. However, this potential impact for the decommissioning phase has not been rated as it is believed to be of a very low significance and extremely unlikely in terms of probability.

The status of this impact is rated as neutral with a site specific spatial extent and short-term duration (i.e. the impact and risk will be experienced for less than 1 year). The consequence and probability of the impact is respectively rated as slight and extremely unlikely. The reversibility of the impact is rated as high and the irreplaceability is rated as low. The significance of the impact without the implementation of mitigation measures is rated as very low.

Management Actions

During the construction phase all reasonable measures must be taken to prevent soil and groundwater contamination. The main source of contamination will be from construction vehicles leaking oil or fuel, fuel storage and spillages that may occur whilst filling vehicles and machinery. During the construction phase, vehicles must be regularly serviced and maintained to check and ensure there are no leakages.

With effective implementation of these prevention / mitigation actions, the impact of the proposed project on groundwater is predicted to be of very low significance (even without the implementation of mitigation measures).

11.6.3 Groundwater impact as a result of increased Storm Water Outflows (Construction and Operational Phase)

The groundwater within the study area is very limited in occurrence; occurs at a depth of 12 m or greater; and is saline therefore not being utilised for human consumption. The low recharge rates; the significant thickness and low permeability of the unsaturated zone, implies this zone will have a high attenuation capacity. Thus the storm water requires no filtration or treatment prior to infiltration. It is highly unlikely that the storm water will be contaminated. Thus the proposed storm water outflows pose no risk to the groundwater of the site. The direct and indirect impacts are listed in **Table 11.3** and **Table 11.4**.

The status of this impact is rated as neutral with a site specific spatial extent and short-term duration (i.e. the impact and risk will be experienced for less than 1 year). The consequence and probability of the impact is respectively rated as slight and extremely unlikely. The reversibility of the impact is rated as high and the irreplaceability is rated as low. The significance of the impact without the implementation of mitigation measures is rated as very low.

Management Actions
Infiltration can have significant benefit to the environment in terms of groundwater quality and recharge. Good quality storm water will improve the quality of groundwater.

The impact of the proposed project on groundwater as a consequence of the presence of the storm water is predicted to be very low significance (without and with the implementation of mitigation measures).

11.6.4 Potential Impact on Groundwater Quality as a result of Accidental Oil Spillages or Fuel Leakages (Construction, Operational and Decommissioning Phases)

If there is an accidental oil spill or fuel leakage during the construction, operational or decommissioning phases, then the low permeability of the unsaturated zone will provide significant attenuation capacity. The status of this impact (for the construction, operation and decommissioning phases) is rated as neutral with a site specific spatial extent and short-term duration (i.e. the impact and risk will be experienced for less than 1 year). The consequence and probability of the impact are respectively rated as slight and extremely unlikely. The reversibility of the impact is rated as high and the irreplaceability is rated as low. The significance of the impact without the implementation of mitigation measures is rated as very low. The direct and indirect impacts are listed in **Table 11.3**; **Table 11.4** and **Table 11.5**.

Management Actions
A precautionary approach must be implemented and reasonable measures should be undertaken to prevent oil spillages and fuel leakages from occurring. During the construction phase, vehicles must be regularly serviced and maintained to check and ensure there are no leakages. Any engines that stand in one place for an excessive length of time must have drip trays. Diesel fuel storage tanks should be above ground on an impermeable surface in a bunded area. Construction vehicles and equipment should also be refuelled on an impermeable surface. A designated area should be established at the construction site camp for this purpose. If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilled material. Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes.

With effective implementation of these prevention / mitigation actions, the impact of the project on groundwater as a consequence of the presence of accidental oil spillages and fuel leakages is predicted to be of very low significance.

11.6.5 Cumulative Impacts

It is recommended that groundwater is not utilised as a source of water supply for the proposed project, due it its limited occurrence; low recharge rates and poor quality. Also the groundwater occurs at a depth of 12 m or greater and the unsaturated zone will have a high attenuation capacity. For these reasons the proposed development will have no cumulative impact on the groundwater resources of the area.

11.7 IMPACT ASSESSMENT SUMMARY

Table 11.3: Impact assessment summary table for the Construction Phase

Construction Phase													
Direct and Indirect Impacts													
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Duration	Consequence	Prob-ability	Revers-ibility of Impact	Irrepla-ceability	Potential Mitigation Measures	Significance of Impact and Risk		Ranking of Residual Impact/ Risk	Confi-dence Level
										Without Mitigation/ Manage-ment	With Mitigation/ Manage-ment (Residual Impact/ Risk)		
Construction of storage and labour accommodation yards	Ground-water contami-nation	Neutral	Site	Short-term	Slight	Extre-mely unlikely	High	Low	All reasonable measures must be taken to prevent soil and groundwater contamination. Vehicles to be correctly serviced	Very low	Very low	5	High
Stormwater outflows	Ground-water contami-nation	Neutral	Site	Short-term	Slight	Extre-mely unlikely	High	Low	All reasonable measures must be taken to prevent soil, storm water outflows and groundwater contamination	Very low	Very low	5	High
Accidental oil spillage / fuel leakage	Ground-water contamination	Neutral	Site	Short - term	Slight	Extre-mely unlikely	High	Low	Vehicles must be regularly serviced and maintained to check and ensure there are no leakages. Any engines that stand in one place for an excessive length of time must have drip trays.	Very low	Very low	5	High

Construction Phase													
Direct and Indirect Impacts													
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Duration	Consequence	Prob-ability	Revers-ibility of Impact	Irrepla-ceability	Potential Mitigation Measures	Significance of Impact and Risk		Ranking of Residual Impact/ Risk	Confi-dence Level
										Without Mitigation/ Manage-ment	With Mitigation/ Manage-ment (Residual Impact/ Risk)		
									Diesel fuel storage tanks should be above ground on an impermeable surface in a bunded area. Construction vehicles and equipment should also be refuelled on an impermeable surface. If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilled material. Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes.				

Table 11.4: Impact assessment summary table for the Operational Phase

OPERATIONAL PHASE													
DIRECT AND INDIRECT IMPACTS													
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Duration	Conse-quence	Probabi lity	Reversi-bility of Impact	Irreplace ability	Potential Mitigation Measures	Significance of Impact and Risk		Ranking of Residual Impact/ Risk	Confid-ence Level
										Without Mitigation/ Management	With Mitigation/ Management (Residual Impact/ Risk)		
Stormwater outflow impact on groundwater	Ground-water contam-ination	Neutral	Site	Short-term	Slight	Extrem ely unlikely	High	Low	All reasonable measures must be taken to prevent soil, storm water outflows and groundwater contamination	Very low	Very low	5	High
Accidental oil spillage / fuel leakage	Ground-water contami-nation	Neutral	Site	Short-term	Slight	Ex-tremely unlikely	High	Low	Vehicles must be regularly serviced and maintained to check and ensure there are no leakages. Any engines that stand in one place for an excessive length of time must have drip trays. Diesel fuel storage tanks should be above ground on an impermeable surface in a bunded area. Vehicles and equipment should also be refuelled on an impermeable surface. If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilled material. Proof of disposal (waste disposal slips or waybills) should be obtained	Very low	Very low	5	High

OPERATIONAL PHASE													
DIRECT AND INDIRECT IMPACTS													
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Duration	Conse-quence	Probability	Reversi-bility of Impact	Irreplace ability	Potential Mitigation Measures	Significance of Impact and Risk: Without Mitigation/ Management	Significance of Impact and Risk: With Mitigation/ Management (Residual Impact/ Risk)	Ranking of Residual Impact/ Risk	Confid-ence Level
									and retained on file for auditing purposes.				

Table 11.5: Impact assessment summary table for the Decommissioning Phase

Decommissioning Phase													
Direct and Indirect Impacts													
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Duration	Conse-quence	Probability	Reversi-bility of Impact	Irre-place-ability	Potential Mitigation Measures	Significance of Impact and Risk: Without Mitigation/ Management	Significance of Impact and Risk: With Mitigation/ Management (Residual Impact/ Risk)	Ranking of Residual Impact/ Risk	Confi-dence Level
Acciden-tal oil spillage / fuel leakage	Ground-water contami-nation	Neutral	Site	Short-term	Slight	Extremely unlikely	High	Low	Vehicles must be regularly serviced and maintained to check and ensure there are no leakages. Any engines that stand in one place for an excessive length of time must have drip trays. Diesel fuel storage tanks should be above ground on an impermeable surface in a bunded area. Vehicles and	Very low	Very low	5	High

Decommissioning Phase													
Direct and Indirect Impacts													
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Duration	Conse-quence	Probability	Reversi-bility of Impact	Irre-place-ability	Potential Mitigation Measures	Significance of Impact and Risk		Ranking of Residual Impact/ Risk	Confi-dence Level
										Without Mitigation/ Management	With Mitigation/ Management (Residual Impact/ Risk)		
									equipment should also be refuelled on an impermeable surface. If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilled material. Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes.				

11.8 INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAM

Measures need to be put in place to ensure that the groundwater is not contaminated. The following aspects are considered important:

- All vehicles and other equipment (generators etc.) must be regularly serviced to ensure they do not spill oil. Vehicles should be refuelled on paved (impervious) areas. If liquid product is being transported it must be ensured this does not spill during transit.
- Emergency measures and plans must be put in place and rehearsed in order to prepare for accidental spillage.
- Diesel fuel storage tanks must be above ground in a bunded area.
- Engines that stand in one place for an excessive length of time must have drip trays.
- Vehicle and washing areas must also be on paved surfaces and the by-products removed to an evaporative storage area or a hazardous waste disposal site (if the material is hazardous).

11.9 CONCLUSION AND RECOMMENDATIONS

The groundwater in the area is saline and not fit for human consumption or recommended for the cleaning of solar panels. There is limited groundwater abstraction occurring in the study area and in the broader area groundwater is being used for livestock watering only. The study area is located in a highly metamorphic geological setting. Metamorphic rocks rarely produce sufficient groundwater and are considered an effective barrier to groundwater flow. The poor potential for groundwater development is related to the low occurrence of fractured networks within the formations and low rainfall. The proposed activities have very low significance of impact (with the implementation of mitigation measures) with respect to groundwater.

The geohydrological investigation was assessed based on the worst case scenario (in terms of the larger project area assessed). With a very low significance impact to groundwater within the surveyed area, the site for the proposed 250 ha KENHARDT PV 3 (preferred) facility may be placed within the larger surveyed area on remaining extent of Onder Rugzeer Farm 168, provided that the recommended prevention measures are implemented as suggested. No specific conditions are required for inclusion in the environmental authorisation.

Groundwater is considered not a viable source of water for construction purposes, or domestic or industrial use based on groundwater quality data collected during the site assessment and also that no groundwater abstraction occurs in the study area except via wind pumps and one solar pump in the region.

Should the applicant want to determine the feasibility of groundwater as a source, or if the Project Applicant considers the use of municipal water too expensive to use during the construction phase, the applicant will need to have the boreholes yield tested according to the SANS guideline for borehole testing to assess their sustainable yield and a desalination plant is recommended for the removal of minerals from the saline groundwater (outside of this EIA Process). In addition a Water Use Licence will be required for the use of the groundwater, if the use exceeds the General Authorisation. If the conclusions of the authors are considered too rigid then a cost benefit analysis will assist with clarifying the way forward (outside of this EIA Process). The possible use of groundwater will have to be addressed as an entirely separate project, however all indications at this stage are that groundwater will not be used in the construction, operational or decommissioning phases of the proposed project.

From a groundwater perspective the proposed activity can be authorised and no specific measures are applicable other than all measures to prevent soil and groundwater contamination, especially by hydrocarbons, must be in place.

11.10 REFERENCES

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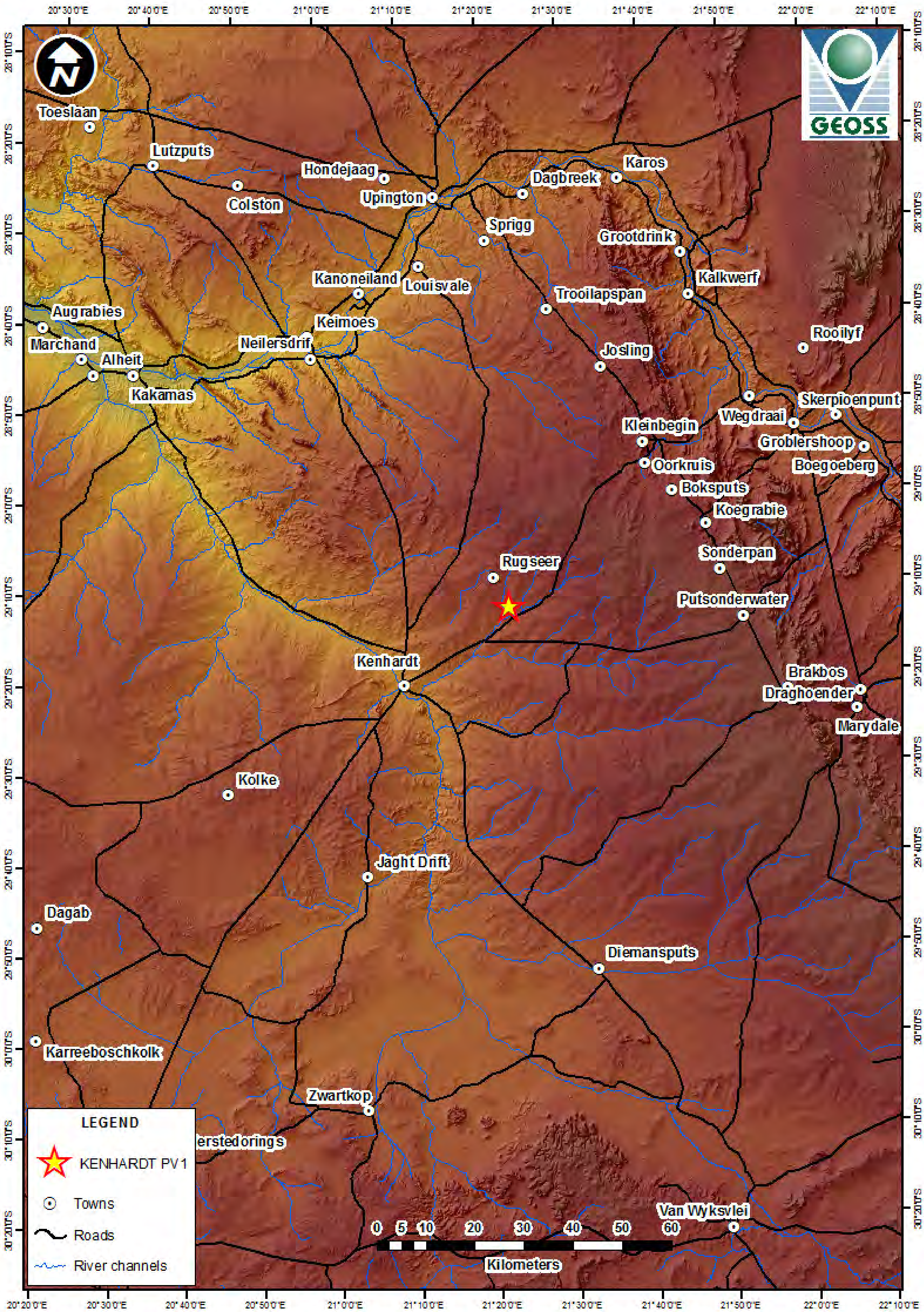
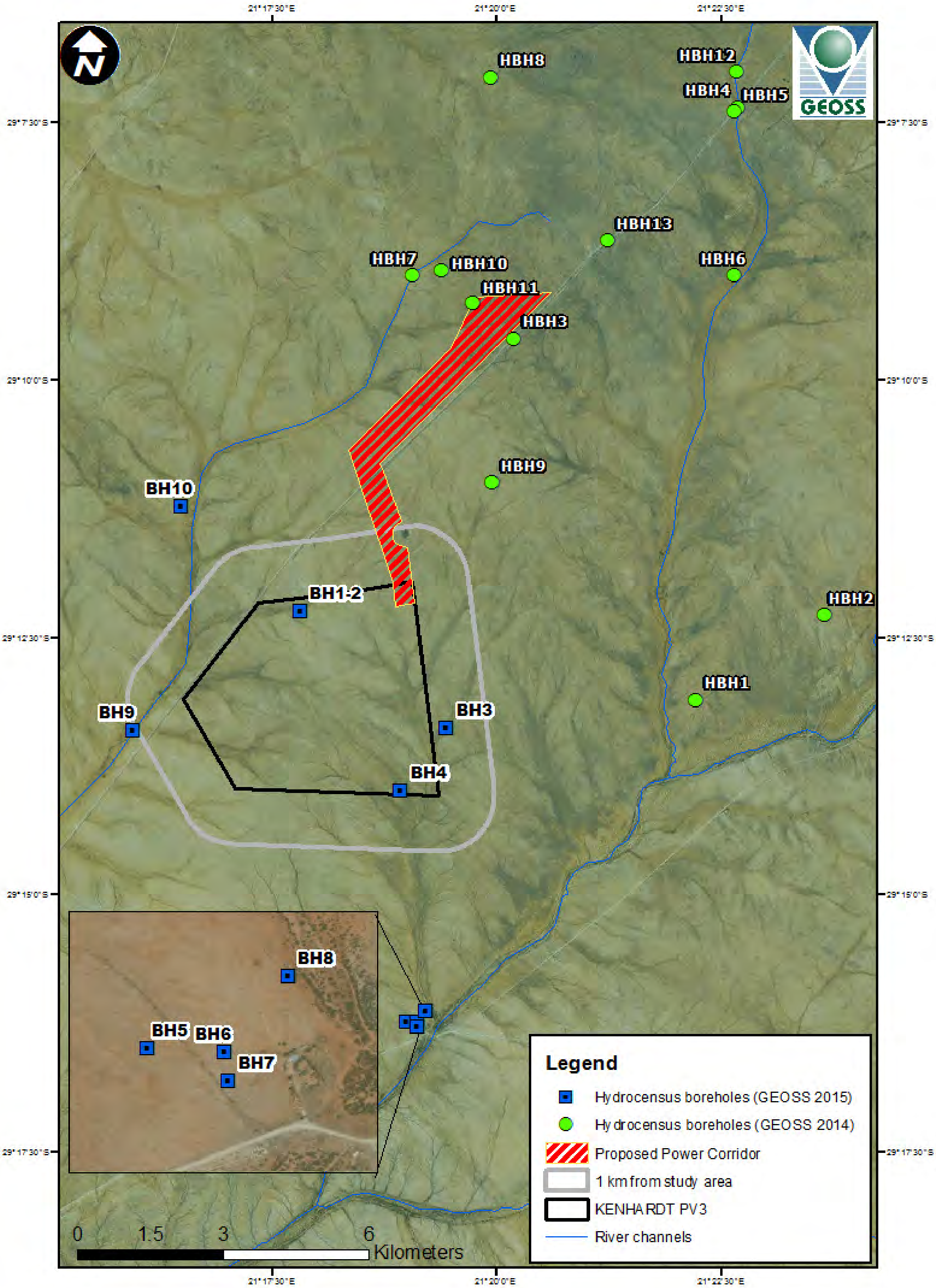
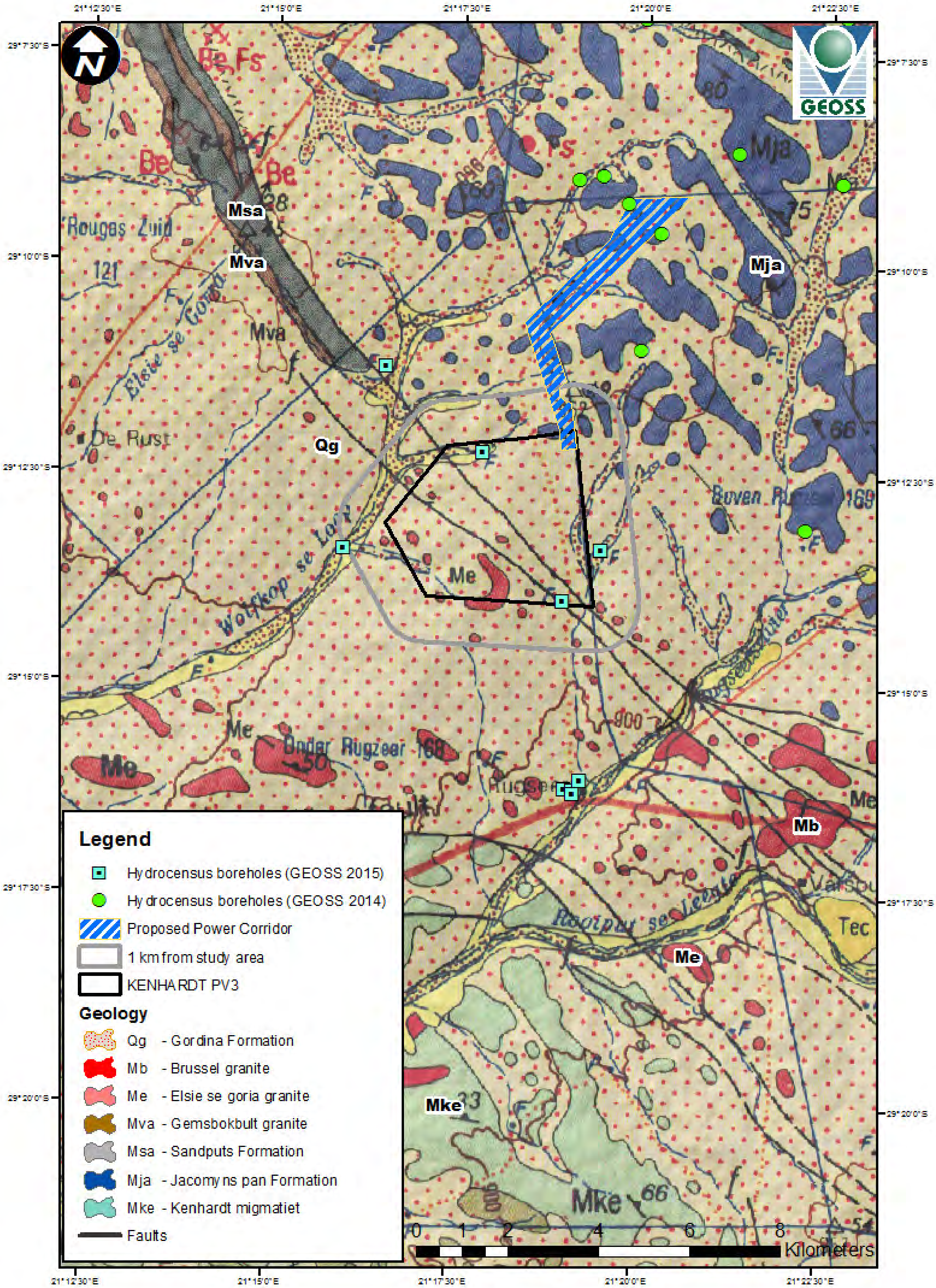
APPENDICES 11.A: MAPS



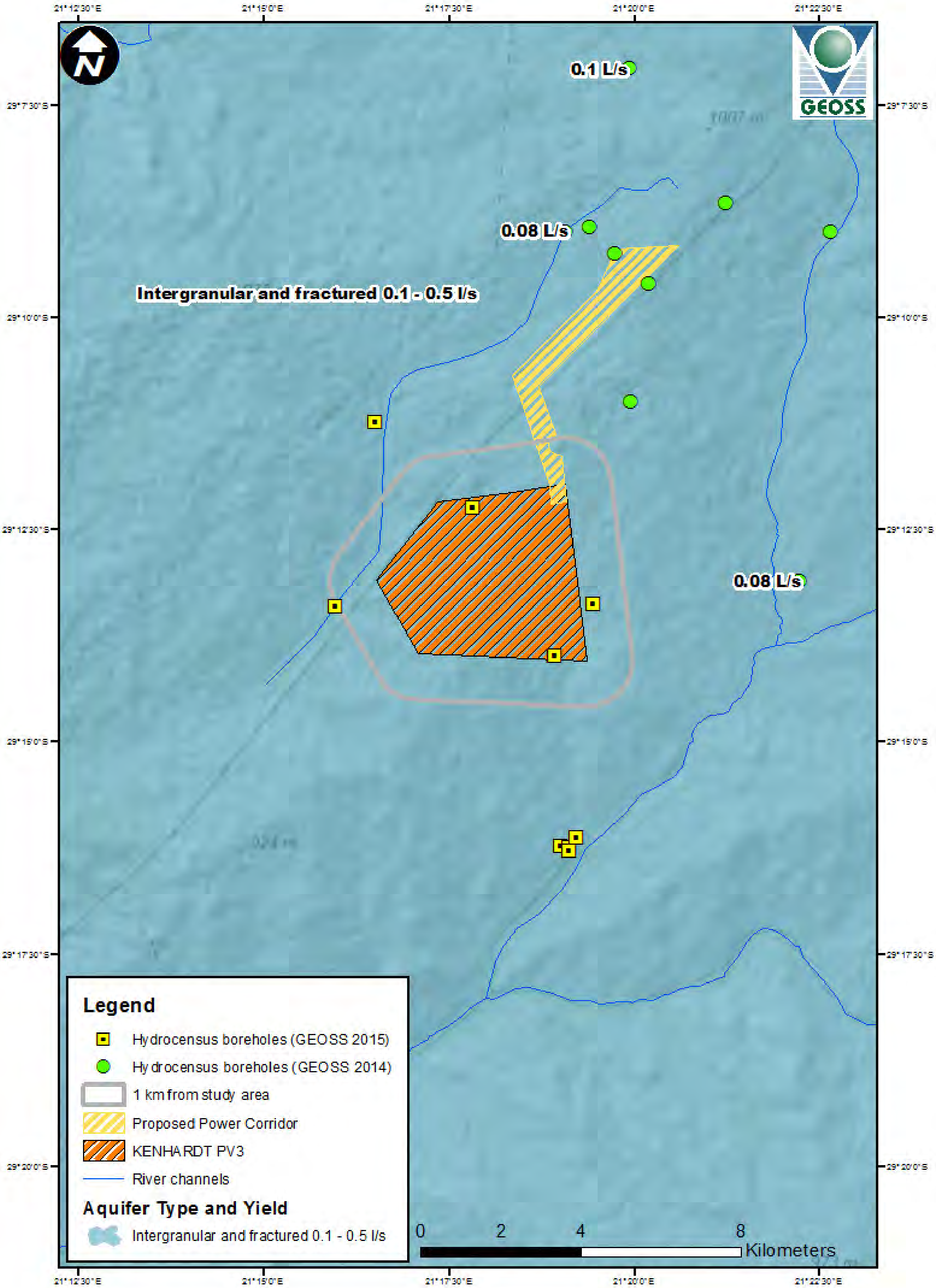
Map 1: Locality map of the study area within a regional setting



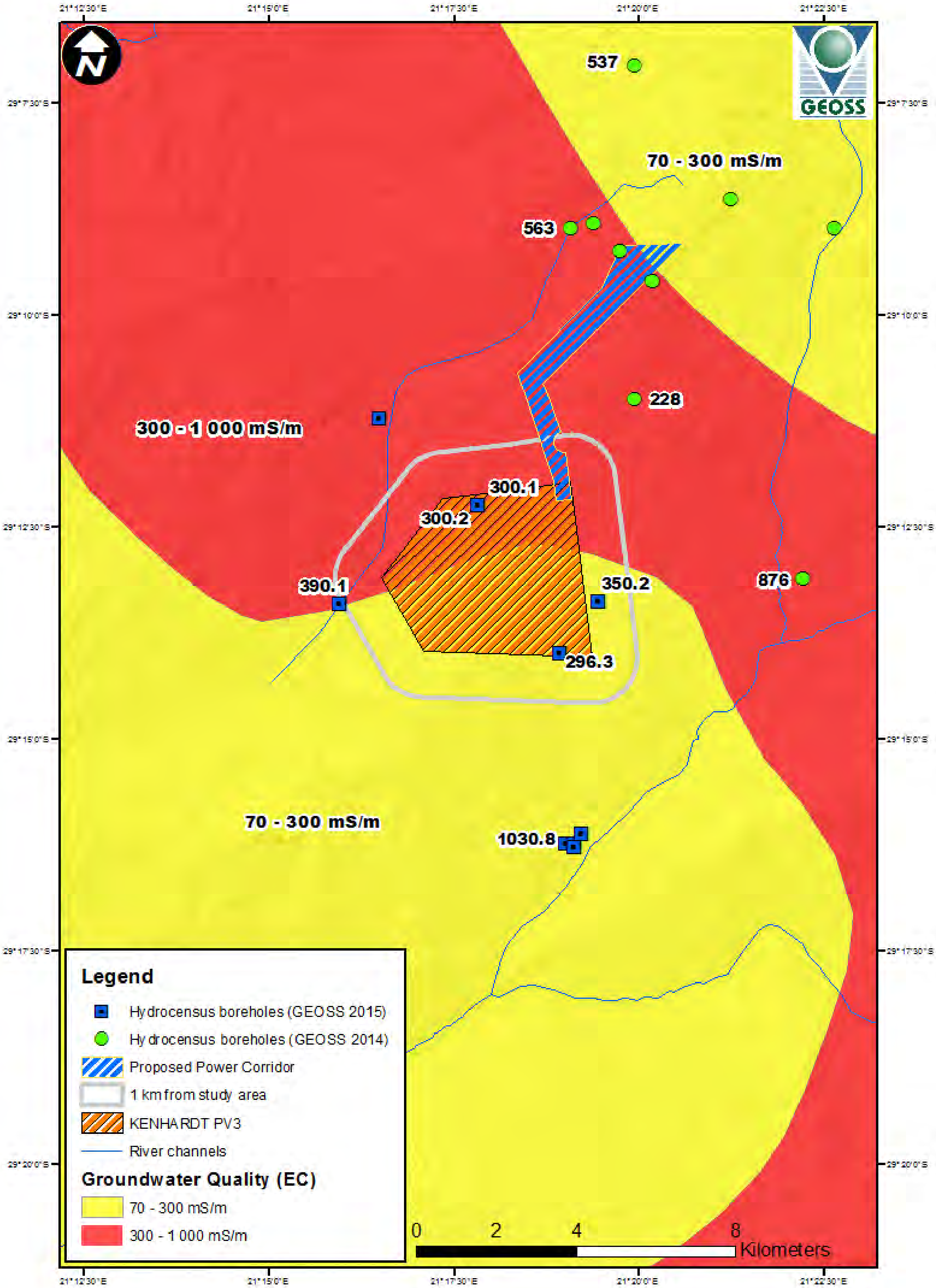
Map 2: Setting of the study area superimposed on an aerial photograph (source ESRI), showing hydrocensus boreholes.



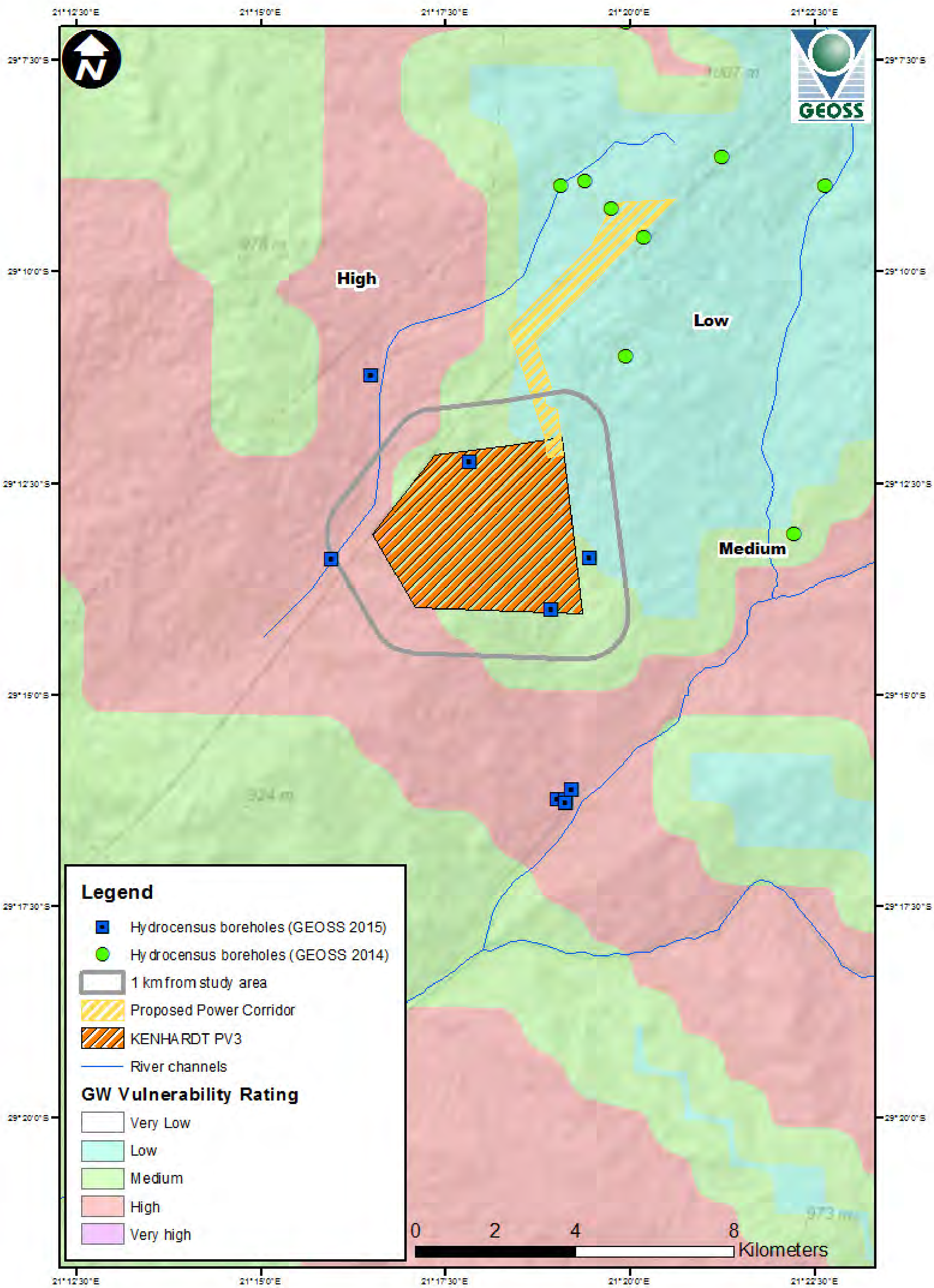
Map 3: The geological setting of the study area and NGA boreholes (Council for Geoscience Map: 1:250 000 scale 2920 – Kenhardt)



Map 4: Aquifer type and yield
(Department of Water Affairs Groundwater Map: 1:500 000 scale 2920 - Prieska)



Map 5: Regional groundwater quality
(Department of Water Affairs Groundwater Map: 1:500 000 scale 2920 - Prieska)



Map 6: Regional groundwater vulnerability (calculated according to the DRASTIC Methodology) and boreholes (DWAF, 2005).

APPENDICES 11.B: SITE PHOTOS


BH1 – wind pump


BH2 – wind pump


BH3 – wind pump

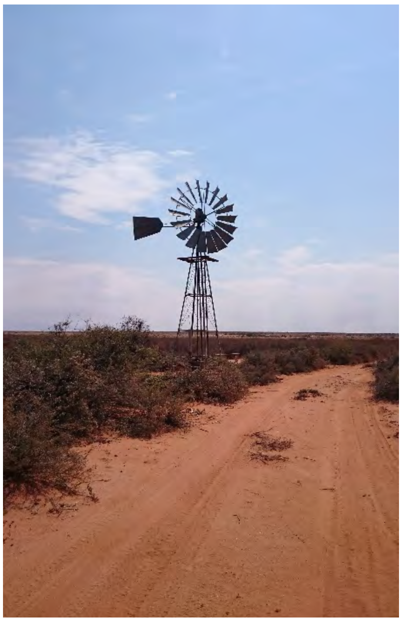

BH4 – wind pump


BH5 – wind pump


BH6 – wind pump

BH7 – Solar pump

BH8 – wind pump



BH9 – wind pump borehole

No photo available
(site not accessible)

BH10 – wind pump borehole

EIA REPORT

CHAPTER 12:

Soils and Agricultural Potential Assessment

Scoping and **Environmental Impact Assessment** for the Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province

Report prepared for:	*Report prepared by*:
CSIR – Environmental Management Services P O Box 17001 Congella, Durban, 4013 South Africa	Johann Lanz – Soil Scientist P.O. Box 6209 Stellenbosch, 7599 South Africa

March 2016

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS

Requirements of Appendix 6 - GN R982	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Appendix A of the EIA Report
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix B of the EIA Report and Section 12.1.6 of this chapter
c) an indication of the scope of, and the purpose for which, the report was prepared;	Sections 12.1.1 and 12.1.2
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 12.1.3
e) a description of the methodology adopted in preparing the report or carrying out the specialised process;	Section 12.1.3
f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;	Section 12.3.8
g) an identification of any areas to be avoided, including buffers;	Section 12.3.8
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figure 12.1
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 12.1.4
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	Section 12.6
k) any mitigation measures for inclusion in the EMPr;	Section 12.6
l) any conditions for inclusion in the environmental authorisation;	Not applicable
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 12.8
n) a reasoned opinion- i. as to whether the proposed activity or portions thereof should be authorised; and ii. if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 12.9
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 12.1.3
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Not applicable
q) any other information requested by the competent authority.	Not applicable

list of abbreviations

AGIS	Agricultural Geo-Referenced Information System
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
EIA	Environmental Impact Assessment
PET	Potential evapotranspiration

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figures

12 SOILS AND AGRICULTURAL POTENTIAL ASSESSMENT

12.1 INTRODUCTION AND METHODOLOGY

This report presents the Soil and Agricultural Potential Assessment undertaken by Mr. Johann Lanz (an independent consultant), under appointment to the CSIR, as part of the Environmental Impact Assessment (EIA) for the proposed Kenhardt PV 3 Solar Energy Facility, near Kenhardt in the Northern Cape Province.

12.1.1 Objectives of the Specialist Study

The objectives of the study are to identify and assess all potential impacts of the proposed development on agricultural resources including soils and agricultural production potential, and to provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for all identified impacts.

The scope of work is captured and listed under the terms of reference below.

12.1.2 Scope of Work and Terms of Reference

The following terms of reference apply to this study:

The report will fulfil the terms of reference for an agricultural study as set out in the National Department of Agriculture's document, Regulations for the evaluation and review of applications pertaining to renewable energy on agricultural land, dated September 2011, with an appropriate level of detail for the agricultural suitability and soil variation on site (which may therefore be less than the standardised level of detail stipulated in the above regulations).

The above requirements together with requirements for an EIA specialist report may be summarised as follows:

- Research and describe the existing environment in terms of its soils, geology and agricultural potential. Identify any significant soils and agricultural features or disturbances, as well as any sensitive features and receptors within the proposed project area.
- Undertake a desktop assessment to compile a baseline description, including an assessment of the existing soil and agricultural potential data for the site.
- Provide a sensitivity map indicating the presence of sensitive features and receptors (i.e. sensitive soil and agricultural features), “no-go” areas, setbacks/buffers, as well as any red flags or risks associated with soil and agricultural impacts.
- Define the environmental risks to the soils and agricultural land and potential, as well as the consequences thereto.
- Highlight any gaps in baseline data.
- Conduct a site visit and a field investigation of soils and agricultural conditions across the site and conduct a soil survey to distinguish areas that do not have and have potential for cultivation.
- Describe and map soil types (soil forms) and characteristics (soil depth, soil colour, limiting factors, and clay content of the top and sub soil layers).
- Describe the topography of the site and map soil survey points.
- Summarise available water sources for agriculture.

- Describe historical and current land use, agricultural infrastructure, as well as possible alternative land use options.
- Describe the erosion, vegetation and degradation status of the land.
- Determine and map, if there is variation, the agricultural potential across the site.
- Determine and map the agricultural sensitivity to development across the site.
- Identify relevant protocols, legal and permit requirements relating to soil and agricultural potential impacts likely to be generated as a result of the proposed project.
- Identify and assess all potential impacts (direct, indirect and cumulative) of the construction, operational and decommissioning phases of the proposed development on soils and agricultural potential, and note the economic consequences of the proposed development on soils and agricultural potential.
- Provide recommended mitigation measures, management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts (for inclusion into the EMPr as well).

12.1.3 Approach and Methodology

The pre-fieldwork assessment was based on the existing Agricultural Geo-Referenced Information System (AGIS) data, as well as satellite imagery for the site. This was supplemented by a field investigation that aimed at ground-proofing the AGIS data and assessing specific field conditions and the variation of these across the site. It did not comprise a detailed soil mapping exercise, but was based on an overview assessment, which involved driving and walking across the site, assessing topography and surface conditions, investigating existing cuttings in numerous excavations along the railway, and in animal burrows. Because of the shallow soils and the existing burrows and excavations, it was not necessary to auger additional holes. The field investigation also included a visual assessment of erosion and erosion potential on site, taking into account the proposed development layout. The field assessment was completed on 18 November 2015 (summer). An assessment of soils (soil mapping) and long term agricultural potential is in no way affected by the season in which the assessment is made, and therefore the fact that the assessment was done in summer has no bearing on its results. The conducted soil investigation is considered completely adequate for the purposes of this study (i.e. for the purposes of determining the impact of the proposed development on agricultural resources and productivity). Detailed soil mapping has no relevance to an assessment of agricultural potential in this environment, as the limitations are overwhelmingly climatic. In other words, even where soils suitable for cultivation may occur, they cannot be utilised because of the aridity constraints. More detailed soil mapping would add no value to the assessment.

Soils were classified according to the South African soil classification system.

Telephonic consultation was done with the current farmer of the land, Mr Sarel Strauss to get details of current farming practices on the farm and to get his opinion on the impacts of the development on agriculture.

The impacts have been assessed in line with the methodology indicated in Chapter 4 of this EIA Report. The developments listed in Chapter 4 of the EIA Report, which are located within a 20 km radius of the proposed Kenhardt PV 3 project, have been considered in the assessment of cumulative impacts.

12.1.4 Assumptions and Limitations

The following assumption was used in this specialist study:

- It was assumed that water is not available anywhere on the site for irrigation. Given the very severe moisture constraints of the environment and that no suitable water has ever been identified by farmers in the area, this is a fair assumption.

- The cumulative impact assessment assumes that a number of other renewable energy developments will take place in the surrounding area (See Chapter 4 of the EIA Report).

The following limitations were identified in this study:

- Soils were not mapped in detail for the study. However detailed soil mapping has no relevance to an assessment of agricultural potential in this environment, as the limitations are overwhelmingly climatic. In other words, even where soils suitable for cultivation may occur, they cannot be utilised because of the aridity constraints. The study had more than sufficient information on the soils to make an assessment on the impacts of the development on agriculture, and so this is not seen as a limitation.
- The assessment rating of impacts is not an absolute measure. It is based on the subjective considerations and experience of the specialist, but is done with due regard and as accurately as possible within these constraints.

There are no other specific constraints and limitations for this study.

12.1.5 Information Sources

All data on land types, land capability, grazing capacity etc. was sourced from the online Agricultural Geo-Referenced Information System (AGIS), produced by the Institute of Soil, Climate and Water (Agricultural Research Council, undated). Satellite imagery of the site available on Google Earth was also used for evaluation.

12.1.6 Declaration of Independence of Specialists

Refer to Appendix A of this EIA Report for the Curriculum Vitae of Mr. Johann Lanz, which highlights his experience and expertise. The declaration of independence by the specialist is provided in Box 12.1 below and included in Appendix B of this EIA Report.

BOX 12.1: DECLARATION OF INDEPENDENCE

I, Johann Lanz, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed Kenhardt PV 3 Project, application or appeal in respect of which I was appointed, other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.

JOHANN LANZ

12.2 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO SOILS AND AGRICULTURAL POTENTIAL IMPACTS

The components of the project that can impact on agricultural resources and productivity, during all phases of the project, are:

1. Occupation of the site by the footprint of the solar PV facility's infrastructure and roads.
2. Constructional activities that denude the surface cover of vegetation, for example for lay down areas, and/or disturb the soil below surface, for example for levelling, excavations, borrow pits etc.
3. Vehicle traffic on site.

It is important to note that a detailed project description is included in Chapter 2 of the EIA Report.

Furthermore, the information regarding the proposed transmission line is indicatively provided in this report. A detailed description of the transmission line corridor is provided and assessed separately in the Basic Assessment for the Kenhardt PV 3 – Transmission Line project.

12.3 DESCRIPTION OF THE SOILS AND AGRICULTURAL CAPABILITY OF THE AFFECTED ENVIRONMENT

A satellite image of the site including the development layout is given in Figure 12.1. Photographs of site conditions are given in Figures 12.2 to 12.5.

12.3.1 Climate and Water Availability

Rainfall for the site is given as a very low 183 mm per annum, with a standard deviation of 71 mm according to the South African Rain Atlas (Water Research Commission, undated). The average monthly distribution of rainfall is shown in Table 12.1. One of the most important climate parameters for agriculture in a South African context is moisture availability, which is the ratio of rainfall to evapotranspiration. Moisture availability is classified into six categories across the country (as shown in Table 12.2). The proposed development site falls within Class 6, which is described as a very severe limitation to agriculture.

Table 12.1: Average monthly rainfall for the site (29° 10' S; and 21° 21' E) in mm (Water Research Commission, undated)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Total**
25	33	38	24	11	5	3	4	5	8	11	16	**183**

Table 12.2: The classification of moisture availability climate classes for summer rainfall areas across South Africa (Agricultural Research Council, Undated)

Climate Class	Moisture Availability (Rainfall/0.25 PET)	Description of Agricultural Limitation
C1	>34	None to slight
C2	27-34	Slight
C3	19-26	Moderate
C4	12-18	Moderate to severe
C5	6-12	Severe
C6	<6	Very severe

Water for stock is obtained from wind pumps on the farm. There is insufficient water available for any form of irrigation.

12.3.2 Terrain, Topography and Drainage

The proposed development is located on level plains with some relief in the Northern Cape interior at an altitude of between 900 and 1000 meters. Slopes across the site are almost entirely less than 2%.

The underlying geology is migmatite, gneiss and granite of the Namaqualand Metamorphic Complex with abundant calcrete.

There are no perennial drainage courses within the project footprint. There are temporary drainage courses, typical of arid environments, where surface run-off would accumulate and flow, but this would only occur very occasionally, immediately after high rainfall events.

12.3.3 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 two land types, Ag6 in the north and the very similar Ag2 in the south. These land types comprise predominantly shallow, red, sands to loamy sands on underlying rock, hard-pan carbonate, or hard-pan dorbank. The soils fall into the arid Silicic, Calcic, 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 12.1 of this chapter. The field investigation confirmed that the soils on site are shallow, red sandy soils on underlying rock and hard-pan carbonate. Actual soil forms vary within short distances depending on rock ridges that run across the area and the extent of calcrete formation. There are numerous outcrops of rocky ridges at the soil surface across the entire area. All investigated sample points across the area were one of four soil forms: Coega, Mispah, Plooysberg or Hutton. However there is very little practical difference between these different soil forms. All have a clay content of approximately 7%, are shallow and are underlain by a hard impenetrable layer (either rock or hard-pan carbonate).

The land has low to moderate water erosion hazard, mainly due to the low slope, but is susceptible to wind erosion because of the sandy texture of the soil.

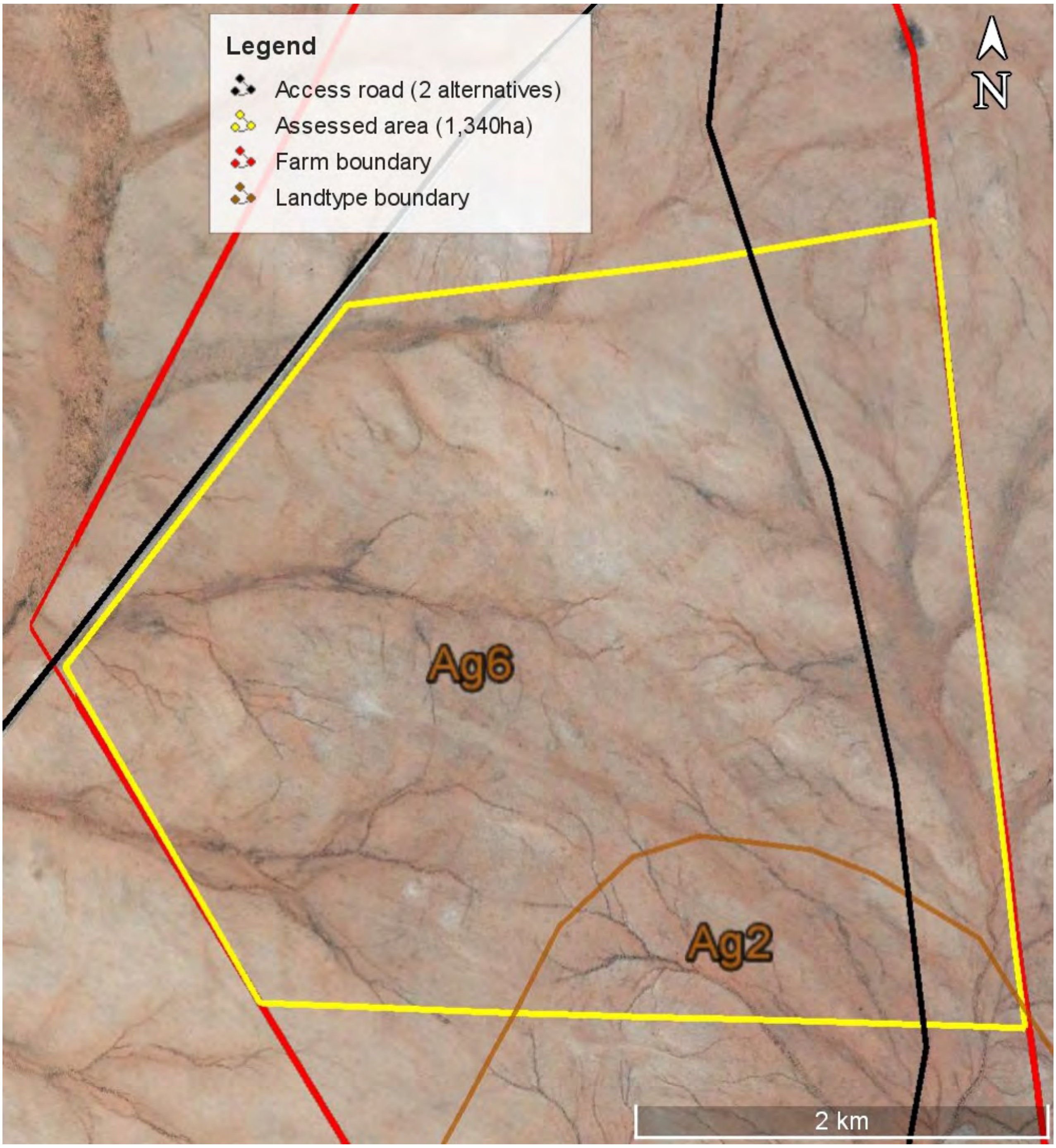

Figure 12.1: Satellite image of the site showing the farm boundary (total area of 5,552 ha) and the assessed site.

Figure 12.2: Photograph showing typical veld conditions on the farm.

Figure 12.3: Photograph showing typical conditions in parts where more rocks occur.

Figure 12.4: Photograph showing typically occurring, shallow hard-pan carbonate horizon (Coega soil form).

Figure 12.5: Photograph showing typically occurring, red sandy soil overlying shallow rock (Hutton soil form).

12.3.4 Agricultural Capability

Land capability is the combination of soil suitability and climate factors. The area has a land capability classification, on the eight category scale, of Class 7 - non-arable, low potential grazing land. The limitations to agriculture are aridity and lack of access to water in addition to the shallow soil depth and rockiness. Because of these constraints, agricultural land use is restricted to low intensity grazing only. The natural grazing capacity is low, at mostly 31 - 40 hectares per animal unit. The current farmer uses an average stocking rate of 10 hectares per sheep.

12.3.5 Land Use and Development on and Surrounding the Site

The farm is located within a sheep farming agricultural region and land use for the farm and surrounding area is sheep farming only. There is no cultivation or any history of cultivation on the farm. The Sishen-Saldanha railway line with its associated infrastructure runs through the farm to the south of the PV site. Apart from fences and one stock watering point, there is no agricultural infrastructure on the site. There are no buildings on the site.

There are two proposed access roads. The one makes use of the existing road running along the Sishen-Saldanha railway line, which is in good condition. The other makes use of a farm track running northwards to the site through the farm. This will require upgrading.

12.3.6 Status of the Land

The biome classification for the site is Bushmanland Arid Grassland. The natural vegetation is grazed, veld conditions are very sparse but there is no evidence of significant erosion or other land degradation on the site.

12.3.7 Possible Land Use Options for the Site

Because of both the climate and soil limitations, the site is not suitable for any agricultural land use other than low intensity grazing.

The site is within one of South Africa's eight proposed renewable energy development zones, and has therefore been identified as one of the most suitable areas in the country for renewable energy development, in terms of a number of environmental impact, economic and infrastructural factors. These factors include an assessment of the significance of the loss of agricultural land. Renewable energy development is therefore a very suitable land use option for the site.

12.3.8 Agricultural Sensitivity

Agricultural potential is uniformly low across the farm and the choice of placement of the facility on the farm therefore has no influence on the significance of agricultural impacts. No agriculturally sensitive areas occur within the assessed area, and so no parts of it need to be avoided by the development. No buffers are required.

12.4 APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

A change of land use (re-zoning) for the development on agricultural land needs to be approved in terms of the Subdivision of Agricultural Land Act (Act 70 of 1970) (SALA). This is required for long term lease, even if no subdivision is required. Rehabilitation after disturbance to agricultural land is managed by the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA). The Department of Agriculture, Forestry and Fisheries reviews and approves applications in terms of these Acts according to their *Guidelines for the evaluation and review of applications pertaining to renewable energy on agricultural land*, dated September 2011.

12.5 IDENTIFICATION OF KEY ISSUES AND POTENTIAL IMPACTS

The following have been identified by the specialist as potential impacts on agricultural resources and productivity.

12.5.1 Construction and Decommissioning Phases only

1. Degradation of veld vegetation beyond the direct footprint of the proposed PV facility due to construction and decommissioning disturbance and potential trampling by vehicles.
2. Loss of topsoil due to poor topsoil management (burial, erosion, etc.) during construction and decommissioning related soil profile disturbance (levelling, excavations, road surfacing etc.) and resultant decrease in that soil's capability for supporting vegetation.

12.5.2 All Phases – Construction, Operation and Decommissioning

1. Loss of agricultural land use due to direct occupation by the infrastructural footprint of the proposed development for the duration of the project (all phases). This will take affected portions of land out of agricultural production.
2. Soil erosion by wind or water due to alteration of the land surface characteristics. Alteration of surface characteristics may be caused by construction related land surface disturbance, vegetation removal, and the establishment of hard standing areas, surfaces and roads. Erosion will cause loss and deterioration of soil resources and may occur during all phases of the project.
3. Generation of additional land use income through the rental of the land for the proposed solar energy facility. This will provide the farming enterprise with increased cash flow and rural livelihood, and thereby improve its financial sustainability. This is rated as a positive impact.

12.5.3 Cumulative Impacts

Cumulative impacts due to the regional loss of agricultural land resources as a result of other developments on agricultural land in the region.

The Scoping Report was released for a 30-day comment period which extended from 25 September 2015 to 27 October 2015. The Addendum to the Scoping Report was also released for a 30-day comment period, extending from 6 October 2015 to 5 November 2015. To date, no comments and issues have been raised by I&APs in relation to soil and agricultural potential. The issues noted above were included in the Scoping Phase for consideration in the EIA Phase.

In addition, the Scoping Report was submitted to the National DEA on 12 November 2015 for decision-making. The Scoping Report was accepted by the National DEA on 8 December 2015. As part of the acceptance, the National DEA had the certain requirements for the Soils and Agricultural Potential Assessment, as shown in Table 12.3 below.

Table 12.3: National DEA Requirements for the Soils and Agricultural Potential Assessment

DEA Requirement	Feedback from Specialist
• Detailed soil assessment of the site in question, incorporating a radius of 50 m surrounding the site, on a scale of 1:10 000 or finer. The soil assessment should include the following: - Identification of the soil forms present on site; - The size of the area where a particular soil form is found; - GPS readings of soil survey points; - The depth of the soil at each survey point; - Soil colour; - Limiting factors; - Clay content; - Slope of the site; - A detailed map indicating the locality of the soil forms within the specified area; and - Size of the site.	Detailed soil mapping has no relevance to an assessment of agricultural potential in this environment, where cultivation is not possible, soil conditions are generally poor and the agricultural limitations are overwhelmingly climatic. In such an environment, even where soils suitable for cultivation may occur, they cannot be cultivated because of the aridity constraints. The level of detail in the DEA (and DAFF) requirement is appropriate for arable land only. It is not appropriate for this site. Conducting a soil assessment at the required level of detail would be very time consuming and be a complete waste of that time. It would add absolutely no value to the assessment. The level of soil assessment that was conducted for this report is considered more than adequate for a thorough assessment of all agricultural impacts. The assessment did include identification of soil forms, soil depth, colour, limiting factors and clay content, and the slope and size of the site.
• Exact locality of the site	Refer to the site map shown in Figure 12.1 of this chapter.
• Current activities on the site, including developments or buildings.	Refer to Section 12.3.5 of this chapter.
• Surrounding developments/land uses and activities in a radius of 500 m of the site.	Refer to Section 12.3.5 of this chapter.
• Access routes and the condition thereof.	Refer to Section 12.3.5 of this chapter.
• Current status of the land (including erosion, vegetation, and a degradation assessment).	Refer to Section 12.3.6 of this chapter.
• Possible land use options for the site.	Refer to Section 12.3.7 of this chapter.
• Water availability, source and quality (if available).	Refer to Section 12.3.1 of this chapter.
• Detailed descriptions of why agriculture should or should not be the land use of choice.	Refer to Section 12.3.7 and 12.9 of this chapter
• Impact of the change of land use on the surrounding area.	Refer to Section 12.6 of this chapter.
• A shape file containing the soil forms and relevant attribute data as depicted on the map	A shapefile containing soil forms is not relevant - see first point above

12.6 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

The six potential impacts identified in Section 12.5 are assessed in table format in Tables 12.4 and 12.5 below.

The proposed development is located on land zoned and used for agriculture. South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of land that may be valuable and important for agricultural production. The proposed site is however on land which has very low agricultural potential and is only suitable for low intensity grazing.

All impacts are evaluated in terms of their consequence for agricultural production, not in terms of the impact *per se*. This is because it is agricultural production that must be the focus of an agricultural assessment. Because the undisturbed site already has extremely limited agricultural potential, it means that the consequence of any impact for agricultural production is limited with the result that the consequence and significance of agricultural impacts is low.

Furthermore, the poor, very shallow soil conditions reduce the significance of loss of topsoil and the low slope gradients reduce the significance of potential erosion impacts.

Irreplaceability of impacts is considered low because the resource that is being impacted is non-arable, low potential grazing land which is not a scarce resource in the country. The confidence level of the assessment is considered high because there is certainty about the low agricultural potential of the land and the impacts are fairly easy to understand and predict.

There are a large number of other potential projects in the area that will also lead to a loss of agricultural land. Although the loss of individual project portions of land has low significance, as discussed above, the cumulative impacts of land loss regionally becomes more significant. However, despite this cumulative impact, it is still agriculturally strategic from a national perspective to steer as much of the country's renewable energy development as possible to regions such as this one, with very low agricultural potential. It is preferable to incur a higher cumulative loss in such a region, than to lose agricultural land with a higher production potential elsewhere in the country.

It is important to note that the impacts identified and assessed in this section only apply to the preferred site.

Mitigation measures are also included in Table 12.4. Recommendations for the monitoring and review of all identified mitigation measures are described in Section 12.8 of this chapter, as well as the EMPr (Part B of this EIA Report).

12.6.1 Degradation of veld vegetation beyond the direct footprint of the proposed PV facility due to constructional disturbance and potential trampling by vehicles

The potential impact of degradation of veld vegetation beyond the direct footprint of the proposed PV facility is rated as negative, direct impact that is predicted to occur as a result of disturbance during activities undertaken during the construction and decommissioning phases. The impact is rated with a site specific spatial extent and medium-term duration (i.e. the impact and risk will be experienced between 1 and 10 years). The consequence and probability of the impact is respectively rated as slight and likely. The reversibility and irreplaceability of the impact is respectively rated as moderate and low. The significance of the impact without the implementation of mitigation measures is rated as very low.

The following mitigation measures have been recommended during the construction and decommissioning phases in order to reduce the significance of veld degradation:

- Minimize the footprint of disturbance during construction and decommissioning activities.
- Confine vehicle access to roads only.
- Control dust generation during construction and decommissioning activities by implementing standard construction site dust control measures (dampening with water) where required. Because of water scarcity, this should only be done where and when dust generation is a significant problem.

With effective implementation of these mitigation actions, the impact of the project on veld degradation is predicted to be of very low significance.

12.6.2 Loss of Topsoil due to Poor Topsoil Management

The potential impact of loss of topsoil due to poor topsoil management (burial, erosion, etc.) during construction and decommissioning related soil profile disturbance (such as levelling, excavations, road surfacing etc.) and the resultant decrease in the capability of the soil to support vegetation is rated as a negative, direct impact. The impact is rated with a site specific spatial extent and medium-term duration (i.e. the impact and risk will be experienced between 1 and 10 years). The consequence and probability of the impact is respectively rated as slight and likely. The reversibility and irreplaceability of the impact is respectively rated as moderate and low. The significance of the impact without the implementation of mitigation measures is rated as very low.

The following mitigation measures have been recommended during the construction and decommissioning phases in order to reduce the loss of topsoil:

- Strip and stockpile topsoil from all areas where soil will be disturbed. There are no particular requirements for stockpile management and it can therefore be done in the way that is most practical for the operation.
- After cessation of disturbance, re-spread topsoil over the surface.
- Dispose of any sub-surface spoil material, generated from excavations, where they will not impact on land that supports vegetation, or where they can be effectively covered with topsoil.

With effective implementation of these mitigation actions, the impact of the project on topsoil is predicted to be of very low significance.

12.6.3 Loss of Agricultural Land Use

The potential impact of loss of agricultural land use due to the direct footprint of the proposed project for the construction, operational and decommissioning phases is predicted to be a negative, direct impact. The impact is rated with a site specific spatial extent and long-term duration (i.e. the impact and risk will be experienced for the duration of the proposed project). The consequence and probability of the impact is respectively rated as slight and very likely. The reversibility and irreplaceability of the impact is respectively rated as high and low. The significance of the impact without the implementation of mitigation measures is rated as very low. No mitigation measures are recommended.

The loss of 250 hectares of grazing land should be seen in the context of the total farming enterprise. Mr Sarel Strauss reports that his total sheep farming enterprise takes place on four adjacent farms totalling about 38,000 hectares and the loss therefore represents only 0.66% of the total. Mr Strauss is of the opinion that the loss will have negligible impact on his farming enterprise.

12.6.4 Soil Erosion due to Alteration of the Land Surface Characteristics

The potential impact of soil erosion by wind or water due to alteration of the land surface characteristics is predicted to be a negative, direct impact. As noted above, alteration of surface characteristics may be caused by construction related land surface disturbance, vegetation removal, and the establishment of hard standing areas, surfaces and roads. The impact is rated with a site specific spatial extent and long-term duration (i.e. the impact and risk will be experienced for the duration of the proposed project). The consequence and probability of the impact is respectively rated as slight and likely. The reversibility and irreplaceability of the impact are rated as low. The significance of the impact without the implementation of mitigation measures is rated as very low.

The following mitigation measures have been recommended during the construction, operational and decommissioning phases in order to reduce soil erosion:

- Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.

With effective implementation of these mitigation actions, the impact of increased soil erosion is predicted to be of very low significance.

12.6.5 Additional Land Use Income Generation

As noted above, the additional income generated during the construction, operational and decommissioning phases as a result of the leasing of the land to Scatec Solar is predicted to be a direct, positive impact. This will provide the increased cash flow and thereby improve the financial sustainability of the farming enterprise. The impact is rated with a site specific spatial extent and long-term duration (i.e. the impact and risk will be experienced for the duration of the proposed project). The consequence and probability of the impact is respectively rated as slight and very likely. The reversibility and irreplaceability of the impact is respectively rated as high and low. The significance of the impact without the implementation of enhancement measures is rated as very low. No enhancement measures are recommended.

12.6.6 Cumulative Impact: Regional Loss of Agricultural Land Resources

As mentioned above, the implementation of various other developments (refer Chapter 4 of the EIA Report) in conjunction with the proposed Scatec Solar PV facilities and transmission lines are expected to result in a cumulative impact in terms of the loss of agricultural land resources on a regional scale. The impact is rated with a regional spatial extent and long-term duration (i.e. the impact and risk will be experienced for the duration of the proposed project). The consequence and probability of the impact is respectively rated as moderate and very likely. The reversibility and irreplaceability of the impact are rated as moderate. The significance of the impact without the implementation of mitigation measures is rated as moderate. No mitigation measures are recommended.

12.7 IMPACT ASSESSMENT SUMMARY

The potential impacts of the proposed project ton soils and agricultural potential is summarised in Tables 12.4 and 12.5.

Table 12.4: Impact assessment summary table

Aspect/Impact pathway	Nature of impact	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility	Irreplaceability	Mitigation/ Management Actions	Significance		Ranking of Residual Impact	Confidence Level
										Without Mitigation	*With Mitigation*		
	Construction and Decommissioning Phases (Direct Impacts)												
Vehicle traffic and dust generation	Veld degradation	Negative	Site	Medium term	Slight	Likely	Moderate (i.e. Partially)	Low	1. Minimize footprint of disturbance. 2. Confine vehicle access on roads only. 3. Control dust generation during construction and decommissioning activities by adopting standard construct site dust control methods (such as dampening surfaces with water), where required. Because of water scarcity, this should only be done where and when dust generation is a significant problem.	Very Low	Very Low	5	High
Constructional and decommissioning activities that disturb the soil profile.	Loss of topsoil	Negative	Site	Medium term	Slight	Likely	Moderate (i.e. Partially)	Low	1. Strip and stockpile topsoil from all areas where soil will be disturbed. 2. After cessation of disturbance, re-spread topsoil over the surface.	Very Low	Very Low	5	High

Aspect/Impact pathway	Nature of impact	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility	Irreplaceability	Mitigation/ Management Actions	Significance		Ranking of Residual Impact	Confidence Level
										Without Mitigation	*With Mitigation*		
									3. Dispose of any sub-surface spoils from excavations where they will not impact on land that supports vegetation, or where they can be effectively covered with topsoil.				
	Construction, Operational and Decommissioning Phases (Direct Impacts)												
Occupation of the land by the project infrastructure	Loss of agricultural land use	Negative	Site	Long term	Slight	Very Likely	High	Low	None	Very Low	Not applicable	5	High
Change in surface characteristics and surface cover.	Erosion	Negative	Site	Long term	Slight	Likely	Low	Low	Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.	Low	Very Low	5	High
Project rental	Additional land use income	Positive	Site	Long term	Slight	Very Likely	High	Low	None	Very Low	Not applicable	5	High

Table 12.5: Cumulative impact assessment summary table

Aspect/Impact pathway	Nature of impact	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility	Irreplaceability	Mitigation/ Management Actions	Significance		Ranking of Residual Impact	Confidence Level
										Without Mitigation	***With Mitigation***		
Occupation of the land by the infrastructure of multiple projects	Regional loss of agricultural land	Negative	Regional	Long term	Substantial	Very Likely	Moderate (i.e. Partially)	Moderate	None	Moderate	Not Applicable	3	High

12.8 INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME

The following main mitigation measures and monitoring requirements are proposed for inclusion in the EMPr:

- Minimize the footprint of disturbance during construction and decommissioning activities.
- Confine vehicle access to roads only.
- Control dust generation during construction and decommissioning activities by implementing suitable, standard construction site dust control measures.
- Strip and stockpile topsoil from all areas where soil will be disturbed.
- After cessation of disturbance, re-spread topsoil over the surface.
- Dispose of any sub-surface spoil material, generated from excavations, where they will not impact on land that supports vegetation, or where they can be effectively covered with topsoil.
- Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.

The following main monitoring requirements are proposed for inclusion in the EMPr:

- Undertake a periodic site inspection to verify the occurrence of off-road vehicle tracks surrounding the site.
- Establish an effective record keeping system for each area where soil is disturbed for constructional and decommissioning purposes. Recommendations for the recording system are included in the EMPr (Part B of the EIA Report).
- Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the run-off control system and to specifically record the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring.

12.9 CONCLUSION AND RECOMMENDATIONS

The proposed development is on land zoned and used for agriculture. South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of land that may be valuable for cultivation. This assessment has found that the investigated site is on land which is of very low agricultural potential and is not suitable for cultivation.

Because of the low agricultural potential of the site, the development should, from an agricultural impact perspective, be authorised. Authorisation is promoted by the fact that the site falls within a proposed renewable energy development zone, where such land use has been assessed as very suitable in terms of a number of factors, including agricultural impact. It is preferable to incur a loss of agricultural land in such a region, without cultivation potential, than to lose agricultural land that has a higher potential, to renewable energy development elsewhere in the country.

No agriculturally sensitive areas occur within the site and no part of it is therefore required to be set aside from the development. Because the site is uniformly low potential, from an agricultural point of view, there is no preferred location or layout within the assessed site. There are no conditions resulting from this assessment for inclusion in the environmental authorisation. The following management and mitigation measures should be included in the EMPr:

- Minimize the footprint of disturbance during construction and decommissioning activities.
- Confine vehicle access to roads only.
- Control dust generation during construction and decommissioning activities by implementing suitable, standard construction site dust control measures (i.e. dampening with water) where

required. Because of water scarcity, this should only be done where and when dust generation is a significant problem.

- Strip and stockpile topsoil from all areas where soil will be disturbed.
- After cessation of disturbance, re-spread topsoil over the surface.
- Dispose of any sub-surface spoil material, generated from excavations, where they will not impact on land that supports vegetation, or where they can be effectively covered with topsoil.
- Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.

12.10 REFERENCES

Agricultural Research Council. Undated. AGIS Agricultural Geo-Referenced Information System available at http://www.agis.agric.za/.

Fey, M. 2010. Soils of South Africa. Cambridge University Press, Cape Town.

Water Research Commission. Undated. South African Rain Atlas available at http://134.76.173.220/rainfall/index.html.

APPENDIX 12.1: SOIL DATA

Table A1: Land type soil data for site.

Land type	Land capability class	Soil series (forms)	Depth (cm)	Clay % A horizon	Clay % B horizon	Depth limiting layer	% of land type
Ag6	7	Hutton	10-35	6-12	7-15	ca, so, db	43
		Mispah	5-15	5-12		R	14
		Hutton	45->120	6-12	7-15	ca, so, R	10
		Hutton	10-35	10-20	15-25	ca, so, db	9
		Rock outcrop	0			R	8
Ag2	7	Hutton	10-30	4-13	6-15	so, db, R	30
		Mispah	5-15	5-12		R	18
		Glenrosa	10-30	3-13		so	10
		Hutton	10-30	10-20	15-25	so, db, R	9
		Hutton	45->120	3-13	3-15	so, R, db	8
		Mispah	5-15	5-12		db	7
		Rock outcrop	0			R	7

Land capability classes: 7 = non-arable, low potential grazing land.
Depth limiting layers: R = hard rock; so = partially weathered bedrock; ca = hardpan carbonate; db = dorbank hardpan.

EIA REPORT

CHAPTER 13:

Social Impact Assessment

Scoping and **Environmental Impact Assessment** for the Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province

Report prepared for:

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March 2016

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS

Requirements of Appendix 6 – GN R982	**Addressed in the Specialist Report**
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Appendix A of the EIA Report
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Section 13.1.6 of this chapter and Appendix B of the EIA Report
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 13.1.1
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	30 July 2014. The season of the site visit is immaterial as social impacts likely to result from the proposed project are not seasonal in nature.
e) a description of the methodology adopted in preparing the report or carrying out the specialised process;	Section 13.1.3
f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;	Section 13.3
g) an identification of any areas to be avoided, including buffers;	Not applicable as the project is not proposed in an urban area where social impacts are expected to manifest.
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Not applicable as the project is not proposed in an urban area where social impacts are expected to manifest.
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 13.1.5
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	Sections 13.4.3, 13.4.4, 13.4.5 and 13.4.6
k) any mitigation measures for inclusion in the EMPr;	Section 13.5
l) any conditions for inclusion in the environmental authorisation;	No conditions identified or required.
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	No monitoring conditions identified or required.

Requirements of Appendix 6 – GN R982	**Addressed in the Specialist Report**
n) a reasoned opinion- i. as to whether the proposed activity or portions thereof should be authorised; and ii. if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 13.6
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 13.3.1.2
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Section 13.4.1
q) any other information requested by the competent authority.	External Peer Review required by the DEA. This external review report is included as an appendix to this specialist report (i.e. Appendix 13.A).

list of abbreviations

CLD	Causal Loop Diagram
DEA	Department of Environmental Affairs
ECT	Equity Control Theory
EIA	Environmental Impact Assessment
IDP	Integrated Development Plan
MW	Megawatt
PV	Photovoltaic
SIA	Social Impact Assessment
SES	Socio-ecological System

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13 SOCIAL IMPACT ASSESSMENT

13.1 INTRODUCTION

This Social Impact Assessment (SIA) was commissioned in response to the Environmental Impact Assessment (EIA) and Basic Assessment (BA) application processes initiated by Scatec Solar SA 163 (PTY) Ltd (Scatec) for the three proposed 75 Megawatt (MW) Solar Photovoltaic (PV) Facilities and three transmission lines to connect each facility to the National Grid, near Kenhardt in the Northern Cape. The proposed EIA and BA projects are referred to as follows:

- EIA Projects - Kenhardt PV 1, Kenhardt PV 2, and Kenhardt PV 3; and
- BA Projects – Kenhardt PV 1 – Transmission Line, Kenhardt PV 2 – Transmission Line, and Kenhardt PV 3 – Transmission Line.

This SIA has been compiled by Rudolph du Toit of the Council for Scientific and Industrial Research (CSIR) and externally reviewed by Ms. Liza van der Merwe (a private consultant). As part of the acceptance of the Scoping Reports, the Department of Environmental Affairs requested for an external review of the SIA to be conducted. The review report is included as Appendix 13.A of this report.

A single SIA has been compiled based on the following reasons:

- The proposed project sites (as included in the official survey area) are located in very close proximity to each other and therefore present very similar baseline social conditions;
- The nature of the proposed development (i.e. solar PV electricity generation and transmission line development) is exactly the same for all the proposed projects sites. As such, the anticipated impacts resulting from the proposed developments will be similar regardless of its location; and
- Anticipated significant social impacts are expected to manifest in the urban node or sizeable human settlement in closest proximity to the proposed development (i.e. the town of Kenhardt) and not on the actual project sites. This is due to the extremely low population density of the relevant farms, its remote location and the relative absence of infrastructure and economic opportunity capable of attracting and sustaining agents of social change. Accordingly, it makes no difference on which land parcel or ERF the relative impacts originate, as the consequences resulting from such impacts are expected to manifest in Kenhardt, and can therefore be addressed in a single report.

A SIA can be defined as the process of determining "*[t]he consequences to human populations of any public or private actions (these include policies, programmes, plans and/or projects) that alter the ways in which people live, work, play, relate to one another, organise to meet their needs and generally live and cope as members of society. These impacts are felt at various levels, including individual level, family or household level, community, organisation or society level. Some social impacts are felt by the body as a physical reality, while other social impacts are perceptual or emotional*" (Barbour, 2007).

Evidently, the realm of human experience is characterised by subjectivity; both in terms of affected community's experiences and the SIA practitioner's interpretation of such experiences. Such subjectivity is known as the "social construct of reality" (Anderson & Taylor, 2002). However, social well-being can largely be agreed upon regardless of ones worldview. Accordingly, the SIA process must be committed to the following objectives (Barbour, 2007):

- The principles of sustainable development and social sustainability;
- Vulnerable groups;
- Meeting basic needs and services;
- Livelihood strategies;
- Fairness and equity;
- Social justice;
- Openness and participation; and,
- Accountability.

In pursuit of these objectives, it is imperative that an SIA looks beyond the direct positive and negative impacts likely to result from proposed projects and looks at promoting the well-being of communities potentially affected by a project by addressing entrenched structural issues of empowerment, minority groups, gender issues and poverty reduction.

13.1.1 Scope and Objectives

This SIA Report investigates the potential social disruptors and associated social impacts likely to result from the development of the proposed Kenhardt PV 1, Kenhardt PV 2, and Kenhardt PV 3 solar energy projects, as well as the proposed Kenhardt PV 1 – Transmission Line, Kenhardt PV 2 – Transmission Line, and Kenhardt PV 3 – Transmission Line projects near Kenhardt in the Northern Cape. In this regard, the study focuses on the town of Kenhardt and not the individual land parcels on which the proposed projects will developed, as most, if not all, of the anticipated social impacts will be experienced in the urban area nearest to the proposed developments (i.e. Kenhardt). Social disruptors and impacts under investigation are those which are most likely to significantly influence social and cultural concerns, values, consequences and benefits to communities.

The objective of this SIA is to assist with informed decision-making by the competent authority (DEA) as, as well as the development of appropriate management directives, as it relates to the consideration of social impact likely to result from the proposed development.

13.1.2 Terms of Reference

The SIA will include:

- A review of existing information, and collecting and reviewing baseline social information etc.
- Conducting interviews with key affected parties, including local communities, local landowners, key government officials (local and regional) etc.
- An identification and assessment of key social issues and potential impacts (negative and positive) associated with the construction, operational and decommissioning phases of the proposed projects.
- An identification of potential mitigation and enhancement measures.
- A specialist report which includes an assessment of the potential social impacts associated with the proposed projects.
- An outline of mitigatory measures and additional management or monitoring guidelines.
- Provide input to the Environmental Management Programme (EMPr), including mitigation and monitoring requirements to ensure that negative social impacts are limited.

13.1.3 Study Approach and methodology

This SIA consulted secondary data sources (published documentation) to obtain basic socio-economic baseline demographics. This secondary data was then augmented with primary data generated by a site visit to the proposed project site as well as the town of Kenhardt and the surrounding areas.

13.1.3.1 Applied Anthropological Methods

Collection of primary data during the site visit was guided by a Participant Observation Methodology (Anderson & Taylor, 2002). Participant observation is an applied anthropological approach, whereby the researcher 'becomes' a resident in the community for a given period of time to observe the normal daily lives of community members and to conduct informal interviews with informants. The intention of interviews is to uncover the major livelihood strategies present in the study area, to understand the key socio-economic challenges, and gain insights into the 'constructed reality' of the Kenhardt community. Observation of community members' lives, routines and living environments help to gain insight into practices, patterns and processes which community members may not be consciously aware of.

13.1.3.2 Systems Theory

Conventional SIA reports generally describe the affected environment in terms of social and economic conditions, with only very cursory references to the biophysical environment. Due to the inherent complexity of human-nature interaction, and the profound impacts resulting from this interaction, a more holistic approach was adopted towards understanding and representing the affected environment. Accordingly, the receiving environment and subsequent impacts thereon were viewed and interpreted as a coupled socio-ecological system (SES). This approach is a radical departure from viewing the receiving environment as a loose collection of independent economic, social and environmental variables.

Systems theory provides insight into complex system relationships by interpreting a given system through the following set of principles:

- Complex systems **are open systems** (i.e. free interaction with other systems across systemic boundaries);
- Complex systems operate under conditions **not at equilibrium** (i.e. supply and demand of systemic services are not in balance, also known as redundancy in cases of over supply);
- Complex systems have an **asymmetrical structure** (i.e. structure is maintained, though component parts my change);
- Complex systems consist of **many** components;
- In a complex system, components on average **interact with many others** via numerous possible routes;
- Some sequences of interaction within complex systems will result in **feedback routes;**
- Parts of a complex system interact in non-linear ways to create properties and behaviours which is not inherent to the system's component parts; known as **emergence.**

Subsequently, typical socio-economic baseline data is then represented in a Causal Loop Diagram (CLD) to illustrate the systemic causal linkages between variables present in the SES in which the study area is located.

13.1.3.3 Vulnerability Context

Finally, an Asset Pentagon has been used to interpret the collected information. An Asset Pentagon is an assessment method developed within the discipline of Livelihoods Assessment, and aims to establish the vulnerability context of a given social grouping. People's access to productive assets (Human-, Social-, Natural-, Physical- and Financial capital) lies at the heart of their vulnerability context. Generally, the greater access people have to assets, the more livelihood strategies are available and the easier it is for them to switch from one strategy to the next. Conversely, limited access to assets results in reduced livelihood strategies and impaired ability to assume alternative strategies should the need arise.

As a result, the SIA research approach is descriptive in nature and uses indicative reasoning to reach its impact assessment findings. In terms of the impact assessment, the methodology adopted is outlined in Chapter 4 of the EIA Report.

13.1.4 Information Sources

The primary and secondary data sources used in the SIA include:

- Primary data generated through participant observation techniques;
- The South African Guideline for Involving Social Assessment Specialists in EIA (Barbour, 2007);
- The Kai !Garib Local Municipality Draft IDP of 2014;
- Orlight SA (Pty) Ltd's "Kenhardt Solar PV Power Plant"; BioTherm (Pty) Ltd's "Aries Solar PV Facility"; AES Solar Energy Limited's "Olvyn Kolk PV Power Plant" and the Eskom SOC's "Aries-Helios 765 kV transmission line upgrade");
- The 2011 Census report (Statistics South Africa (StatsSA), 2011); and
- Academic journal articles on the topics of vandalism, teenage pregnancy and poverty such as Ceccato and Haining (2005).

13.1.5 Assumptions and Limitations

Secondary data on the study area is very limited. The site visit was therefore intended to gather sufficient primary data to guide the SIA. However, information gathered during the site visit generally carries a medium level of confidence as the SIA is an applied research method, as opposed to a scientific research method. This means that much less time and resources are available for primary research and the subsequent verification of findings. As a result, the majority of significance ratings ascribed to both the potential positive and negative impacts of the proposed Kenhardt PV and Transmission Line projects were given a ***medium*** confidence rating.

The SIA[1] assumes that the majority of socio-economic impacts will be experienced in the town of Kenhardt; due to its proximity to the project site. It is however possible for socio-economic impacts to be experienced in other urban nodes close to the project site. The project boundary, in terms of socio-economics, is therefore arbitrarily constructed.

Various energy-related developments are present in the general study (i.e. within a 50 km radius) area and were considered in this study (e.g. Mulilo Renewable Project Developments (Pty) Ltd's "Phase 1 and Phase 2-Nieuwehoop Solar PV Power Plants"; Orlight SA (Pty) Ltd's "Kenhardt Solar PV Power Plant"; BioTherm (Pty) Ltd's "Aries Solar PV Facility"; AES Solar Energy Limited's "Olvyn Kolk PV Power Plant" and the Eskom SOC's "Aries-Helios 765 kV transmission line upgrade"). However, when considering cumulative impacts, the combined impacts of *all* developments in a given area should be considered; not only the impacts resulting from *similar* activities/projects. Clearly, considering the possible socio-economic impacts likely to result from all development in an arbitrarily defined study area is not practically possible in the limited timeframe of the EIA process. However, this SIA attempts to identify and understand the cumulative socio-economic impacts likely to result from the interaction of similar (i.e. solar energy and electrical infrastructure developments) development activities within the general study area. Chapter 4 of the EIA Report notes the developments within a 20 km radius that have been considered in order to assess cumulative impacts.

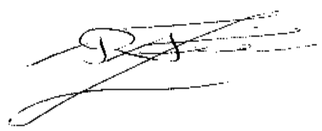
In terms of the employment estimates, the man months noted in this study, which are also known as "person months", is the total number of employees in each of the Contract Months, within the Construction Measurement Period and the Operating Measurement Period, as applicable. It should be noted that the said "person months" are, at present, best estimates only and could well change once the project is initiated.

13.1.6 Declaration of Independence of Specialist

Refer to Appendix A of this EIA Report for the Curriculum Vitae of Rudolph du Toit, which highlights his experience and expertise. The declaration of independence by the specialist is provided in Box 13.1 below and included in Appendix B of this EIA Report.

BOX 13.1: DECLARATION OF INDEPENDENCE

I, Rudolph du Toit, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed Kenhardt PV Facilities and Transmission Lines Project, application or appeal in respect of which I was appointed, other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.



RUDOLPH DU TOIT

13.2 PROJECT CONTEXT (SOCIO-ECONOMICS)

13.2.1 Project Information

As noted above, Scatec is proposing to develop three 75 MW Solar PV power generation facilities and associated electrical infrastructure (including transmission lines for each 75 MW facility) on the remaining extent of Onder Rugzeer Farm 168 and the connection points to the Eskom Nieuwehoop Substation on the

[1] This study is a SIA as per the definition contained in the *Guideline for Involving Social Assessment Specialists in the EIA Process* (Barbour, 2007): "*Social impacts can be defined as 'The consequences to human populations of any public or private actions (these include policies, programmes, plans and/or projects) that alter the ways in which people live, work, play, relate to one another, organise to meet their needs and generally live and cope as members of society'*".

remaining extent of Portion 3 of Gemsbok Bult Farm 120, approximately 80 km south of Upington and 30 km north-east of Kenhardt within the !Kheis Local Municipality, Northern Cape Province (Figure 13.1).

The three proposed 75 MW Solar PV facilities require a separate EIA Process and the three transmission line/electrical infrastructure projects (that will support the Kenhardt PV facilities) require a BA Process.

The following proposed transmission line and electrical infrastructure connectivity options have been considered in the BA Process:

- Each PV facility will be connected by a separate short 132 kV transmission line to the Eskom Nieuwehoop Substation that is currently being constructed on Farm Gemsbok Bult (remaining extent of Portion 3 of Farm 120); or
- Connect the Kenhardt PV 2 and Kenhardt PV 3 projects via separate 22/33 kV transmission lines to the proposed Kenhardt PV 1 on-site substation which will link via a 132 kV line to the Eskom Nieuwehoop Substation; or
- Construct one 132 kV transmission line from the Kenhardt PV 1 project to the Eskom Nieuwehoop Substation and connect the Kenhardt PV 2 and Kenhardt PV 3 facilities together via medium voltage transmission lines to either the on-site substation of Kenhardt PV 2 or PV 3, followed by the construction of one 132 kV transmission line from the on-site substation to the Eskom Nieuwehoop Substation.

The above connectivity options occur within an electrical infrastructure corridor (Figure 13.1).

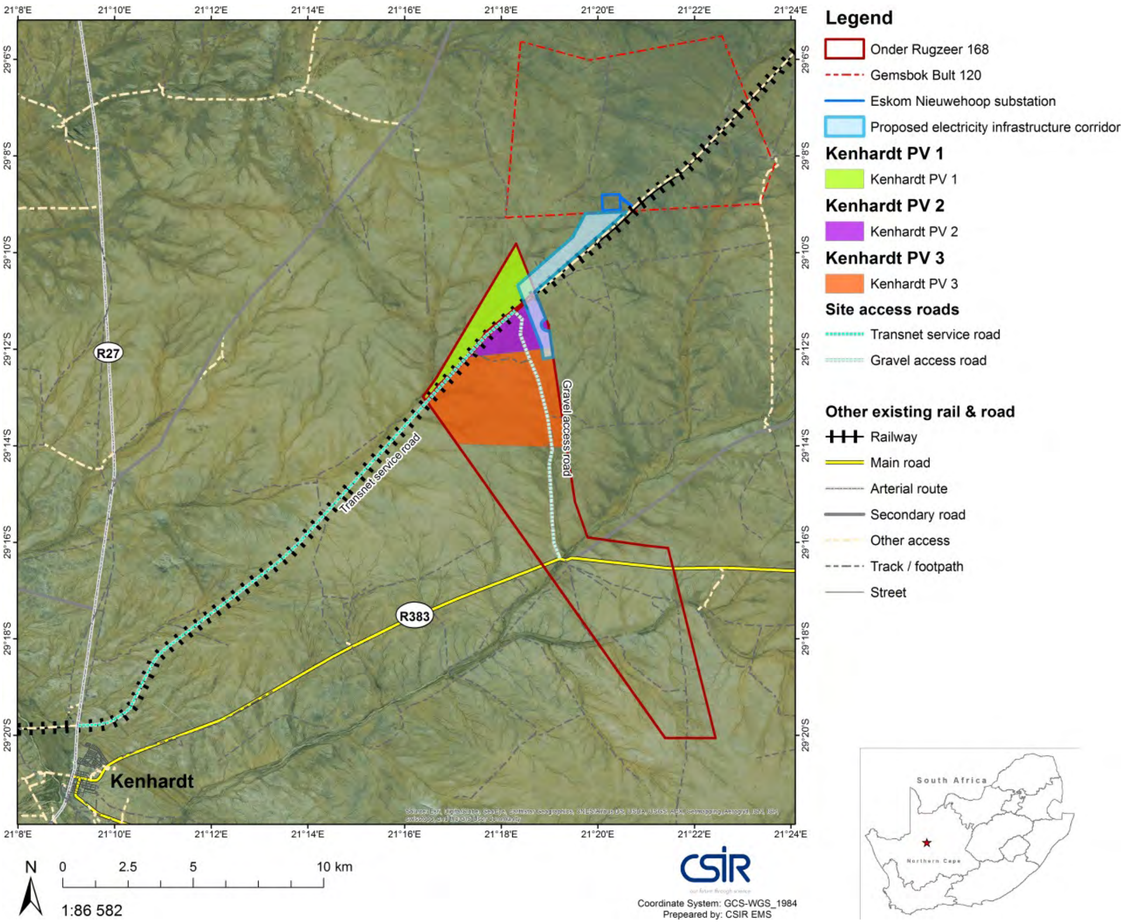


Figure 13.1: Preferred site locations of the three proposed Kenhardt PV solar developments (namely Kenhardt PV 1 (outlined in green); Kenhardt PV 2 (outlined in purple); and Kenhardt PV 3 (outlined in orange), and the transmission line projects (namely Kenhardt PV 1 – Transmission Line; Kenhardt PV 2 – Transmission Line; and Kenhardt PV 3 – Transmission Line) which will collectively occur within an electrical infrastructure corridor (outlined in blue).

The current land use of the proposed project areas, as well as the surrounding land parcels is zoned for agricultural development and use. The construction phase of each proposed solar PV facility would last approximately 14 months. The construction phase of each proposed transmission line (which is subject to the BA Process) is expected to last 12 to 14 months. However, it should be noted that the construction period is subject to the final requirements of Eskom and the REIPPPP Request for Proposal provisions at that point in time. Employment opportunities created during the construction phase for the PV projects equates to approximately 1 260 – 2 100 man months (for skilled opportunities) and approximately 5 600 - 6 400 man months (for unskilled opportunities) per project (i.e. three 75 MW PV projects in total). Employment opportunities created during the construction phase of each transmission line project are estimated to range between 1 560 and 1 820 man months. Table 13.1 lists the anticipated number of skilled and unskilled employment associated with the solar PV plant developments as well as the associated transmission lines projects. It should be noted that the employment opportunities provided in this report are estimates and is dependent on the final engineering design and the REIPPPP Request for Proposal provisions at that point in time.

Employment opportunities to be created during the operational phase equate to approximately 4 800 man months (for skilled opportunities) and approximately 9 600 man months (for unskilled opportunities) per project (i.e. three 75 MW PV projects in total) over the 20 year plant lifespan.

Scatec further proposes an Economic Development Plan which sets out to achieve the following:

- Create a local community trust which has an equity share in the project life to benefit historically disadvantaged communities;
- Initiate a training strategy to facilitate employment from the local community; and
- Give preference to local suppliers of components for the construction of the facility.

Table 13.1: Anticipated skilled and unskilled employment opportunities created during construction and operational phases of the project

EIA SOLAR PV PROJECTS:	
Construction Phase	**Man Months** **(Man months is also known as "Person Months": means the total number of Employees in each of the Contract Months, within the Construction Measurement Period and the Operating Measurement Period, as applicable, which are adjusted for the actual working time, compared to normal working time).**
Kenhardt PV 1 - between 90 and 150 skilled and 400 and 460 unskilled employment opportunities are expected be created during the construction phase.	Skilled: 90 * 14 months = 1260 man months Skilled: 150 * 14 months = 2100 man months Unskilled: 400 * 14 = 5600 man months Unskilled: 460 * 14 = 6440 man months
Kenhardt PV 2 - between 90 and 150 skilled and 400 and 460 unskilled employment opportunities are expected be created during the construction phase.	Skilled: 90 * 14 months = 1260 man months Skilled: 150 * 14 months = 2100 man months Unskilled: 400 * 14 = 5600 man months Unskilled: 460 * 14 = 6440 man months
Kenhardt PV 3 - between 90 and 150 skilled and 400 and 460 unskilled employment opportunities are expected be created during the construction phase.	Skilled: 90 * 14 months = 1260 man months Skilled: 150 * 14 months = 2100 man months Unskilled: 400 * 14 = 5600 man months Unskilled: 460 * 14 = 6440 man months
Operation Phase	
Kenhardt PV 1 - approximately 20 skilled and 40 unskilled employment opportunities will be created over the 20 year lifespan of the proposed facility	Skilled: 20 * 240 months = 4800 man months Unskilled: 40 * 240 months = 9600 man months
Kenhardt PV 2 - approximately 20 skilled and 40 unskilled employment opportunities will be created over the 20 year lifespan of the proposed facility.	Skilled: 20 * 240 months = 4800 man months Unskilled: 40 * 240 months = 9600 man months
Kenhardt PV 3 - approximately 20 skilled and 40 unskilled employment opportunities will be created over the 20 year lifespan of the proposed facility.	Skilled: 20 * 240 months = 4800 man months Unskilled: 40 * 240 months = 9600 man months
BA TRANSMISSION LINE PROJECTS:	
Construction Phase	
Transmission Line for PV 1 – about 130 employment opportunities, 30 % of which will accrue to previously disadvantaged individuals.	130 * 12 construction months = 1560 man months 130 * 14 construction months = 1820 man months
Transmission Line for PV 2 – about 130 employment opportunities, 30 % of which will accrue to previously disadvantaged individuals.	130 * 12 construction months = 1560 man months 130 * 14 construction months = 1820 man months
Transmission Line for PV 3 – about 130 employment opportunities, 30 % of which will accrue to previously disadvantaged individuals.	130 * 12 construction months = 1560 man months 130 * 14 construction months = 1820 man months
Operational Phase	
There will no additional new employment opportunities as the operation and maintenance of transmission lines is an Eskom competency.	n/a

It is important to note that a detailed project description is provided in Chapter 2 of the EIA Report and Section A of the BA Report.

13.2.2 Legal, Policy and Planning Context

The Draft Integrated Development Plan (IDP) (2014) for the Kai! Garib Local Municipality was considered in the drafting of this specialist study, due to its specific relevance to social and economic considerations related to proposed developments. Note that other key statutes were also considered in drafting this study (i.e. National Environmental Management Act (NEMA); National Heritage Act; and the Development Facilitation Act), but are discussed in greater detail in Chapter 4 of this EIA Report.

13.2.2.1 Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)

Section 24 of the Constitutional Act 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 –

i. Prevents pollution and ecological degradation;
ii. Promotes conservation; and
iii. Secures ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

In support of the above rights, the environmental management objectives of proposed projects are to protect ecologically sensitive areas and support sustainable development and the use of natural resources, whilst promoting justifiable socio-economic development in the towns nearest to the project sites.

13.2.2.2 National Environmental Management Act, 1998 (Act No. 107 of 1998)

The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) requires cooperative environmental governance by establishing principles for decision making on matters affecting the environment, institutions that will promote cooperative governance and procedures for coordinating environmental functions exercised by organs of state. NEMA also aims to achieve sustainable development. In this regard NEMA requires the integration of social, economic and environmental factors into planning, implementation and decision-making to ensure that development serves present and future generations.

13.2.2.3 National Heritage Resources Act, 1999 (Act No. 25 of 1999)

The National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) transfers responsibility for the identification of local heritage resources and the inclusion of heritage areas to all municipalities in South Africa. Developers/proponents need to integrate the NHRA into relevant planned projects and obtain approval (if necessary) from the relevant heritage authorities or municipalities before commence of the project.

13.2.2.4 Draft Integrated Development Plan, 2014 for the Kai !Garib Local Municipality

The objective of the IDP is to create an economically viable and maturely developed municipality, which enhances the standard of living of all the inhabitants and communities through good governance and excellent service. The IDP has identified key priority issues for the municipality.

13.2.2.5 Development Facilitation Act (Act 67 of 1995)

The Development Facilitation Act, 1995 (Act 67 of 1995) (DFA) sets out a number of key planning principles which have a bearing on assessing proposed developments in light of the national planning requirements. The planning principles most applicable to the study area include:

- Promoting the integration of the social, economic, institutional and physical aspects of land development;
- Promoting integrated land development in rural and urban areas in support of each other;
- Promoting the availability of residential and employment opportunities in close proximity to or integrated with each other;
- Optimising the use of existing resources including such resources relating to agriculture, land, minerals, bulk infrastructure, roads, transportation and social facilities;
- Contributing to the correction of the historically distorted spatial patterns of settlement in the Republic and to the optimum use of existing infrastructure in excess of current needs;
- Promoting the establishment of viable communities; and,
- Promoting sustained protection of the environment.

13.3 AFFECTED SOCIO-ECONOMIC ENVIRONMENT

The intention of this section is to provide background information of the socio-economic baseline conditions present in the study area. Information sources used to compile the socio-economic baseline consists of both primary (a site visit conducted on the 30 July 2014) and secondary research (relevant published literature and policy documents).

13.3.1 Socio-economic Baseline Data

13.3.1.1 Secondary Data

The study area is located within the ZF Mgcawu District Municipality (formally known as the Siyanda District Municipality). The actual project footprint (I.e. the remaining extent of Onder Rugzeer Farm 168 and the remaining extent of Portion 3 of Gemsbok Bult Farm 120 (for the connection points to the Eskom Nieuwehoop Substation)) is located in the !Kheis Local Municipality (part of the ZF Mgcawu District Municipality). However, the closest urban centre, Kenhardt, is located in the Kai !Garib Local Municipality. Given the proximity of the proposed projects to the town of Kenhardt; the focus of this SIA will be on the Kai !Garib Local Municipality (Figure 13.2), as this is where the vast majority of potential project impacts (both positive and negative) might manifest.

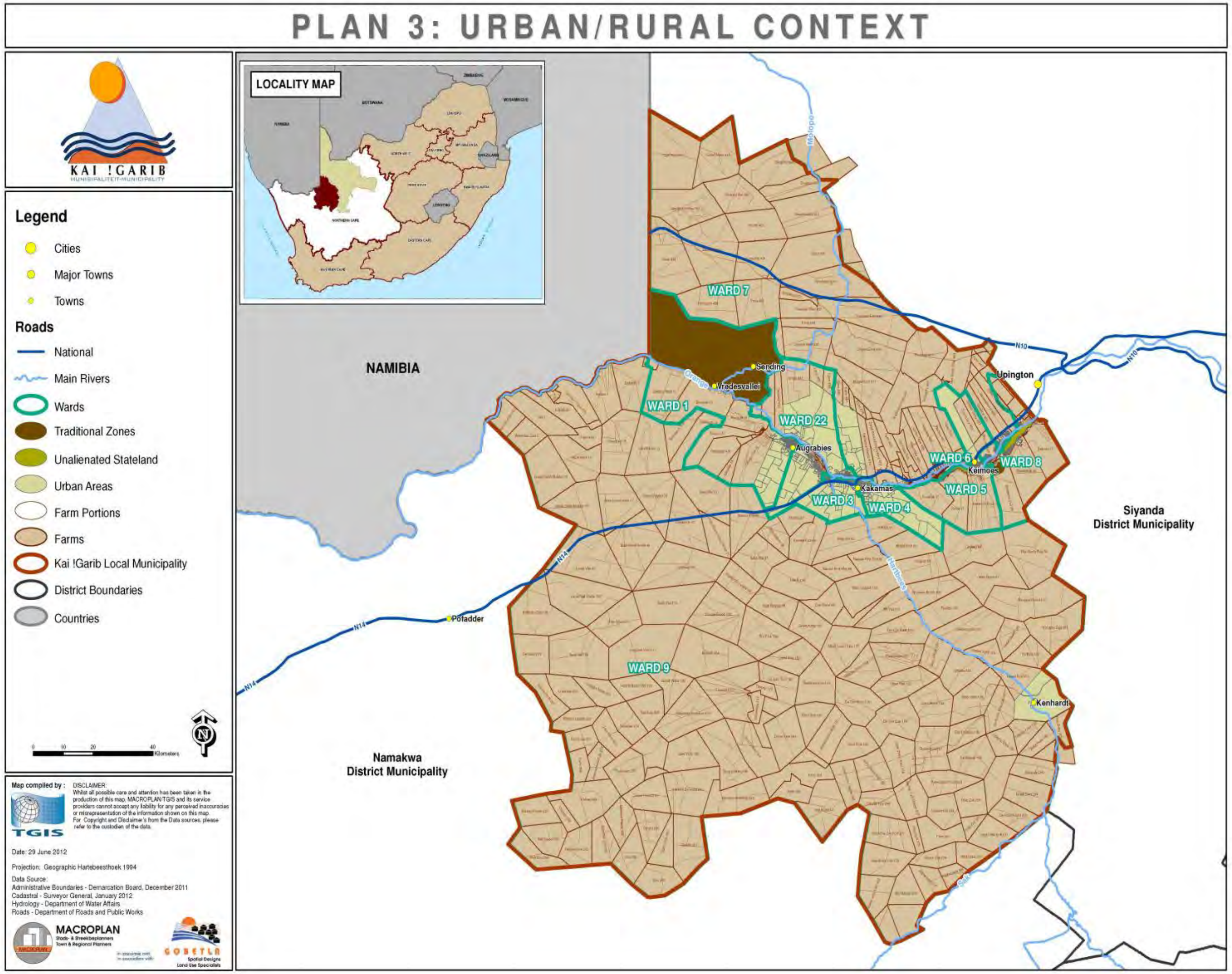


Figure 13.2: Kai !Garib Local Municipality
(Source: Kai !Garib Draft IDP, 2014)

According to the Kai !Garib Draft IDP (2014) and the Stats SA 2011 Census data, the total population of the Kai !Garib municipal area is 65 869; of which 6 679 resides in the Kenhardt area. A total of 16 703 households resides in the Kai !Garib Local Municipality, with 35% of households being female headed. The total female population dominates the total male population by 8.5% (Kai !Garib Draft IDP, 2014). Population of the working age demographic (15 to 65 years) makes-up 70.5% of the population, whereas those below 15 years of age comprises 24.4% of the population; the + 65 years age group makes-up 5.1% of the population. Accordingly, the dependency ratio (the economically active population vs the non-economically active population) is 41.9% (Stats SA, 2011).

The official unemployment rate of 10% has decreased by 6.1% since the 2011 Census measurement of 16.1%. The economic sector is dominated by agriculture which provides 51.8% of jobs, followed by the Community and Government Services sector with 15.9% (Figure 13.3).

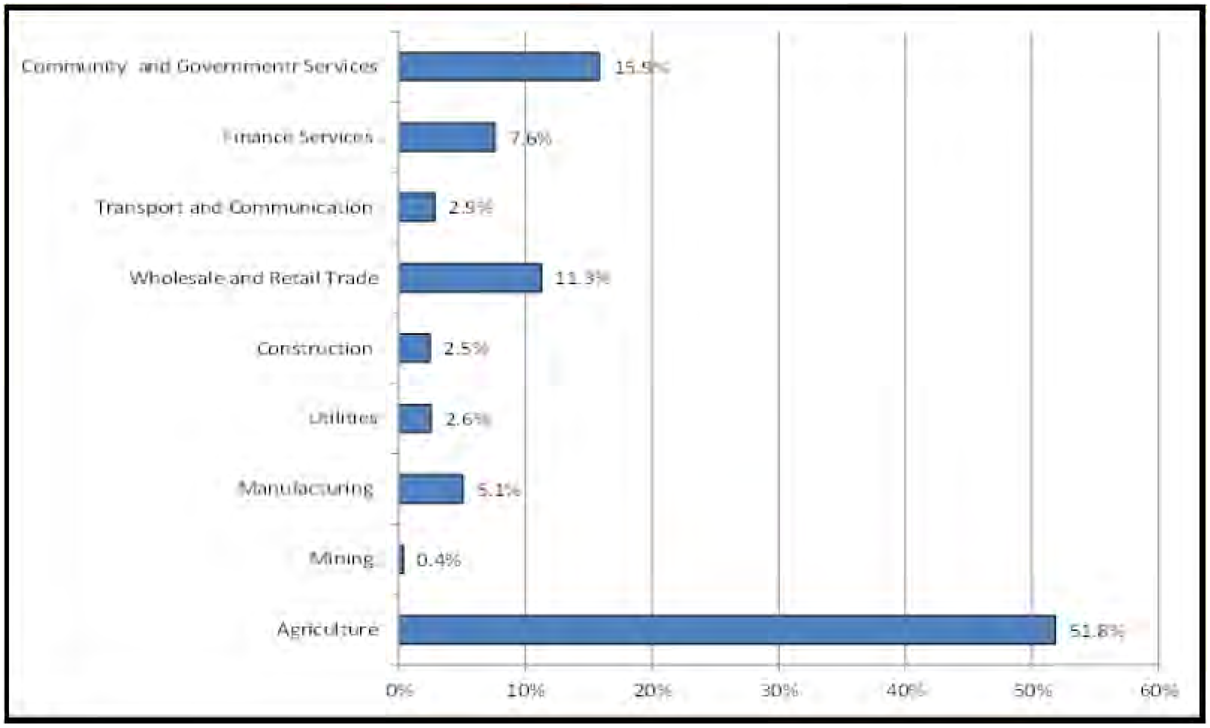


Figure 13.3: Most active economic sectors within the Kai !Garib Local Municipality
(Source Kai !Garib Draft IDP, 2014)

The major social challenges faced in the Kai !Garib Municipal area include (Kai !Garib Draft IDP, 2014):

- Increases in drug abuse;
- Increases in children under 10 years abusing alcohol;
- Increases in teenage pregnancies;
- Increased crime linked to alcohol and drug abuse;
- High youth unemployment rates; and
- Increased prevalence of HIV & AIDS.

13.3.1.2 Fieldwork

Clearly, the above mentioned figures and findings relate to the larger municipal area and subsequently provide limited detailed information regarding the actual study area (i.e. Kenhardt and surrounding areas). Furthermore, a dramatic difference in landscape character and environmental features occurs throughout the Kai !Garib municipal area that are due to the availability of irrigation water along the areas immediately adjacent to the Orange River. For example, due to the higher productivity of areas under irrigation, the total employment opportunities in the municipal area (especially in the agricultural and support services sector) tend to be limited to the banks of the Orange River. It is therefore safe to assume that Kenhardt, being located approximately 70 km away from the Orange River, has a different profile in terms of employment figures, as well as the various socio-economic impacts resulting from gainful employment. Consequently, it was deemed necessary to supplement the limited secondary data with a site visit to Kenhardt and the surrounding area to try and obtain useful data relating to socio-economic conditions.

Informants[2] in Kenhardt indicated that levels of unemployment in the town are particularly high. All informants interviewed indicated that the vast majority of the economically active population is dependent on some form of government subsidy (reported to be approximately R 1300 per person per month). These statements appear to be reliable given the very limited amount of businesses operating within Kenhardt. Businesses generally consist of liquor stores, restaurants and accommodation (Bed and Breakfast), with only one observed clothing store (PEP) and one general dealer (KLK). Employment figures for these businesses appear to range from a minimum of one to a maximum of four employees. Agriculture in the Kenhardt area is dominated by sheep farming which requires particularly low levels of labour (approximately 2-4 labours per farm) (R. Grobbelaar, personal communication, 31 July 2014), with limited seasonal increases in labour requirements during the shearing season. Larger employers in Kenhardt include the local high school, the Kai !Garib municipal offices, the Department of Social Development satellite office and the local police station.

Subsequently, the local labour market appears to offer very limited absorption of the economically active component (i.e. approximately 4675 employment opportunities, based on a 70.5% working age demographic for the Kai !Garib municipal area) of the 6679 inhabitants of the Kenhardt area.

Participant observation further supports the claim of high unemployment. Groups of young men (approximately 16 to 30 years of age) where observed loitering on various street corners during the normal working hours of both days of the site visit (a Wednesday and Thursday during the weekday). Furthermore, public infrastructure (public telephones, the public swimming pool and benches) where vandalised to such an extent that further use of these facilities is impossible. Acts of social disorder, such as loitering and vandalism, are regularly associated with poverty and elevated levels of distress within communities (Richardson & Shackleton, 2014). According to Fisher and Baron's (1982) Equity-Control Theory (ECT), acts of vandalism are often triggered by a perceived violation of norms related to fairness in terms of social and environmental arrangements. From this perspective, acts of vandalism can be understood as an attempt to reduce inequality.

Ceccato and Haining (2005) report that vandalism is particularly obvious in areas with low social integration and organisation; whereas Nowak *et. al.* (1990) reports higher levels of vandalism in areas with high unemployment rates and low private property ownership. A possible alternative interpretation of social disorder could be the "Broken Windows" theory put forward by Wilson and Keeling (1982). According to this theory, the presence of vandalism (or social disorder), however minor, creates a condition in which further vandalism is sanctioned; thereby increasing its frequency. However, acts of vandalism in Kenhardt were perpetrated in the formal, well maintained precinct of the town, as well as in the informal, poorly maintained precinct. This suggests that the "Broken Windows" theory does not apply to the observed social disorder in Kenhardt.

Informants further indicated that teenage pregnancies and drug abuse were major social issues in Kenhardt, and that the prevalence of these issues is increasing. This claim is validated by secondary data contained in the Kai !Garib Draft IDP (2014), which lists teenage pregnancy and drug abuse as major social challenges within the larger municipal area. Both these issues elevate the local dependency ratio, thereby placing already stressed livelihood strategies under even more strain.

Teenage pregnancy may be positively related to elevated levels of poverty, associated idleness and inappropriate forms or recreation (Were, 2007). Recreational opportunities in Kenhardt are extremely limited. A public rugby field and an oval racing track just outside of town are the only public recreational facilities offered. Informants identified an informal nightclub on the north-eastern outskirts of Kenhardt, which is associated (according to informants) with alcohol abuse and other forms of inappropriate recreation. Informants further confirmed that no internet cafes or public internet facilities are available in Kenhardt, which contributes to the overall lack of recreation/entertainment opportunities. Poverty and limited recreation opportunities may be contributing factors to the high teenage pregnancy rate. However, poor sex education, limited understanding of and access to modern contraception and lack of parental guidance are likely exacerbating factors.

[2] Sociological research ethics dictates that the identity of informants (i.e. those being interviewed) should be protected if *any* possibility of physical, mental, emotional or legal harm exists. Accordingly, the identities of informants are not disclosed in this study.

With regards to teenage pregnancy; interviewed parents communicated disappointment and indignation, rather than concern about the practical implications of teenage pregnancy. This suggests a violation of existing cultural norms. It is therefore assumed that further escalation of teenage pregnancies (and/or teenage sexual activity) would continue to disrupt the Kenhardt community not only in terms of livelihoods, but also in terms of family relations. The relative lack of employment in and around Kenhardt is suggestive of a community heavily reliant on kinship and reciprocity for its economic survival. Accordingly, further deterioration of kinship ties as a result of cultural taboos might jeopardize the already precarious livelihood strategies of young mothers and their children.

A study of Kenhardt's urban form is revealing. The town displays typical apartheid planning structure, with a distinct poorer urban node (previously a coloured township) to the north and a wealthier urban node (previously white urban node) to the south. A clear buffer zone (*cordon sanitaire)* separates the two areas (Figure 13.4). The poorer urban node to the north is characterised by small ERF sizes, erratic street patterns, a significant informal housing component and no business nodes.

Conversely, the wealthier urban node to the south is characterised by larger ERF sizes, a clear grid patterned road infrastructure, a complete absence of informal structures and a business node in the shape of a ribbon development along the R 27. Furthermore, the secondary school, municipal offices, and local clinic are all located within the wealthier southern node. During fieldwork, it was also observed that informal traders are located throughout the poorer northern node, but are virtually absent from the wealthier southern node. Informants complained that informal shop owners and traders are generally foreign nationals and are not seen as 'members' of the community. This outsider versus insider experience, coupled with a dependency of the local community on the services offered by outsiders appears to generate feelings of distrust and vulnerability. A secondary issue might also be the potential "leakage" of investment from the local economy due to foreign nationals not reinvesting in Kenhardt, but rather evacuating their funds to friends and family abroad or residing elsewhere. This existing outsider versus insider phenomenon suggests that the local community could be sensitive to the influx of job seekers and other forms of in-migration into Kenhardt.

Interestingly, the poorer northern node is expanding, while the wealthier southern node remains unchanged. Figure 13.5 indicates the expansion of the northern urban node through satellite imagery from 2005 and 2013, respectively. The yellow polygons indicate new informal residential units and the orange polygons indicate densification of informal units. These images show a potentially significant residential growth in the poorer community of Kenhardt.

Figure 13.6 indicates the wealthier southern node in 2005 and 2013, respectively. No discernable growth in the formal residential housing stock can be observed. Fieldwork also revealed that some houses in the southern node are for sale. This suggests that the southern urban node may be shrinking.

The growth of informal housing in Kenhardt is difficult to explain as the town does not appear to offer any significant social or economic pull factors. Recent declines in local rainfall and subsequent knock-on effects on agriculture are unlikely to fully account for increased urbanisation, as sheep farming does not generate significant employment opportunities. It therefore seems reasonable to assume that the increase can, to a large degree, be attributed to natural growth. This would suggest that wealthier residents (residing in the south) have the ability to 'escape' from the area, should they wish to; whereas the poorer residents (residing in the north) are 'trapped' in the area, thereby causing a natural growth in population numbers. The general trend of declining birth rates among white South Africans might also be a contributing factor. This increase in population is bound to add additional strain on the livelihoods of the poor community.

The fastest growing industry in Kenhardt appears to be Bed and Breakfast (B&B) establishments. Observations during fieldwork indicated that B&Bs were the single largest industry (in terms of number of establishments, not turnover) in the town. This observation is supported by local informants who suggested that the growth in the industry is attributable to the recent increases in energy–related projects (solar energy and Eskom transmission lines) proposed in the area.

Informants further reported frustration regarding job creation expectations created by other developments in the area. Apparently, other energy-related developments in the Kenhardt area, for which EIA processes are currently underway, communicated to the community that employment opportunities will be offered to local residents. When residents established that these jobs would only materialise in 5 to 10 years' time; considerable frustration and anger was (and is) experienced. According to Barbour (2007), the expectation of an occurrence (in social terms) should be considered as an impact resulting from a planned development. Consequently, the Kenhardt community is likely to be particularly sensitive to similar expectation which could be created by the proposed development.

13.3.2 Vulnerability Context

According to the Department for International Development (DFID) (1999), a community's vulnerability context is a product of *trends*, *shocks* and *seasonality* within the context of the community being researched. Informants indicated that very little seasonal variation is experience in income levels and livelihood strategies; therefore seasonality is of negligible interest in the vulnerability context of the Kenhardt community. Shocks, interpreted as an impact of sudden occurrence which directly destroy assets or livelihood strategies, also appears to have a limited role in the Kenhardt community. Trends do however seem to have a significant impact on those living in the area. Of particular importance are the increasing trends in unemployment and social deviance (teenage pregnancies and drug abuse), as well as the decreasing trend in the relative contribution of agriculture to job creation in Kenhardt.

Figure 13.4: Urban form of Kenhardt, with the (i) red polygon indicating the historical coloured township, (ii) the yellow polygon indicating the historical white urban node; and (iii) the green arrow indicating the cordon sanitaire

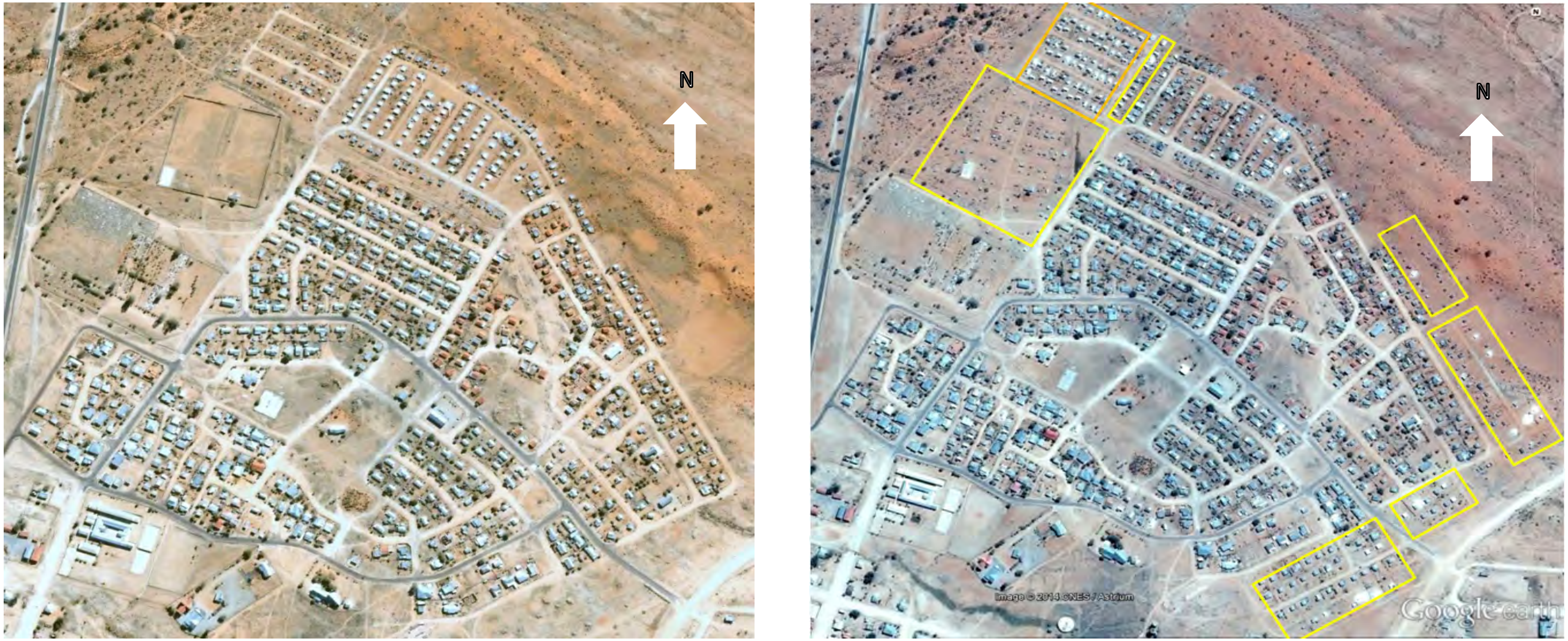


Figure 13.5: Satellite image of the poorer (northern) urban node of Kenhardt in 2005 on the left, and a satellite image of the same node in 2013 on the right; with (i) the yellow polygons indicating urban expansion; and (ii) the orange polygon indicating densification.

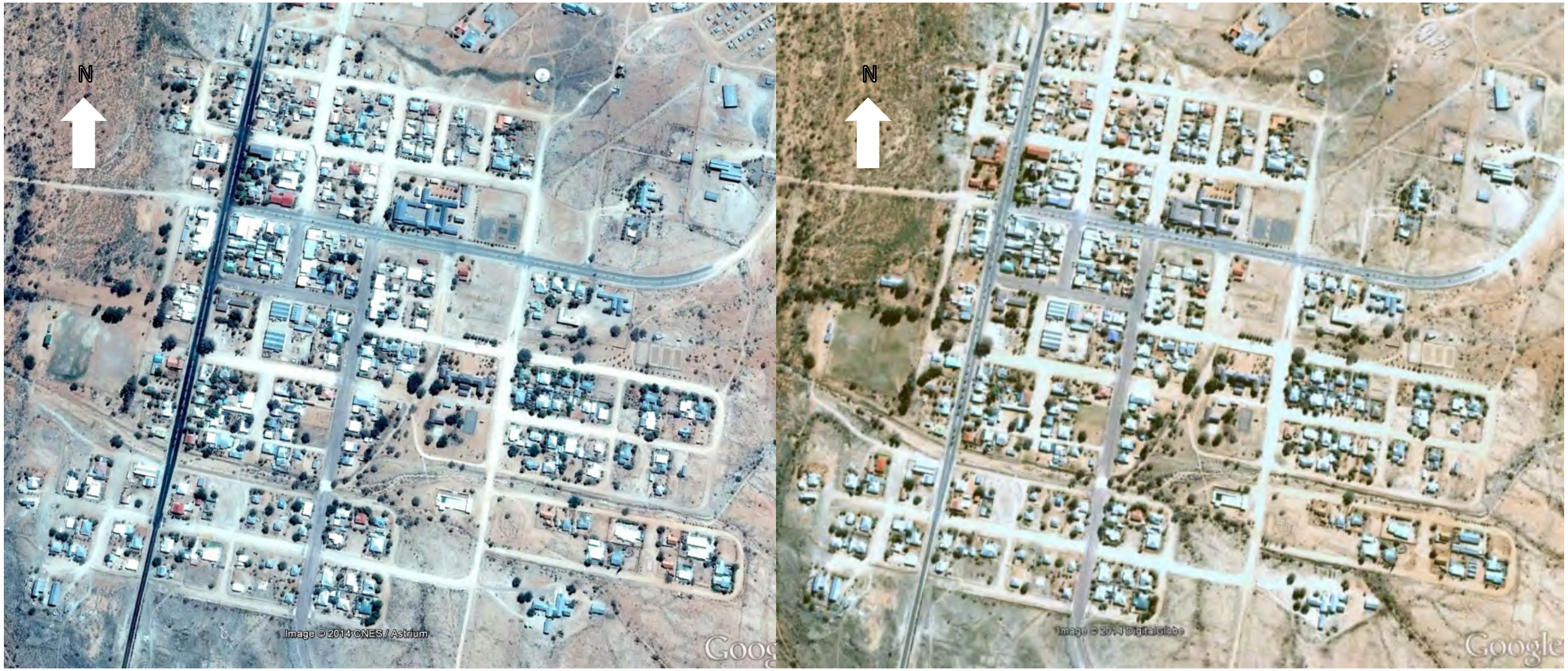


Figure 13.6: Satellite image of the wealthier (southern) urban node of Kenhardt in 2005 on the left, and satellite image of the same node of Kenhardt in 2013 on the right; indicating no discernible expansion or densification

People's access to productive assets (Human-, Social-, Natural-, Physical- and Financial capital) lie at the heart of their vulnerability context. Table 13.2 provides a brief explanation of the various forms of capital. Generally, the greater access people have to assets, the more livelihood strategies they have available and the easier it is for them to 'switch' from one strategy to the next. An effective way to assess access to assets is by using an Asset Pentagon (Figure 13.7).

The Asset Pentagon schematically represents variations in people's access to assets. The centre of the pentagon represents zero access to assets. Consequently, a resilient[3] community will have a pentagon characterised by a relative balance between all 5 forms of capital. Conversely, a pentagon wherein one or two capital classes dominate could be indicative of a vulnerable community.

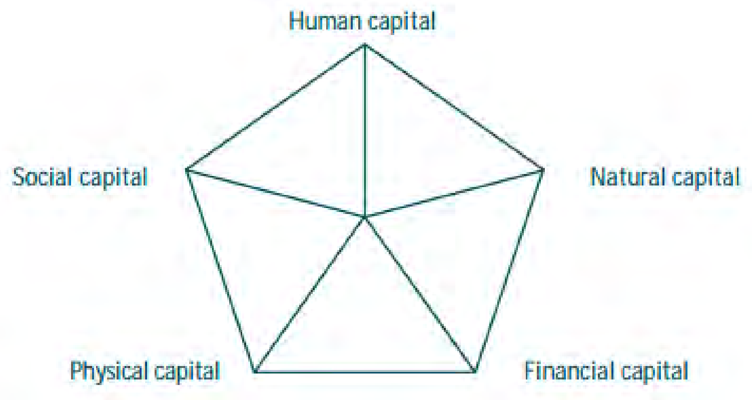


Figure 13.7: Example of an Asset Pentagon with 100% access to all 5 forms of capital

Table 13.2: Brief definition of the 5 capital forms

Capital class	Description
Human capital	Human capital signifies the ability to perform labour, skills-set, knowledge and health that empowers people to pursue different livelihood strategies and attain their livelihood objectives.
Social capital	These are the social resources available to people in the pursuit of their livelihood strategies. These include: networks and social connectedness, membership of formalised groups and/or relationships of trust reciprocity and exchange.
Natural capital	Natural capital refers to the natural resource stocks, flows and services which are beneficial for livelihoods. There are numerous natural resources that make up natural capital, from intangible services such as the atmosphere, to divisible assets used directly for production.
Physical capital	Physical capital is the basic infrastructure and producer goods, necessary for people to pursue their relevant livelihood strategies. Such capital includes; inexpensive transport, affordable energy, secure shelter, adequate and safe potable water supply, and access to information.
Financial capital	Financial capital simply refers to the financial resources people use to achieve their livelihood strategies. Generally financial capital consists of available stocks (savings, livestock, jewellery, etc.) or, regular inflows (pensions, remittances, government subsidies, etc.).

Source: DFID (1999)

[3] The use of the term 'resilient' in this context should not be confused with 'resilience theory' (i.e. the ability of a system to accommodate change while still maintaining its core function structure and identity), but is here merely used to refer to adaptability and robustness.

The Kenhardt community appears to have acceptable access to both Human and Social capital. Informants reported that community members are generally in very good health and that most young adults have a secondary education. The high level of unemployment and the increasing number of teenage pregnancies present in Kennard requires robust social capital to prevent affected community members from falling into abject poverty. The relative success of the local community in preventing this, suggests that access to Social capital is satisfactory.

Access to Physical capital in Kenhardt seems average to low. The community has access to bulk services (water, electricity and waste collection), and a range of housing types ranging from formal to informal. Transport is not a significant factor within Kenhardt, due to its very small size; however, access to other urban areas (e.g. Keimoes, Kakemas and Upington) is limited to private transport. Informants also indicated that access to information and awareness of basic rights and public services are very low. Natural capital in Kenhardt is limited due to the harsh climatic conditions and general lack of irrigation water. As a result, community members appear to have limited access to productive natural assets. Finally, access to financial capital is very limited as the bulk of the vulnerable section of the Kenhardt community seems to be dependent on government subsidies and pensions.

Represented as an Asset Pentagon; the Kenhardt community's access to assets is indicated in Figure 13.8.

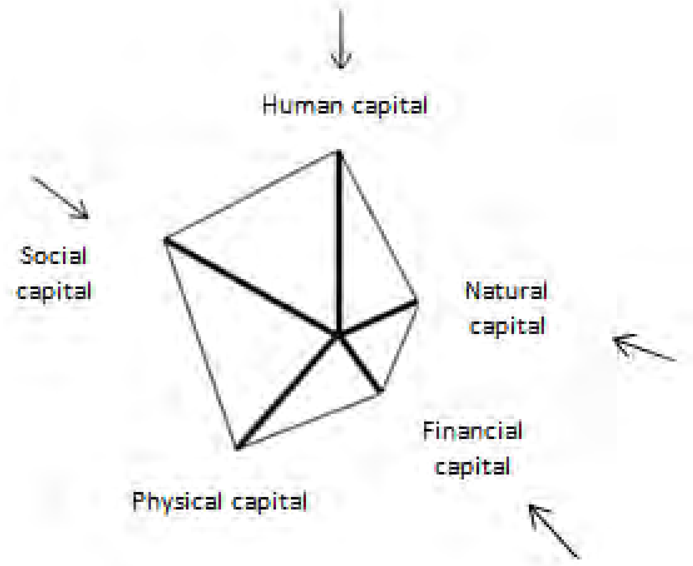


Figure 13.8: Kenhardt Asset Pentagon

The Kenhardt community appears to be vulnerable in terms of its livelihood strategies due to a relative imbalance in access to assets classes, with Human and Social capital dominating the pentagon. The arrows (Figure 13.8) indicate downward pressure (or trends) on the various asset classes. Climate change is expected to continue to deteriorate Natural capital; while high levels of unemployment coupled with a growth in population size is likely to weaken Human, Social and Financial capital. Future development in the Kenhardt area needs to take cognisance of the community's current vulnerability context. In this context, the proposed solar energy development could offer much need relief in terms of Human, Social and Financial capital through the creation of employment (even short-term employment) and local spending. Accordingly, the receiving social environment is not deemed to be sensitive (in a negative sense) to the proposed development, its structures and associated infrastructure.

13.3.3 Systems Analysis

A systemic analysis of the SES of Kenhardt is informed by the discipline of Systems thinking. According to Systems thinking, development (as proposed by Scatec) is introduced in complex systems of human-nature interaction. Such systems are open, functions in non-linear ways, are characterised by feedback loops and display emergence. Emergence is simply the creation of system characteristics which are not present in the individual variables constituting the system. Put differently, the sum of the individual parts does not necessarily equal the whole.

Systems thinking has been applied in this SIA for its ability to engage with complexity and uncertainty; something conventional reductionist and empirical research methods fails to do effectively. Of particular interest are the unintended consequences or causal relationships of the proposed development (indirect impacts), as well as the cumulative impacts likely to result from it. Such impacts are systemic consequences and are therefore complex in nature.

The CLD presented in Figure 13.9 is a simplified representation of the SES of which Kenhardt is part. The CLD contains system variables (i.e. goods, services and stocks of capital) displayed as boxes; linking relationships indicating the causal flow of goods, services and/or impacts which are displayed as arrows; and the polarity of causal flows (i.e. is the causal flow reinforcing or diminishing a subsequent variable), indicated by a “+” or “-“ at the head of each arrow (reinforcing relationships are depicted in blue and diminishing relationships are depicted in red). Linking relationships represented by dashed arrows indicate weak causality, while solid arrows show strong causality (the thicker the arrow, the stronger the causal relationship). Together, these attributes of the CLD enables a more holistic understanding of causality and the relative impact of causal relationships.

Figure 13.9 consists of 27 causal relationships. However, of greatest importance to this study are relationships 9, 11 and 12. Relationship 9 indicates a strong causal relation between “Government subsidies” and “Livelihoods”, wherein subsidies are heavily contributing to the livelihoods of the local community. Relationship 11 explains a strong causal link between “Energy sector developments” in the study area with “Livelihoods”. Accordingly, new energy-related developments in the area are contributing significantly to livelihoods. Relationship 12 indicates that “Sheep farming” has a weak causal link with “Livelihoods”, as it has a limited contribution to local livelihood strategies.

Both “Government subsidies” and “Energy sector developments” are variables which are sustained by exogenous capital flows (i.e. it is *not* generated and maintained by the Kenhardt SES); however, both contribute significantly to local livelihood strategies. “Sheep farming” is endogenous to the SES (i.e. it *is* generated and maintained by the Kenhardt SES), but it is suggested that it only contributes weakly to local livelihoods. This suggests that the Kenhardt SES is vulnerable to exogenous shocks. Any proposed developments within the Kenhardt SES should therefore aim to reduce this vulnerability by growing the number of alternative endogenous livelihood strategies. The ability to choose from a variety of income streams (redundancy[4]) enables adaptive capacity within the system.

A second observation relates to relationships 21 and 22. Relationship 21 indicates a diminishing causal relationship between “Energy sector developments’ and “Biodiversity”. Similarly, relationship 22 explains a diminishing causal link between “Energy sector developments and “Tourism”. These relationships demonstrate that energy related developments in the study area will ultimately reduce biodiversity and could also negatively impact on tourism. Clearly, this could impact negatively on livelihood strategies related to biodiversity and tourism. However, the significant vulnerability of the SES to exogenous shocks and the subsequent need to transform exogenous capital flows into endogenous adaptive capacity; suggests that *limited* loss of biodiversity, tourism and subsequent income is acceptable in order to achieve greater *systemic* resilience.

[4] Redundancy is used here in a systems perspective, and aims to indicate that the SES under consideration does not necessarily function at equilibrium levels (i.e. a balance between supply and demand of goods, services and functions). Accordingly, an oversupply of income generating options, though not resulting in equilibrium, does cause greater adaptive capacity by allowing people to change from one option to the next as needed.

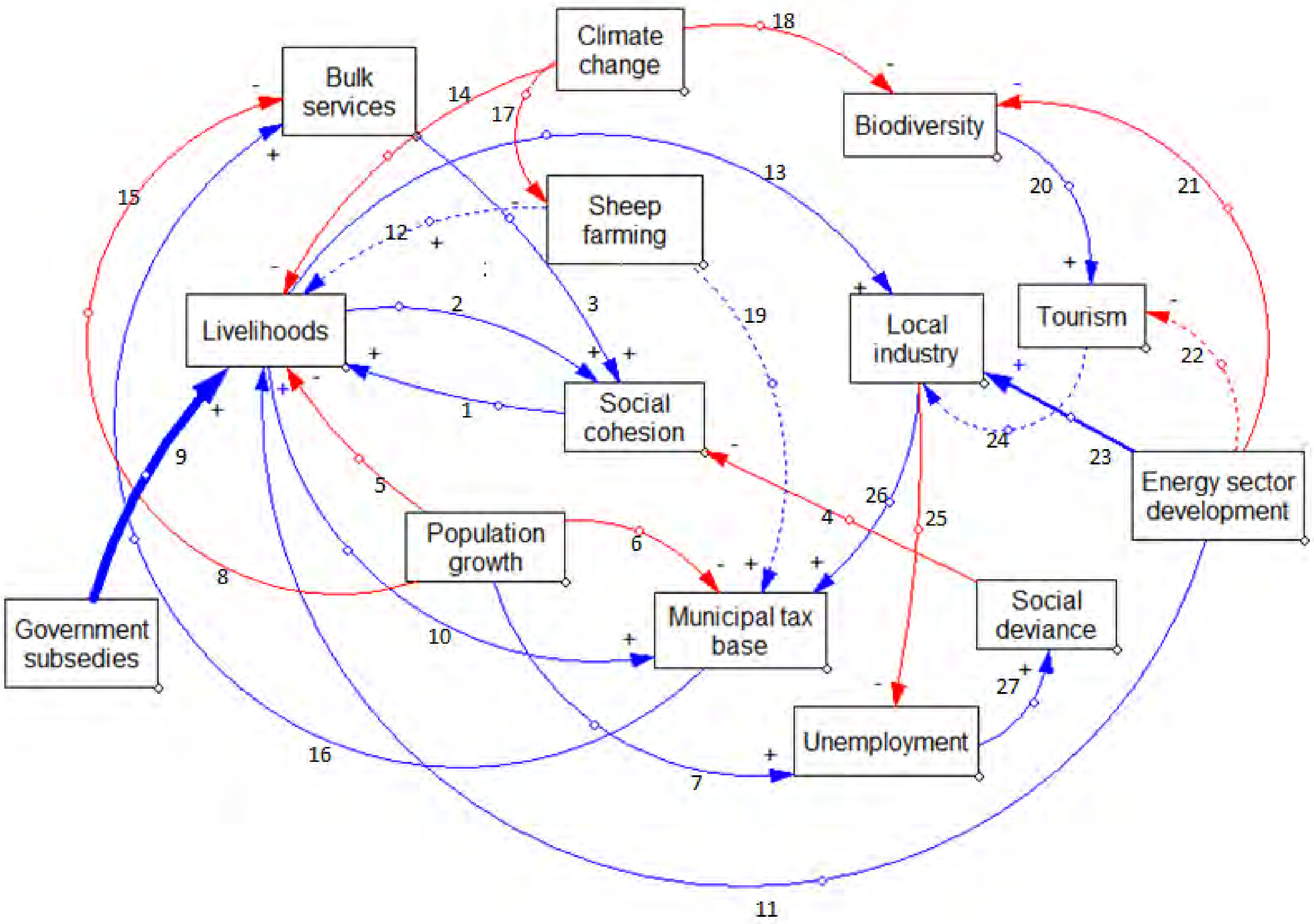


Figure 13.9: Causal Loop Diagram (CLD) of the Kenhardt Socio-ecological System (SES)

13.4 IDENTIFICATION OF KEY ISSUES AND ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

This section of the report discusses the expected social impacts resulting from the proposed Solar PV and transmission line projects near Kenhardt. These impacts are discussed in terms of its construction-, operational- and/or decommissioning phase impacts. Impacts are determined based on the assessment methodology discussed in Chapter 4 of the EIA Report.

All proposed projects will result in the same anticipated impacts. This is due to the remote location of the actual project footprint and the subsequent absence of substantial concentrations of people (i.e. communities) wherein socio-economic impacts could manifest. As previously noted, Kenhardt is the closest settlement; accordingly, most of the significant socio-economic impacts are expected to be experienced here.

13.4.1 Key issues identified during the Project Initiation and Scoping Phase

By far the most significant driver of change likely to result from the proposed project is the influx of people into the study area, and the corresponding increase in spending and employment. Such an influx of "strangers" into the receiving environment is likely to cause a disturbance in the order of the existing social structure and might also lead to increases in social deviance. Increased spending and employment (even though such employment might be short-term) generates positive impacts through the multiplier effect and by providing much needed financial relief in the area. However, it also creates significant, and often unrealistic, expectations regarding potential employment. The specific influence of anticipated impacts on woman and children will be an important consideration in the SIA.

During the Project Initiation Phase in July 2015, the Background Information Document was made available to I&APs for a 30-day comment period. The Scoping Report was released for a 30-day comment period which extended from 25 September 2015 to 27 October 2015. The Addendum to the Scoping Report was also released for a 30-day comment period, extending from 6 October 2015 to 5 November 2015. To date, no specific comments have been raised by I&APs that relate to social impacts. However, the following comment relating to the change in land use was raised by the Northern Cape Department of Environment and Nature Conservation on 5 November 2015:

- The EIA should indicate how the Social-Agricultural-Conservation dynamic will change in terms of land use. Will the properties on which the developments occur still be actively farmed or will they become dormant or effectively be converted into conservation land with minimal land use management. Will problem animal control still occur as in standard practice in small livestock farming? How will fencing infrastructure change around the properties which has a bearing on problem animal control, but also on wildlife movement and landscape connectivity.

The above comment asks multiple questions, some of which fall beyond the scope of the SIA (e.g. issues related to conservation management, land-use management, fencing and problem animal control). However, the issue of whether the farms on which the developments are proposed will still be actively farmed once the developments are operational appears to have at least some bearing on social impacts likely to result from the project.

Given the limited footprint of the proposed developments in relation to the overall size of the relevant properties, and given the large surface area but low density nature of sheep farming; the likelihood of property owners abandoning their commercial farming operations as a result of the presence of the proposed solar PV plants on their properties appears unlikely. This is due to the fact that sheep farming will remain commercially viable and profitable on the remaining extents of the affected properties and it would therefore be economically irrational to abandon such a profitable income generating activity (in which the property owners have invested money over extended periods of time) simply because an additional income generating activity (i.e. solar PV plants) is present on their properties. Furthermore, to the best of the author's knowledge, other South African farms on which commercial-scale solar PV plants have been constructed are still being actively farmed. This would suggest that the abandonment of farming in favour of limited passive income from solar PV plants is a conceivable, but relatively unlikely impact to result from the proposed projects.

13.4.2 Identification of Potential Impacts

Based on the status quo conditions of the study area and the nature of the proposed development, the following social impacts are identified:

- Influx of jobseekers;
- Increases in social deviance;
- Increases in incidence of HIV/AIDS infections;
- Expectations regarding jobs;
- Local spending;
- Local employment;
- Human development resulting from the proposed Economic Development Plan; and
- Job losses at the end of the project life-cycle.

The above mentioned impacts are discussed and assessed according to its relevant construction phase and operational phase (Section 13.4.3) and decommissioning phase (Section 13.4.4) impacts, as well as expected residual (Section 13.4.5) and cumulative impacts (Section 13.4.6) below.

13.4.3 Construction and Operational Phase Impacts

Social impact discussed in this section is expected to occur in the construction phase and persist into the operational phase of the project.

13.4.3.1 Potential Impact 1: Influx of job seekers

Construction of the proposed projects is likely to attract job seekers to the town of Kenhardt. Such an influx generally causes a disturbance in the existing social order as prevailing leadership, kinship and social control mechanisms are challenged by new and alternative values, beliefs and practices. Disturbance of the existing social order commonly results in the deterioration of social capital and general disorientation of affected communities. Furthermore, in-migration is likely to place additional strain on formal housing and bulk services. This can lead to a growth in informal housing and a deterioration of hygiene conditions in informal areas. It should however be noted that influx of job seekers is considered as a social disruptor and not an impact in itself. Accordingly, disturbance in the existing social order might result from such an influx, or it might not. The influx of job seekers, in the interest of the precautionary principle, is treated as an impact for the purposes of this impact assessment process.

The potential impact is expected to be ***long to medium term*** in duration and ***local in extent***. Influx of job seekers into the study area is therefore rated as having a ***moderate significance (negative)*** rating before mitigation. Should the mitigation measures discussed below be implemented, this significance rating will drop to ***low***.

<u>Mitigation</u>
The proponent (Scatec) must develop a Workforce Recruitment Policy. This policy must clearly state the criteria used to allocate jobs. It is strongly recommended that the Workforce Recruitment Policy should reserve employment, where practically possible, for local residents (particularly for vulnerable groups such as women and previously disadvantaged individuals). This requirement should be contractually binding. Local in this regard is defined as firstly, the residents of Kenhardt (given its close proximity); followed by the residents of the other urban nodes in the immediate area (I.e. Grobelaarshoop, Marydale and Keimoes). Position should only be filled with outsiders should the requisite skills not be available in the study area.

The proponent must also clearly define who is considered to be local (Kenhardt) residents; known as the Project Affected People (PAP). This should ideally be conducted in collaboration with the local community and local government structures. The purpose of demarcating the PAP is to develop a criterion of characteristics considered to identify a given job seeker as a PAP. Once this criterion is known; all subsequent job seekers can be screened against it in order to determine whether they qualify for employment. The criterion for a PAP should be incorporated into the Workforce Recruitment Policy.

It is also suggested that the proponent assembles a database of local residents and their relevant skills and experience (in collaboration with local structures such as the NGO Marcyrox: www.marcyrox.org) well in advance of the construction phase of the project. This will assist in the early identification of a suitable workforce. Should a similar database already be available in the study area; it can be used by the proponent to achieve the same purpose. However, such an existing database must be regarded as legitimate by the local community in order for it to be used as a substitute by the proponent.

Finally, the proponent must develop a Stakeholder Engagement Plan which sets-out the communication strategy to be followed with regards to the proposed projects. This should be done well in advance of the construction phase of the project. The intention of the plan should be to ensure that all project related information (including those related employment) is communicated: (*i*) accurately; (*ii*) timeously; (*iii*) to the appropriate constituency; (*iv*) in an appropriate format; and is aimed towards fostering realistic expectations.

13.4.3.2 Potential Impact 2: Increases in social deviance

In-migration into the study area, particularly Kenhardt, could lead to an increase the incidence of teenage pregnancies, drug abuse, prostitution and other socially deviant behaviour. As discussed above, such increases are associated with the social disturbance caused by in-migration; however, it is also related to a growth in alternative livelihood strategies (e.g. prostitution) and conflict regarding limited employment opportunities. Increase in socially deviant behaviour could deteriorate both Social and Human capital through the violation of cultural norms and values (Social capital), as well as through the spread of Sexually Transmitted Diseases (STDs) (Human capital).

This impact is expected to be ***long term to medium term*** in duration and ***local*** in extent. Increases in social deviance within the study area are therefore rated as having a ***moderate significance (negative)*** rating before mitigation which drops ***to low significance*** after mitigation. Increases in social deviance are extremely difficult to control and often lies outside the exclusive control of the proponent as it is driven by complex socio-ecological conditions related to poverty and feelings of hopelessness.

Mitigation
Mitigation against increases in social deviance is largely indirect in nature. In other words, the overall success of the project and the ability and commitment of the proponent to involve the local community in the benefits of the project is of much greater importance than direct interventions. This is due to the need to change the prevailing conditions of unemployment, poverty and disempowerment, as opposed to command and control mechanisms aimed at simple regulation of activities.

The mitigation measures proposed for Potential Impact 1 must also be used to mitigate impacts resulting from increases in social deviance, as Potential Impact 1 is a precursor to Potential Impact 2. Furthermore, the proponent should be contractually bound to deliver on its Economic Development Plan for the area once the proposed projects are successfully awarded preferred bidder status.
Though not an official mitigation measure; it is proposed that the proponent seeks to actively engage with Marcyrox NPC to investigate possible synergies in community development within Kenhardt.

13.4.3.3 Potential Impact 3: Expectations regarding jobs

Informants in the Kenhardt area indicated a significant level of frustration with other potential developments in the area due to expectations related to possible employment. Unrealised expectations in a poor community could lead to feelings of desperation, disempowerment, anger and a general distrust in developers. In isolated cases, such frustration of expectations might lead to malicious damage of project property and intimidation of employees.

The impact is expected to be ***short term*** in duration and ***local in extent***. Influx of job seekers into the study are is therefore rated as having a ***low (negative)*** rating before mitigation. Should the mitigation measures discussed below be implemented, this significance rating will drop to ***very low***.

Mitigation
It should be recognised that expectations of employment are probably unavoidable in totality. However, proper implementation of the Stakeholder Engagement Plan proposed for Potential Impact 1 should lead to realistic expectation of employment for most of the local community. It is important to note that communication should not only elaborate on what kind of employment is on offer and to whom it is offered; but also the worst-case timeframe for such employment to commence. Forewarned community members are better equipped to adjust livelihood strategies to the variability of the project timeframe.

13.4.3.4 Potential Impact 4: Local Spending

Procurement of goods and services in the Kenhardt area during the construction and operational phases of the proposed projects is likely to hold socio-economic benefits as a result of the multiplier effect (i.e. the increase in final income resulting from a new injection of spending). Such benefits are already evident in

Kenhardt as a result of other energy-related developments in the area. As indicated earlier, B&B establishments appear to dominate local industry in Kenhardt as a result of increased numbers of consultants and project staff frequenting the area. It is therefore reasonable to assume that the proposed project will result in similar positive impacts.

A secondary positive impact might result from entrepreneurial development in the project area, whereby niche and/or supporting goods and service industries are developed in response to the demand created for such services in the area. It is important to note the unintended consequence related to this positive impact. Clearly, the economic pull factors created by demand could lead to the in-migration of outsiders.

The impact is expected to be ***medium to long term*** in duration and ***local in extent***. Local spending in the study area is therefore rated as having a ***low significance (positive)*** rating.

<u>Enhancement</u>
The proponent must procure goods and services, as far as practically possible, from within the project area (with a focus on Kenhardt). Only if required goods and services are not available in the study area should the proponent seek to obtain it elsewhere. It is also suggested that regularly required goods and services (e.g. food and accommodation) be obtained from as large a selection of service providers as possible to ensure distribution of project benefits.

13.4.3.5 Potential Impact 5: Local Employment

The creation of short term employment for low skilled community members in the study area, though not ideal, does provide much needed temporary financial relief, while also contributing to a sense of empowerment and dignity. The limited number of long term employment offered by the proponent provides long term (small scale) socio-economic benefit to the affected community and may also contribute to the multiplier effect, as more income generally results in greater spending.

Local employment not only improves access to Financial capital, but also boosts Human and Social capital as skills sets and experience increases and reciprocal and kinship relationships are invigorated through the ability to give and support. Importantly, on an individual level, employment has the ability to empower people. Such empowerment could lead individuals (and communities) to perceive themselves not as suffering entities, but as active, doing entities that has the ability and potential to change their environment in a positive way (Davids, Theron & Maphunye, 2005).

The impact is expected to be ***long term*** in duration and ***local in extent***. Local employment is therefore rated as having a ***moderate significance (positive)*** rating.

<u>Enhancement</u>
As recommended for Potential Impact 1, the proponent must develop a Workforce Recruitment Policy. This policy should reserve employment, where practically possible, for local residents (particularly for vulnerable groups such as women and previously disadvantaged individuals). This requirement should be contractually binding on the proponent.

Though not an official mitigation measure; it is proposed that the proponent actively engages with the local government and other NGOs and CBOs to investigate how skills can be developed to enable short term workers to gain the necessary skills in pursuit of longer-term employment. Such employment does not necessarily have to be with Scatec.

13.4.3.6 Impact 6: Human development via the proposed Economic Development Plan

Scatec indicated that an Economic Development Plan will be developed, should the proposed project be successful (i.e. selected as a preferred bidder, not merely obtaining a positive Environmental Authorisation). The proposed Economic Development Plan aims to achieve the following broad objectives:

- Create a local community trust which has an equity share in the project life to benefit historically disadvantaged communities;
- Initiate a training strategy to facilitate employment from the local community; and
- Give preference to local suppliers of components for the construction of the facility.

It is recognised that this plan is still in its infancy and will be refined once the proposed project has reached maturity. However, it is clear that even the obtainment of the broad objectives alone will result in significant positive and negative impacts.

The positive impacts are self-evident and will relate to the creation of employment, local spending and human capacity development. However, the attainment of these positive impacts will create substantial social and economic pull factors which are likely to attract job seekers. Such job seekers will not only be attracted by the employment offered by Scatec, but also by the secondary growth and development which might result from the Economic Development Plan. Accordingly, negative socio-economic impacts resulting from in-migration are inherent to the positive impacts of the Economic Development Plan. Such negative impacts are however considered to be acceptable in light of the much needed development in the area. Furthermore, these negative impacts are largely unavoidable, especially through EIA-level (i.e. project-level) interventions; as it is caused by complex structural inequalities which needs to be addressed at a strategic policy level. Subsequently, no mitigation is proposed.

The impact is expected to be ***long term*** in duration and ***local in extent***. Human development is therefore rated as having a ***moderate significance (positive)*** rating.

Enhancement
A systems thinking approach (discussed in Section 13.3.3) reveals that the SES of which the Kenhardt area is a part of, can be considered to be vulnerable. This vulnerability is attributed to, amongst others, the system's disproportional dependence on exogenous flows of capital for its continued existence. It is therefore imperative to build resilience within the SES to enable greater adaptive capacity. Such adaptive capacity could be created by growing the skills base of the local community. However, such skills development should not be limited to vocational training relevant to the solar energy industry, but should also be extended to address life skills and other relevant skills/competencies as might be required.

The Economic Development Plan, once fully developed, must be implemented. It is also proposed that the proponent should engage with local NGOs, CBOs and local government structures to identify and agree upon relevant skills and competencies required in the Kenhardt community. Such skills and competencies should then be included in the proponent's Economic Development Plan. The proponent must also align economic development and skills development initiatives with the Kai !Garib Local Municipality's IDP objectives.

13.4.4 Decommissioning Phase Impacts

Impacts identified in this section are expected to occur during the decommissioning phase of the proposed projects. Decommissioning of the proposed solar energy developments and transmission lines entails termination of most (if not all) local created employment opportunities.

13.4.4.1 Impact 7: Job Losses

It is expected that the proposed projects could be decommissioned after an operational lifespan of approximately 20 years. Decommissioning of the proposed development will result in job losses. Though unavoidable in projects of this nature, appropriate measures should be taken to plan for such retrenchments and to provide the affected community with alternatives where practical and appropriate. Secondary impacts might result from incorrect decommissioning of project infrastructure which might be used for inappropriate purposes. This in turn could result in health and safety impacts on the local community.

This impact is expected to be ***long term*** in duration and ***local*** in extent. Job losses resulting from decommissioning within the study area are therefore rated as having a ***moderate significance (negative)*** rating before mitigation and ***low (negative)*** with mitigation. This impact is however considered to be acceptable in light of the local need for employment and development.

Mitigation
The proponent must comply with relevant South African labour legislation when retrenching employees. Scatec should also consider appropriate succession training of locally employed staff earmarked for retrenchment during decommissioning. Such training could gradually equip workers to enter gainful employment in other locally viable sectors. Finally, all project infrastructures should be decommissioned appropriately and thoroughly to avoid misuse.

13.4.5 Residual Impacts

A number of potential negative socio-economic impacts resulting from the proposed projects are likely to persist regardless of proposed mitigation measures. Increases in social deviance are unlikely to be mitigated completely and a certain measure of social disruption and loss of social capital must be accepted as part of the proposed developments. Secondly, an influx of job seekers will occur in spite of the mitigation proposed. In-migration is a double edged sword; as not all in-migration necessary leads to social disruption. Lastly, job losses once the project reached the end of its operational lifespan are unavoidable.

13.4.6 Cumulative Impacts

Socio-ecological cumulative impacts associated with the proposed projects, as with most cumulative impacts, are notoriously difficult to predict. Part of this challenge is due to the fact that a certain level of educated guesswork is required in order to construct a probable picture of the future as it relates to socio-economics in particular and the development in the area in general. Significant subjectivity in this regard should not be denied, nor should it be rejected. When faced with complex problems, like cumulative impacts, conventional reductionist and empirical processes tend to become less useful. It is therefore appropriate to employ subjective (but informed) reasoning as a pragmatic solution.

Development of more solar energy facilities and associated electrical infrastructure (such as transmission lines) in the study area is likely to negatively impact on biodiversity, farming and tourism. These impacts might further negatively affect local industries, and consequently diminish certain livelihood strategies. However, the relationship of biodiversity, tourism and farming to the majority of local livelihood strategies is weak (Section 13.3.3). As a result, cumulative impacts on biodiversity, tourism and farming in the study area appear to be acceptable.

Similarly, the incidence and severity of the in-migration of job seekers as well as increases in social deviance might increase as more solar energy facilities and associated electrical infrastructure (such as transmission lines) are developed in the study area. This is of importance as several other solar energy developments are being proposed in the Kenhardt area (e.g. the Mulilo Renewable Project Developments (PTY) Ltd Nieuwehoop Phase 1 and Phase 2 solar energy developments), as listed in Chapter 4 of the EIA Report. However, such increases are also associated with most other forms of economic and social development and should therefore be expected from any industrial scale developments in the study area.

Finally, the cumulative success of the proposed project and other projects offering significant socio-economic benefits are likely to present a major economic pull factor which might exacerbate in-migration into the study area as well as increases in social deviance. However, the cumulative socio-economic benefit offered by industrial scale development in the study area outweighs the negative impacts associated with economic growth. It should also be borne in mind that influx of job seekers does not necessarily equate in social deviance; i.e. influx of job seekers is a social disruptor which *could* result in social impacts. Given the relative balance between cumulative benefits and impacts, the significance rating ascribed to the cumulative impact of the proposed development is rated as is expected to be of ***long term to medium term*** in duration, ***local*** in extent and of ***moderate significance*** (negative) rating.

Table 13.3: Impact rating table

Aspect/ Impact pathway	Nature of potential impact/ risk	Status	Spatial Extent	Dura-tion	Conse-quence	Proba-bility	Reversi-bility of impact	Irreplace-ability of receiving environ-ment/ resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/ risk	Confi-dence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
CONSTRUCTION AND OPERATIONAL PHASE													
Impact 1: Influx of job seekers into the Kenhardt area	Disruption of existing social structures	Negative	Local	Medium to Long-term	Substantial	Likely	Low	Moderate	• Develop and implement a Workforce Recruitment Plan • Reserve employment, where practical, for local residents • Clearly define and agree upon the PAP • Develop a database of PAP and their relevant skills and experience • Develop and implement a Stakeholder Engagement Plan	Moderate	Low	4	Medium
Impact 2: Outsiders moves into the Kenhardt area	Increases in social deviance	Negative	Local	Medium-term	Substantial	Likely	Low	Moderate	• Develop and implement a Workforce Recruitment Plan • Reserve employment, where practical, for local residents • Clearly define and agree upon the PAP • Develop a database of PAP and their relevant skills and experience • Develop and implement a Stakeholder Engagement Plan • Delivery on the Economic development Plan must be contractually binding on the proponent	Moderate	Low	4	Medium

Aspect/ Impact pathway	Nature of potential impact/ risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/ risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
Impact 3: Expectations created regarding possible employment	Increased frustration in the local community	Negative	Local	Short-term	Moderate	Likely	High	Moderate to low	• Develop and implement the Stakeholder Engagement Plan	Low	Very low	5	Medium
Impact 4: Local spending	Socio-economic benefits as a result of the multiplier effect	Positive	Local	Medium to long-term	Moderate	Likely	n/a	n/a	• Procure goods and services, where practical, within the study area • Obtain regularly required goods and services from as large a selection of local service providers as possible	Low	Low	4	Medium
Impact 5: Local employment	Socio-economic benefits	Positive	Local	Long-term	Substantial	Very likely	n/a	n/a	• Develop and implement a Workforce Recruitment Policy	Moderate	Moderate	3	High
Impact 6: Economic Development Plan	Contribute to local employment, local spending and human capacity development	Positive	Local	Long-term	Substantial	Very likely	n/a	n/a	• The proponent should engage with local NGOs, CBOs and local government structures to identify and agree upon relevant skills and competencies required in the Kenhardt community • Such skills and competencies should then be included in the Economic Development Plan • Where possible, align Economic development Plan with Local Municipality's IDP	Moderate	Moderate	3	High

Aspect/ Impact pathway	Nature of potential impact/ risk	Status	Spatial Extent	Dura-tion	Conse-quence	Proba-bility	Reversi-bility of impact	Irreplace-ability of receiving environ-ment/ resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/ risk	Confi-dence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
DECOMMISSIONING PHASE													
Impact 7: Decom-missioning of the proposed develop-ment	Job losses	Negative	Local	Long-term	Substan-tial	Very likely	Moderat e	Moderate	• The proponent should comply with relevant South African labour legislation when retrenching employees • Scatec should also implement appropriate succession training of locally employed staff earmarked for retrenchment during decommissioning • All project infrastructures should be decommissioned appropriately and thoroughly to avoid misuse	Moderate	Low	4	High
CUMULATIVE IMPACTS													
Exacer-bated in-migration	Disruption of social structures	Negative	Local	Medium to long-term	Substan-tial	Likely	Low	Moderate	n/a	Moderate	Moderate	3	Medium

13.5 INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME

The key mitigation measures proposed by the specialist, and which needs to be included in the EMPr are listed below.

Construction and Operational Phase Mitigations:

- Develop and implement a Workforce Recruitment Plan;
- Reserve employment, where practical, for local residents;
- Clearly define and agree upon the PAP;
- Develop a database of PAP and their relevant skills and experience, or use an existing legitimate database of skills and expertise;
- Develop and implement a Stakeholder Engagement Plan;
- Delivery on the Economic Development Plan must be contractually binding on the proponent;
- Procure goods and services, where practical, within the study area;
- Obtain regularly required goods and services from as large a selection of local service providers as possible;
- The proponent should engage with local NGOs, CBOs and local government structures in the Kenhardt community to identify and agree upon relevant skills and competencies required;
- Such skills and competencies should then be included in the Economic Development Plan; and
- Where possible, align the Economic Development Plan with Local Municipality's IDP.

Decommissioning Phase Mitigations

- The proponent should comply with relevant South African labour legislation when retrenching employees;
- Scatec should also consider appropriate succession training of locally employed staff earmarked for retrenchment during decommissioning; and
- All project infrastructures should be decommissioned appropriately and thoroughly to avoid misuse.

Monitoring recommendations for the above mitigation measures are included in the complete EMPr (included as Part B of the EIA Report).

13.6 CONCLUSION AND RECOMMENDATIONS

Very little socio-economic data is available for the study area. Census data and information from the Kai !Garib Local Municipality Draft IDP (2014) was obtained; however, these only deal with the larger municipal area and offer no site specific data on socio-economic conditions within and around the town of Kenhardt. Secondary data was subsequently augmented by a site visit. The site visit suggests that Kenhardt is an area of low employment, substantial poverty and limited livelihood strategies. Access to Human and Social capital appears to be acceptable, while access to Physical capital seems average. However, access to Natural and Financial capital is limited. This constrained access to capital limits the ability of vulnerable members of the community to adapt livelihood strategies should it be required; which results in vulnerability.

The main income source among vulnerable communities appears to be government subsidies, with limited income generated from employment within industries operating in Kenhardt. Social deviance (i.e. teenage pregnancy and drug abuse) is a major challenge in the area. Such deviance could threaten Social capital on which much of the existing livelihood strategies depend. Unemployment seems to be the single greatest challenge and problem driver in Kenhardt. Not only does unemployment deprive community members from income, it also constrains empowerment and the subsequent ability to perceive one's subjective social reality as meaningful. This more often than not exacerbates social deviance.

Vulnerable community members might be negatively impact by the proposed project through the influx of opportunistic job seekers. Such an influx might threaten existing social structures and could lead to increased pressure on bulk services and housing. Social deviance might also be increased as a result of the proposed project; as deviant behaviour (e.g. prostitution and teenage pregnancy) are likely to increase as more outsiders migrate into Kenhardt in search of employment. Frustrated expectations of employment, created by the proposed development, could also contribute feelings of distrust in the developer and, in isolated instances, damage to project property and potential intimidation of staff. Furthermore, the likelihood of job losses once the proposed project reaches its decommissioning phase is high.

Positive socio-economic impacts likely to result from the project are increased local spending, the creation of local employment opportunities and the proposed development of an Economic Development Plan. These impacts will benefit the community through the creation of income generation opportunities and human development through skills development and training.

No conditions are proposed for inclusion in the environmental authorisation.

It should be noted that from a social perspective, the applicant can select any 250 ha area within the larger **surveyed** area to build the PV plants and associated transmission lines, provided that the recommended mitigation measures are implemented as applicable. As explained earlier, this is due (i) to the relative homogenous nature of the surveyed area, and (ii) the relative remoteness of the surveyed area in relation to any major urban node or human settlement where social impacts are likely to manifest.

13.6.1 Overall Significance Rating and Specialist Opinion

The overall significance rating of the *negative* socio-economic impacts associated with the proposed project is ***low to moderate***; whereas the overall significance rating of the *positive* socio-economic impacts associated with the proposed development is ***moderate***.

It should be accepted that the development of the proposed projects is likely result in some form of negative social impact to the local community. However, such a negative impact needs to be weighed against the potential benefit likely to result from the same development. Given the overall medium significance negative impact of the project, as compared to the overall medium-high significance positive impact of the project; it can be concluded that the prospective socio-economic benefits of the proposed project outweighs the socio-economic losses/impacts. In addition, the local vulnerability context strongly suggests that acceptable, though declining, levels of Social and Human capital is present within the Kenhardt community, which should assist with the mitigation of potential negative socio-economic impacts resulting from the proposed project. Conversely, very limited Financial capital is available in the local community, which in turn adds to the erosion of existing Social and Human capital. Accordingly, there appears to be a clear need to invest in the development of Financial capital within the Kenhardt community in order to restore some level of balance between asset classes which in turn should facilitate more options to local community members in terms of viable livelihood strategies.

From a social impact perspective, in light of the above argument, the specialist conducting this SIA is of the opinion that the proposed projects should be authorised by the competent authority.

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APPENDIX 13.A: EXTERNAL REVIEW REPORT

EXTERNAL PEER REVIEW
OF THIS REPORT:

PEER REVIEWER	**LIZA VAN DER MERWE**
EXPERTISE	• Resettlement Planning and Implementation • Social Impact Assessment • Land Acquisition • Social Monitoring
YEARS OF EXPERIENCE	• 28 Years
ORGANISATION	• Independent Consultant

PROJECT	Proposed 75 MW Solar Photovoltaic Facility and associated Transmission Lines
LOCATION	Remaining extent of Farm Onder Rugzeer 168, north-east of Kenhardt, Northern Cape Province
PROPONENT	Scatec Solar SA 163 (PTY) Ltd
EAP	CSIR
REPORT AUTHOR AND AFFILIATION	Rudolph du Toit (CSIR)
REPORT DATE	January 2016

3 February 2016

Contents

1. BACKGROUND

I was appointed by the CSIR on 22 January 2016 to provide expert peer review of the above mentioned Social Impact Assessment (SIA) report. The peer review encompasses issues which include:

- Adequacy of the Social Impact Assessment (SIA);
- Validity of the report content; and
- Benchmarking against best practice.

2. DECLARATION

I **Liza van der Merwe**, declare that I am independent expert and that no conflict of interest exists in the performance of my review for the CSIR. In familiarising myself about the project, I have read the SIA report.

Liza van der Merwe
31 January 2016

3. SCOPE OF REVIEW

The scope of the review of the SIA report includes a focus on:

- Objective and non-judgemental presentation of information;
- Scientific validity and robustness of SIA methods;
- Technical credibility of report content;
- Impacts to be disaggregated from the impacts of other projects and the background social environment;
- Clear and systematic logic in identification of cause and effect relationships in terms of impact identification, quantification and assigning significance;
- Appropriateness and soundness of proposed mitigation and/or enhancement actions;
- Logical and systematic presentation of information;
- Identification of information gaps;
- Probability of alternative interpretations of impacts; and
- SIA Report is consistent with best practice.

4. REVIEW CRITERIA

The review is structured to assess the report in a systematic manner in terms of content, methodology, information gathering, data analysis, assessment and conclusions. The review is divided into the following sections:

1	**Project and SIA Context**: • Project description (project inputs and project activities) • Terms of reference • Issues of concern from Scoping Report	**5**	**Mitigation and Enhancement**: • Identification of mitigation options • Identification of enhancement opportunities • Identification of appropriate management actions
2	**Methodology**: • Data gathering • Method description	**6**	**Information Gaps, Uncertainty and Assumptions:** • Qualifying data sufficiency and reliability

3	**Social Baseline**: • community profile • Project affected people • Economic activities and livelihoods • Social systems • Use of natural resources	7	**References and Data Sources:** • Credible sources are listed
4	**Impact Assessment and Significance**: • Identification and understanding of social issues and linkages • social impact pathways • zones of influence • sensitive receptors • Linking social processes to social impacts • Differentiation of social impacts at the individual, household level and community level • Job Creation • Population change • Social networks • Displacement and relocation • Economic opportunities (Lease Payments) • Tourism • Quality of Life • Social Cohesion • Health, noise and visual • Safety and security • Use and access to natural resources • Sense of place • Land acquisition	8	**Report Structure:** • Organisation of information • Presentation of information

5. PEER REVIEW SCORING SYSTEM

For each question posed under the Review Criteria, professional judgement is expressed in relation to the requirement for decision-making. Commentary is also provided to compare report content against best practice. The specific terminology used to express professional judgement is explained below:

- **Exceeds (E) requirements**: information exceeds requirements for decision-making. No changes to report section is required.
- **Meet (M) requirements**: the information meets requirements for decision-making. Minor edits/changes to report section is required.
- **Fail (F) to meet requirements**: the information does not meet the requirements for decision-making. Major edits/changes to report section is required.
- **Reject (R)**: Information cannot be used to decision-making. Major gaps in logic and content. Poor report writing and analysis. Section needs to be re-written.

6. PEER REVIEW SUMMARY FINDINGS

	Professional Judgement (E/M/F/R)	Comments
1. Project and SIA Context	F	The project description needs to be improved as suggested in this review. Examples of how the project description can be improved are given in Section 10 of this Review Report.
2. Methodology	E	The choice of systems theory and the application of social methods are commended. However, it is not carried through in the assessment, interpretation and design of mitigation measures.

	Professional Judgement (E/M/F/R)	Comments
3. Social Baseline	**M**	Social baseline is adequate, but can be improved as suggested in this review.
4. Impact Assessment and Significance	**M**	In general, impact assessment and significance ratings are adequate. However, there are areas for improvement and suggestions in this regard are provided in Section 11 of this Review Report.
5. Mitigation and Enhancement	**M**	Mitigation and enhancement measures proposed are adequate.
6. Information Gaps, Uncertainty And Assumptions	**E**	The SIA report clearly indicates the assumptions and inherent uncertainties.
7. References and Data Sources	**E**	The data sources and references are more than adequate.
8. Report Structure	**E**	The report structure is good.

7. PEER REVIEW CONCLUSIONS

The conclusion of the peer review is that the report is:

☐ **Good*:*** The report exceeds the level and quality of information that is required for decision-making. No edits required to the report.

☑ **Adequate*:*** The report meets the level and quality of information that is required for decision-making. Relatively minor information gaps in the report; requiring minimal changes.

☐ **Poor:** The report is of poor quality with flawed scientific logic. Major information gaps, requiring a complete report re-write. The report should be rejected.

8. PEER REVIEW RECOMMENDATIONS

In general the SIA report is adequate. Specific areas in the report have been identified in this peer review where the report can be improved.

9. DETAILED REVIEW QUESTIONS AND EVALUATION

		Professional Judgement (E/M/F/R)	Comments
1.	**PROJECT AND SIA CONTEXT**		
i.	Does the report provide information on the project inputs, activities, sequencing of activities, nature of infrastructure and footprint of land required? Does the project description contain sufficient detail to understand the resultant social processes and likely impacts. Is there information on labour requirements (actual numbers, by sex and skills-base) and source(s) of such labour for both construction and operational phases?	**F**	The information provided in Section 2.1 (Project Information) does not give an indication of the spatial footprint (in hectares or m^2) of the infrastructure (e.g. PV facilities and transmission lines). There is also a lack of detailed information on the sequence of project activities. For social processes to be identified it needs to be linked to the detailed project activities during all phases of the project. It is suggested that a detailed "Project Activities Register/Table" be developed as a first step (a generic list of project activities is provided in Section 10 of this Review Report as an example). This should form the "y-axis" input to develop a detailed "social processes" list that forms the "x-axis" information in the matrix. The value of such a matrix gives the reader an immediate understanding of the social processes that can potentially be triggered by the individual project activities. Table 2.1 which outlines the employment opportunities and duration is useful, but not easily understood. It would be useful to differentiate between the specific skilled, semi-skilled and unskilled job categories. For example, it would be useful for local I&APs to know at this stage what the estimates are for semi-skilled labour such as for construction vehicle/heavy equipment operators (e.g. a rough estimate of the number of semi-skilled construction workers required to operate loaders, dump trucks, backhoes, excavators, bulldozers and graders). It is likely that for some local people are able to take advantage of the semi-skilled vehicle operator jobs on offer.
ii.	Does the report contain a terms of reference outlining the scope of the SIA?	**M**	Adequate terms of reference described.
iii.	Has the study area been delineated? Has the SIA defined the area of direct and indirect influence of the project? Has the social area of influence, likely impacted and beneficiary communities and stakeholders been identified?	**M**	SIA study area is defined as the urban node or human settlement at the town of Kenhardt. The project sites are on farm portions which have extremely low population densities.
iv.	Have location maps and existing land-use patterns been provided?	**M**	It would be useful to include an additional map indicating the location of the PV facilities and the transmission lines in relation to Kenhardt.
2.	**METHODOLOGY**		
i.	Is the theory and methods for the SIA explained? Is the selected SIA methodology appropriate for the project and location?	**E**	The author has a good grasp of social theory and methods and uses them appropriately. However, the author does not robustly use the theory and methods to inform data gathering, interpretation and analysis. The use of systems theory is commended; however, it is not carried through in the assessment, interpretation and design of mitigation measures.

		Professional Judgement (E/M/F/R)	Comments
ii.	Are the data gathering techniques described?	**M**	Data gathering techniques are adequately described.
3.	**SOCIAL BASELINE**		
i.	Has the location of the local population in relation to the proposed project area been indicated?	**M**	SIA study area is defined as the urban node or human settlement at the town of Kenhardt.
ii.	Has demographic information been provided (population size, age composition, growth, literacy levels, education, etc)?	**F**	Sufficient demographic and health information has not been provided to contextualise the background social environment (at the municipal level) within which the proposed project will be located. Information presented in Section 3.3.1 needs to answer the “so what” question to make it relevant for the project. Currently the demographic information and primary qualitative data (gathered from field work) is presented without sufficient interpretation and does not assess the implications of the data for the project. For example, what are the implications to the project of having “35% of households being female headed”? Or, what are the implications to the project of having a high unemployment rate. It would be useful to include demographic graphs on key social indicators such as population diversity, sex and age distribution, employment, income, households, education and poverty levels. Information on the amount of people in the local community who access social grants would have been useful to know.
iii.	Has local community health status information been provided (HIV and AIDS prevalence, causes of mortality, incidences of diseases such as TB, STIs; Life expectancy in project area)?	**F**	No quantitative information has been presented on the health status of the local community. It needs to be stated whether this information is lacking. Qualitative information from interviews reveals the prevalence of teenage pregnancies. Information on the health status of the local community has implications for the proposed project, as it provides an indicator of the ability of the local population to access opportunities from the project.
iv.	Have the Project affected people been identified?	**M**	The project affected people form the human settlement of the town of Kenhardt.
v.	Have the existing land uses and economic activities in the project area been described?	**M**	Adequate information is provided in Section 3.3.1
vi.	Has information on public safety and security been provided?	**F**	No information is provided on the existing levels of safety and security. In farming communities there is typically a feeling of over exposure to crime and stock theft. It would have been useful to even have a qualitative narrative on the perceived sense of safety and security.
vii.	Have the implications of the Local Integrated Development Plans and Spatial Development Plans for the project been analysed? What are the spatial policy and planning frameworks for the site and surround areas?	**F**	A cryptic overview is provided on relevant legislation and local plans and the implications for the project are not assessed. No indication is given whether a Spatial Development Framework exists for the Municipality and whether it covers the project site. A brief evaluation of the implications of the municipal planning frameworks would be useful. Even an indication that there are no implications would be useful to know, as well as a general recommendation that if the proposed project were to proceed, a significant development of this nature would need to be included in future municipal plans.

		Professional Judgement (E/M/F/R)	Comments
viii.	Does the report analyse the potential resilience and status of affected communities?	**E**	The report analyses vulnerability of the local community using an “Asset Pentagon”, as well as provide an insight into social dynamic by applying systems theory in the form of a “Socio-ecological System Causal Loop Diagram”. However, it would be useful if Figure 3.7 (Kenhardt Asset Pentagon) were to be analysed on much more detail, rather than the current high level generic evaluation. Section 3.3.2 (Vulnerability Context) can be much improved by a more in-depth analysis.
ix.	What are the existing land uses and land tenure patterns in the area?	**M**	Adequate information is provided (in Section 2.1) on land use and land tenure patterns for the project farm portions and surrounding area. Detailed information is provided for Kenhardt (in Section 3.3.1.2).
x.	What are the existing levels of municipal services (housing, water, electricity, schools, clinics, policing etc) and current state of infrastructure in the area?	**F**	Information on the level of municipal services and the state of local infrastructure is not provided. An indication needs to be given whether there are any projects implications of the quality of municipal services and the state of infrastructure. Is the project (if it goes ahead) totally independent of municipal services and the state of local infrastructure?
4.	**IMPACT ASSESSMENT AND SIGNIFICANCE**		
4.1 General			
i.	Does the SIA focus on the issues that most concern the community? Are the social issues that have been identified in the Scoping Report referred to in the SIA?	**M**	Issues raised in the Scoping Report are carried through to the SIA Report. However, I am not convinced that issues of concern from the landowner and farming community are reflected in the SIA report. An influx of job seekers, as well as a migrant construction workforce associated with the development, tends to increase the anxiety/concerns of farmers (real and perceived) with regards to issues of security, crime (stock theft) and negligence (e.g. the contractor leaving farm gates open).
ii.	Are the discrete social impacts clearly identified?	**F**	The impacts identified in Section 4.2 are not impacts in my opinion. What are mostly listed are social processes. The impacts are the actual experiences by sensitive receptors to social processes triggered by the development. Section 4.2 needs to be edited to clearly differentiate what social processes are triggered by the different project activities and then identify what the actual social impacts are that are felt by the individual sensitive receptor groups. For example, the influx of job seekers is not a social impact, it is a social process. How receptors (be it the municipality or certain sections of the local community) experience this social process is what matters and is where the impacts are experience and manifested. To explain what I mean, I’ve included a generic list of social processes and social impacts (at the individual and community level) as an example in Section 11 of this Review Report.
iii.	Are the social impact pathways identified?	**F**	Social impact pathways have not been identified. In addition, there is no clear link between project activities, social processes and the resultant social impacts.
iv.	Are the spatial zones of influence identified?	**M**	Kenhardt is considered to be the area of influence.

	Professional Judgement (E/M/F/R)	Comments
v. Are the sensitive receptors (individuals, households and communities) clearly identified?	**F**	Particular sensitive receptors are not clearly identified. An analysis of the sensitive receptors and their levels of vulnerability need to be undertaken. For analysing "receptor sensitivity" you need to consider the type of receptor (namely, biological/ecological, human and physical receptor/feature) and their resilience to identified stressors. This is a particularly weak aspect of the SIA report. For each impact identified (in Section 4.2 and Table 4.1), there needs to be an identification of the particular "sensitive receptors". There is no way that a defined impact as a homogenous and equal impact across all community groups. The SIA makes the common mistake of not disaggregating impacts and differentiating how different groups experience impacts (e.g. women, unemployed men, farmers, etc.).
vi. Is there an indication whether residual impacts would be acceptable?	**F**	Discussion on residual impacts for each identified "impact" (in Section 4.2 and 4.3 and Table 4.1) is not adequately dealt with. There is hardly any indication of what the residual impacts are and whether they would be acceptable.
4.2 Community impacts		
i. <u>Population change</u>: Will the development lead to an increase in a certain section of the population? What would the impact of such a change be on the existing social environment?	**F**	The SIA report acknowledges the background local population increase. However, the report does not clearly distinguish what population segment will form the job seekers from outside.
ii. <u>In-migration of unemployed work seekers</u>: Will the development intentionally or unintentionally contribute to the in-migration of work seekers into the area? What would the impact of this change be on the existing social environment? Is rapid population growth predicted?	**M**	The report acknowledges the potential impact of the influx of job seekers on the population. However, the author assigns a "moderate negative significance" rating to the social process of "influx of job seekers. I disagree with this rating and believe that "with and without mitigation", the significance rating should be high. The reason is that no matter how good the Proponent is at communication and no matter the type of mitigation, it is inevitable that there will be an influx of job seekers and that it is highly likely that these job seekers will remain in the area after the construction period. No qualitative estimation is made of whether there is likely to be rapid in-migration. It is important to recognise that the dominant way in which governments and project proponents understand in-migration, is as a problem. In-migration of job seekers cannot be prevented. There is a powerful negative discourse around in-migration. In-migration is not a problem but rather a response to extreme poverty. In-migration needs to be acknowledged as an irreversible and integral part of rural livelihoods. A pragmatic approach to in-migration needs to be taken with the aim of facilitating the benefits and mitigating against the negative impacts faced by both the host community as well as the migrants. When in-migration is viewed through this lens, it then becomes clear that job seekers from elsewhere are also sensitive receptors that need to be acknowledged in the SIA report.

		Professional Judgement (E/M/F/R)	Comments
iii.	Disruption of social networks: Will the development impact on existing social networks? (e.g. due to the presence of outsiders in communities with a high degree of homogeneity and social cohesion)	**M**	Adequately dealt with in report.
iv.	Relocation or displacement of individuals or families: Will the development lead to relocation of residents? What will the implications be for their livelihood sustainability?	**M**	Not relevant.
v.	Disruption in daily living and movement patterns: Will the development change the lifestyle of residents? Will it impact on movement patterns? Will it divide communities physically	**M**	Adequately dealt with in report.
vi.	Job creation opportunities: Will the development lead to an increase or decrease in employment opportunities? Does the report clearly describe the gender, number and type of permanent and temporary employees required for each phase of the project, where the labour will be sourced from and the company's employment policies? Will skilled workers be imported? Will the local labour pool be qualified for professional, technical, and supervisory jobs? Has the report identified the secondary employment created indirectly by the facility (e.g. local stores, Bed & Breakfast, services)? Is loss of local labour from current jobs predicted (current workers may be tempted to leave their jobs in pursuit of improved wages)?	**M**	The report provides general information on job opportunities but does not disaggregate the jobs into the specific and typical type of jobs for unskilled, semi-skilled and skilled classes. No indication is given on whether the local labour would only be able to access the unskilled jobs. The SIA states that: "decommissioning of the proposed developments will result in job losses". The report needs to state what categories of permanent jobs would be lost. Section 10 in this Review Report outlines the activities/services that need to be performed during the Operation and Maintenance Phase. It is the jobs performing these services that will be lost.
vii.	Infrastructure and services: Will the development create increased demand for basic services, e.g. water, electricity, sewerage, roads?	**M**	The SIA predicts that "in-migration is likely to place additional strain on formal housing and bulk services". I think it would be more plausible to suggest that in-migration is likely to be done by unemployed people desperate for jobs and who would likely stay in the informal settlement (which would not place a strain on formal housing and bulk services). In-migration in the short-term will cause a population increase and result in more job seekers for the limited available jobs.

		Professional Judgement (E/M/F/R)	Comments
viii.	Change in housing demands: Will the development create a housing need, e.g. due to the in-migration of construction workers?	**M**	The SIA report suggests that there will be additional strain on formal housing. No indication is given how the Proponent will deal with this matter. The Proponent may choose to specify to the Main Contractor, to price for the construction of temporary accommodation close to the construction site. In this instance, there will be no need for housing for the project. I recommend that the SIA Report includes a provision for the Proponent to commit to providing temporary accommodation.
ix.	Impact on other businesses: Will the development impact on tourism?	**M**	The SIA report considers tourism to only be affected at a cumulative level (when considered with the impact of all the regional renewable projects). No indication is given of whether this project would have any impact on tourism. It is likely that there will be no impact, except as a “curiosity feature” by South African tourists. A positive mitigation measure that can be considered, is for the Proponent to commit to installing interpretative signage on site and working with the local Municipality (to train tour guides) to include the PV facility as a tourism destination option.
x.	Local Content (economic): Will the development provide opportunities for local procurement and training? (e.g. rental housing, restaurants and stores, etc.)	**F**	The SIA report recommends that the proponent “must procure goods and services, as far as practically possible, from within the project area (with a focus on Kenhardt)”. The report is lacking in detailing what the specific goods and services are that would be required. Section 10 below in this Review Report provides a list of the project activities and it can be inferred from this list what goods and services can realistically be provided from the local area.
xi.	Staff accommodation: Has accommodation (male and female) for construction and permanent staff been identified?	**F**	The SIA report recommends that: “accommodation be obtained from as large a selection of local service providers as possible to ensure distribution of project benefits”. There is no indication in the report whether this is even possible. The SIA should at least have gathered data on whether there is sufficient rooms/housing available for construction staff.
4.3 Health impacts			
i.	Spread of disease, addiction and antisocial behaviours: Has the the spread of HIV and its impacts on vulnerable groups such as women and children been identified? What are the health vulnerabilities of the host community? What are the predicted spread of the disease by construction workers, truck drivers and sex workers?	**F**	The SIA report does not provide any information on the existing health status of the local community and neither is there any indication and assessment of the likely spread of disease from the migrant construction workforce. This is a deficiency in the report.
ii.	Gender (women and girls): Will the project have a negative effect on women and girls?	**F**	The SIA report gives no indication on the discrete and separate impacts of the project on women and girls. The gendered nature of impacts is totally ignored. The report needs to acknowledge that typically, construction work is mostly provided to males in the demographic group between 18-50 years old. The report does however highlight the need for the “Workforce Recruitment Policy” to provide opportunities for women.

	Professional Judgement (E/M/F/R)	Comments
iii. Psychosocial disorder: What impact will the project have on psychosocial disorders of local residents?	F	No indication is given of potential psychosocial disorders such as: stress, substance abuse, social disruption, unrest, violence and decreased tolerance.
4.4 Quality of life and social well-being impacts		
i. Quality of Life: Have impacts on the landscape character, natural setting and visual amenity been identified?	F	No indication is given on the impacts to “quality of life”.
ii. Crime and safety: Will the development impact on existing crime (petty crime and stock theft) and safety patterns?	F	No indication is given on the impacts to “crime and safety”.
iii. Social well-being: Will the development impact on the peaceful coexistence of communities? Will the development lead to conflict between sectors of the social environment? Will tensions form in communities where the economic benefits are not necessarily equally shared among the residents? Will the community identity be preserved?	F	Social well-being issues are not addressed in the report. There is no indication of issues related to: social cohesion and support structures, self-determination, human rights and equity.
4.5 Cultural and heritage impacts		
i. Heritage: Will the development impact on archaeological, historical or cultural resources?	M	Heritage issues appear to not be applicable for this site. However, there is no mention in the report that heritage issues are not relevant.
ii. Culture: Will the development impact on the customs, values, religious and spiritual beliefs?	F	No mention is made of the existing cultural patterns and whether it is an issue.
4.6 Land and natural resource impacts		
i. Livelihoods: Will the development impact on the landowners and local people’s (legal or illegal, formal or informal) access to natural resources that help to sustain their livelihoods?	M	The SIA report clearly indicates that the livelihoods of landowners will not be affected.

		Professional Judgement (E/M/F/R)	Comments
ii.	Land acquisition: Will the development negatively impact the landowner/land users by having a large spatial footprint that limits existing land use (such as loss of grazing land)?	**F**	The SIA report does not mention land acquisition at all. It can be inferred that land acquisition (even through lease contracts) will not impact the landowner. However, an indication should be given that land acquisition is not an issue.
iii.	Land rezoning: Will the existing land be required to be rezoned before the Project can commence?	**M**	It can be inferred from the report that rezoning will not be an issue.
4.7 Economic Impacts			
Have the social implications of economic impacts been assessed?: • Change in modes of production • Changes in property values		**M**	It can be inferred from the report that there are no negative economic impacts.
4.8 Impact Identification			
i.	Have direct and indirect/ secondary effects of construction activities and, where relevant, operation and decommissioning of the project been clearly explained (including both positive and negative effects)?	**F**	The SIA report can be improved by clearly indicating what the individual project activities are (see Section 10 in this Review Report) and the consequential primary and secondary impacts (see Section 11 in this Review Report).
ii.	Is there a clear understanding of impact causation processes, by first listing in detail the project activities per phase and the corresponding social effect? Have social processes clearly been differentiated from social impacts?	**F**	This is an area of deficiency in the SIA report and needs to be addressed. See Section 10 and 11 in this Review Report for suggestions on improvements to the report.
iii.	Have impacts been identified in a non-judgemental manner?	**M**	The SIA report by and large uses non-judgemental language in the identification of impacts. My preference is not to use the term “socially deviant behaviour”, but rather “social disorders” or “psychosocial disorder”.
iv.	Are there clear linkages (in impact identification) to health and ecosystem services issues?	**F**	There is no clear link with other specialist study areas and no link with health and ecosystem services issues.
v.	Have cumulative impacts been assessed?	**M**	Adequately addressed in Section 4.6.

		Professional Judgement (E/M/F/R)	Comments
4.9 Assessment of Impacts			
i.	Are impacts described in terms of the nature, magnitude and probability of the change occurring and the effect (location, number, value, sensitivity) on sensitive receptors?	**M**	Impacts are adequately described in a consistent manner. However, no mention is made of “sensitive receptors”.
ii.	Has the timescale over which the effects will occur been predicted such that it is clear whether impacts are short, medium or long term, temporary or permanent, reversible or irreversible?	**M**	Timescale are adequately described in a consistent manner.
iii.	Have qualitative predictions of impacts been adequately expressed?	**M**	Qualitative predictions of impacts have been adequately expressed.
iv.	Where quantitative predictions have been provided is the level of uncertainty attached to the results described?	**M**	No quantitative impact predictions have been made in the SIA report.
v.	Have the impacts of the social environment on the construction and operation of the project been considered?	**F**	The impacts/implications of the dynamics of the existing social environment on the project is not adequately described.
4.10 Impact Significance			
i.	Does the information include a clear indication of which impacts may be significant and which may not and to whom?	**M**	Significance is adequately dealt with in the report. However, the report can be improved by answering the question: “to whom is this impact significant”?
ii.	Has the significance of effects been discussed taking account of appropriate national and international standards or norms, where these are available?	**M**	Significance is adequately dealt with in the report.
iii.	Where there are no generally accepted standards or criteria for the evaluation of significance, is a clear distinction made between fact, assumption and professional judgement?	**M**	There is a clear distinction in the report between assumption and professional judgement.

		Professional Judgement (E/M/F/R)	Comments
iv.	Have the magnitude, location and duration of the impacts been discussed in the context of value and sensitivity?	**F**	Issues of value and sensitivity are not addressed.
5 MITIGATION AND ENHANCEMENT			
i.	Is there evidence of the application of the Mitigation Hierarchy? (in terms of the sequential application of the mitigation options from avoid ⇨ minimise ⇨ restore ⇨ compensate)	**F**	There is no evidence of the application of the Mitigation Hierarchy.
ii.	Does the report clearly state the objectives and specific goals for the management of social impacts, socio-economic conditions and historical/cultural aspects?	**M**	There is a clear indication of performance objectives.
iii.	Does the report describe the appropriate technical and management options to address each social impact, socio-economic condition and historical/cultural aspects for each phase of the project?	**M**	Appropriate management actions and mitigation measures have been proposed.
iv.	Where appropriate, do mitigation methods considered include modification of project design, construction and operation, the replacement of facilities/ resources, and the creation of new resources?	**M**	Suitable mitigation measures have been proposed.

		Professional Judgement (E/M/F/R)	Comments
v.	Is it clear to what extent the mitigation methods are likely to be effective?	F	There is no indication of the likely effectiveness of the proposed mitigation measures. A "Workforce Recruitment Policy" is recommended. Employment in its totality cannot be reserved for local residents, as the report recommends. Neither can this requirement be contractually binding. In any case, who would be the two contracting parties to make this mitigation measure contractually binding? Local residents may not have the requisite skills to take advantage of the job opportunities. In addition, they may be untrainable for a variety of reasons and therefore not suited for the available jobs. In any event, it is the responsibility of the Contractor to recruit people for jobs and not the Proponent. All the Proponent can do is to define the overall project objectives (for unskilled, semi-skilled and skilled jobs and training). The objectives can then form part of the contractual obligations for the Main Contractor. How the objectives should be achieved should be left up to the Main Contractor. It is recommended that the Proponent develops a local skills database. The SIA report should clearly identify the performance objective for this mitigation measure. It should be recognised that the responsibility for developing the skills database can lie with the Proponent, but how it is used to achieve the objective of optimising local employment is dependent on the nature of the Contract for project implementation (e.g. whether a EPC contract is used). The Proponent would need to hand over the skills database for the Main Contractor to use.
vi.	Have negative social effects of mitigation measures been investigated and described?	F	The negative social effects of mitigation measures proposed have not been described.
6. INFORMATION GAPS, UNCERTAINTY AND ASSUMPTIONS:			
i.	Has field work been undertaken and if not, has the implications been acknowledged?	M	Field work has been undertaken and the qualitative information from the interviews has added richness to the social baseline.
ii.	Has issues of data sufficiency and reliability been addressed?	F	The SIA report needs to make a statement in this regard.
iii.	Have information gaps been identified and its implications assessed?	F	The SIA report needs to clearly identify the information gaps.
iv.	Have the SIA assumptions been disclosed?	M	Assumptions have been fully disclosed. The author states that the "The project boundary, in terms of socio-economics, is therefore arbitrarily constructed". This is not the case. The project boundary for socio-economics has been logically deduced, based on available information and the locality of settlements in the area.
v.	Has any scientific uncertainty inherent been acknowledged and communicated?	M	The SIA report does allude to areas of uncertainty.

		Professional Judgement (E/M/F/R)	Comments
7. REFERENCES			
i.	Does the report contain a reference list?	**M**	All sources have been fully referenced.
ii.	Are the reference sources credible and reliable?	**M**	Reference sources are scientifically credible.
8 REPORT STRUCTURE			
8.1 Organisation			
i.	Does the report contain an Executive Summary which provides a concise presentation of the most significant issues contained in the body of the SIA?	**M**	Clear Executive Summary provided.
ii.	Is the information logically arranged in sections?	**M**	Report is logically structured.
iii.	Is the location of the information identified in an index or table of contents?	**M**	Table of Contents provided.
iv.	Are the credentials of the report authors and specialists presented, with a clear indication of their respective contributions?	**M**	CV of report author included in report.
8.2 Presentation			
i.	Has information and analysis been offered to support all conclusions drawn?	**M**	Information and analysis is adequate, but interpretation can be improved as suggested in sections in this Review Report.
ii.	Has information and analysis been presented so as to be comprehensible to the non-specialist, using maps, tables and graphical material as appropriate?	**M**	Information is adequately presented in graphics, maps and tables where appropriate.
iii.	Is the information balanced and unbiased?	**M**	Information is presented in a balanced manner.
iv.	Is the layout, language and overall presentation of the information accessible to both the lay public and decision-makers?	**E**	The author writes well and the language is clear and unambiguous.

10. GENERIC EXAMPLE OF CONSTRUCTION ACTIVITIES FOR THE DEVELOPMENT OF A PV FACILITY

	PROJECT PHASE	**SEQUENCE OF DETAILED ACTIVITIES**
1	Mobilisation / Site Preparation	• Installing perimeter fencing around the site • Locating temporary construction offices and construction equipment to site • Earthworks for construction of road access and construction parking areas, including vegetation clearing • Minor grading and trimming of areas for permanent site office and switchyard • Minor grading and trimming in array areas • Drum rolling and compaction of array areas • Installation of onsite erosion and sediment controls
2	Construction	• Install steel support posts for array tables • Trenching and wiring of underground cabling (DC and AC) • Attachment of tilt brackets and rails using prefabricated steel members • Connection of PV modules to the brackets • Installation of inverter and transformer skid • Commencement of site rehabilitation works within the development area
3	Commissioning	• Commissioning and testing of solar plant, noting that each array block would be commissioned as it is completed.
4	Demobilisation	• Removal of temporary construction facilities and completion of works within the development area and of temporary access tracks within the site.
5	Operation and Maintenance	Compared to other power generating technologies, solar PV power plants have low maintenance and servicing requirements. Activities include: • Inverter servicing • ground-keeping • security • Low technology module cleaning using brush trolley or dust broom

11. GENERIC EXAMPLE OF THE DIFFERENTIATION BETWEEN SOCIAL PROCESSES AND SOCIAL IMPACTS

SELECTED LIST OF SOCIAL PROCESSES	SELECTED LIST OF SOCIAL IMPACTS AT THE INDIVIDUAL AND HOUSEHOLD LEVEL	SELECTED LIST OF SOCIAL IMPACTS AT THE COMMUNITY LEVEL
Demographic processes ▪ Increase in population size (in-migration) ▪ Presence of newcomers (perceived or real cultural differences) ▪ Presence of temporary construction workers ▪ Presence of tourists *Economic processes* ▪ Conversion of economic activities ▪ Conversion of land use ▪ Increase in economic activity ▪ Decrease in economic activity ▪ Job creation or job loss *Social processes* ▪ Prostitution ▪ Excessive alcohol, drug use and gambling ▪ Opposition ▪ Pollution (air, water and dust) ▪ Litter ▪ Traffic ▪ Vandalism	▪ Debt bondage ▪ Reduced level of health ▪ Reduced mental health, increased stress, anxiety, alienation, apathy, depression ▪ Uncertainty about impacts, development opportunities, about own life as a result of social change ▪ Reduced actual personal safety ▪ Reduction in perceived quality of life, subjective well being ▪ Worsening of economic situation, level of income, property values ▪ Change in status or type of employment or becoming unemployed ▪ Decrease in occupational opportunities ▪ Objection/opposition to project, NIMBY (not-in-my-back-yard) attitude ▪ Dissatisfaction due to failure of a project to achieve heightened expectations ▪ Annoyance because of dust, noise, strangers or more people ▪ Increased density and crowding ▪ Reduced aesthetic quality, outlook, visual impacts	▪ Reduced adequacy of infrastructure (water supply, sewerage, services and utilities) ▪ Reduced adequacy of community social infrastructure, health, welfare, education facilities ▪ Reduced adequacy of housing ▪ Increased workload on institutions ▪ Increase inequity (economic, social, cultural) ▪ Increased unemployment level ▪ Loss of other options (opportunity cost) ▪ Increased actual crime or violence ▪ Increased social tensions, conflict or divisions within community

EIA REPORT

CHAPTER 14:

Traffic Impact Statement

Scoping and **Environmental Impact Assessment** for the Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province

Report prepared for:

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March 2016

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tables

photos

14 TRAFFIC IMPACT STATEMENT

14.1 INTRODUCTION

As per the Plan of Study included in Scoping Report and subsequently approved by the DEA, it was indicated that a Traffic Impact Statement (TIS) will be produced by the CSIR to show the amount of traffic that can be expected during the construction and operational phases from the development of the proposed Kenhardt PV 1, Kenhardt PV 2, and Kenhardt PV 3 solar energy projects, as well as the proposed Kenhardt PV 1 – Transmission Line, Kenhardt PV 2 – Transmission Line, and Kenhardt PV 3 – Transmission Line projects near Kenhardt in the Northern Cape. In this regard, the study focuses on the regional setting in which these projects are proposed and the roads that will be utilised for these projects. The report has therefore been produced for all the projects due to the scale of the assessment and the fact that all the projects are going to use the same road infrastructure.

14.1.1 Terms of Reference

The key issues associated with the construction and operational phases of the project that will be assessed as part of the TIS are:

- Increase in traffic generation throughout the lifetime of the project;
- Decrease in air quality; and
- Increase in road maintenance required.

14.1.2 Assumptions and Limitations

The TIS has been based on the traffic information provided by Scatec. The traffic information was obtained from previous projects and estimates of similar projects currently proposed by Scatec.

14.2 APPROACH AND METHODOLOGY

14.2.1 Objectives

- Determine the current traffic conditions in sufficient detail so that there is a baseline against which impacts can be identified and measured;
- Identify potential impacts and cumulative impacts that may occur during the construction, operational and decommissioning phases of development;
- Provide recommendations with regards to potential monitoring programmes;
- Determine mitigation and/or management measures which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts; and
- Incorporate and address all issues and concerns raised by I&APs and the public (if applicable).

14.2.2 Methodology

The key steps followed in this assessment are:

- Review of available desktop information, including the South African National Roads Agency (SANRAL) National traffic count information, google earth images and similar projects; and
- Liaison with Transnet SOC Ltd regarding access roads to be used and requirements associated with it.

14.3 AFFECTED ENVIRONMENT

During all phases (construction, operation and decommissioning) of the project, traffic will be generated. The highest traffic volumes will be created during the construction phase. This includes activities associated with:

- Site preparation and transporting the construction materials, and associated infrastructure to the site; and
- Transportation of employees to and from the site on a daily basis.

The proposed project site can be accessed via an existing gravel road (an unnamed farm road) and the existing Transnet Service Road (private). Both access routes will be considered in the design of the facility and have been included in the proposed project. The R27 extends from Keimoes (in the north) to Vredendal in the south. The R27 is 6 m wide and falls within a 45 m road reserve. This National Road is designed for minimum daily traffic exceeding 1000 vehicle units. The Transnet Service Road can be accessed from the R27. The existing gravel road can be accessed from the R383 Regional Road also via the R27 National Road. The Transnet Service Road and unnamed farm road are both 7-8 m wide, however in certain sections, the unnamed farm road is believed to be about 2-3 m wide. A further access road will be constructed from either the Transnet Service Road or the unnamed farm road to the proposed Kenhardt PV 1, PV 2 and PV 3 facilities.

Should the Transnet Service Road be considered the preferred access road, it is proposed that an internal gravel road be constructed from the road to the proposed site. This internal gravel road is not expected to exceed 6 m in width. The length of the internal gravel road will be confirmed as the location, design and layout of the facility progresses; however a preliminary site layout plan has been included in Chapter 16 and Appendix J of this EIA Report. Discussions have been initiated and held with Transnet and the Project Applicant during the Scoping and EIA Process regarding the potential use of the Transnet Road and associated specific requirements. Transnet have informed the Project Applicant of their requirements that need to be met by the Project Applicant should the Transnet Service Road be used as to gain access to the site. These requirements will be considered in the design of the facility where required, and the details of the agreement will be finalised outside of this EIA Process.

A photo plate is included (Photo 14.1-14.4) to show the intersection of the Transnet Service Road with the R27 and the current condition of the roads.

Photo 14.1: R27 towards the south (taken towards Kenhardt). The board shows "Loop 14", located to the left, which is accessed via the Transnet Service Road. (Image source: Google, 2010)

Photo 14.2: The intersection of the R27 and Transnet Service Road, going towards Kenhardt. As can be seen on this image, the R27 was being upgraded in 2010 (Image source: Google, 2010)

Photo 14.3: The intersection of the R27 and Transnet Service Road, going towards Keimoes (Image source: Google, 2010)

Photo 14.4: The access point to the Transnet Service Road (Image taken: July 2014)

The closest roads to the site for which traffic counts are available show that the R383 (road between Kenhardt and Marydale) and the R361 (between Van Wyksvlei and Kenhardt) have Average Daily Traffic (ADT) counts of 35 and 41, respectively (SANRAL, 2007). The ADTs how that the current traffic volumes are well below the maximum traffic limits for the roads discussed above. Even though traffic will be generated during the construction and operation of the solar energy facility, given the low ADTs of the surrounding roads, it is not expected that the traffic generated by the solar energy facility will exceed the maximum daily traffic limits for the abovementioned roads.

14.4 TRANSPORT INFORMATION

The general current limitations on road freight transport are:

- Axle load limitation of 7,7t on front axle, 9,0t on single rear axles;
- Axle unit limitations are 18t for dual axle unit and 24t for 3 axle unit;
- Gross vehicle mass of 56t. This means a typical payload of about 30t;
- Maximum vehicle length of 22m for interlink, 18,5m for horse and trailer and 13,5 for a single unit;
- Width limit of 2,6m; and
- Height limit 4,3m.

Abnormal permits are required for vehicles exceeding these limits.

14.4.1 Solar Farm Freight

Materials and equipment transported to the site comprise of:

- Building materials (concrete aggregates, cement and gravel);
- Construction equipment such as piling rigs and cranes;
- Solar panels (panels and frames); and
- Transformer and cables.

The following is anticipated:

A. Building materials comprising of concrete materials for strip footings or piles will be transported using conventional trucks which would adhere to legal limits listed above.
B. Solar Panels and frames will probably be transported in containers using conventional heavy vehicles within the legal limits. The number of loads will be a function of the capacity of the solar farm and the extent of the frames (the anticipated number of loads are discussed below).
C. Transformers will be transported by abnormal vehicles.

14.4.2 Traffic generation

The traffic generation estimates detailed below have been determined based on a single solar energy facility and the associated electrical infrastructure (collector substation and transmission line).

- ***Construction Phase***

Approximately 800 x 40ft containers resulting in more or less 450 double axel trucks will come to site during the construction phase (i.e over a period of 9 to 24 months). In addition to this, more or less 20 light load trucks will come from and go to site on a daily basis during the construction phase. It is estimated that a total of 14 850 trips to the site, based on a 24 month construction phase.

In terms of water supply, the current proposal is to truck water to site via municipal water supply. It is estimated that 1 trip will be made by the water truck every 2 days. In total, this adds up to 365 trips by the water truck over a period of 24 months.

It is important to note that the construction period is likely to extend 14 months (as noted in Chapter 2 of this EIA Report), however the worst case scenario has been considered in this TIS.

- ***Operational Phase***

More or less 4 light load trucks will come from and go to site on a daily basis and 1 small single axel truck to and from site on a weekly basis. The lifetime of the project is 20 years which means that the total amount of trips would be 30 240 over this period. For water supply, the current estimate is that 2 trips per month will be made by a water truck.

- ***Decommissioning Phase***

As per the construction phase, approximately 800 x 40ft containers resulting in more or less 450 double axel trucks will come to site during the decommissioning phase. The decommissioning phase usually takes 12 months (i.e over a period of 9 to 24 months). In addition to this, more or less 20 light load trucks to and from site will come and go to site on a daily basis.

14.5 IDENTIFICATION OF IMPACTS

The traffic impacts that will be generated by the proposed facility are detailed below. The impacts will largely occur during the construction phase of the project, since this is when the highest amount of traffic will be generated by the proposed facility (refer to Section 14.4.2).

The impacts identified and further assessed are:

1. Increase in traffic generation.
2. Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads.
3. Impact on air quality due to dust generation, noise and release of air pollutants from vehicles and construction equipment.
4. Decrease in quality of surface condition of the roads.
5. Cumulative impact of traffic generation of three projects and related projects.

14.6 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

This section assesses the significance of the impacts identified in Section 14.5. Appropriate mitigation and management measures to reduce the significance of the negative impacts and promote the positive impacts have been included in the EMPr.

14.6.1 Increase traffic generation

As discussed in Section 14.4 of this report, conventional trucks, conventional heavy vehicles and abnormal vehicles transporting loads will need to come to site to deliver the infrastructure required for the solar facility. The impact of this on the general traffic would be negligible as the additional peak hour traffic would be at most 2 trips.

Significance of impacts without mitigation
Although the construction phase would have the greatest impact on traffic generated by the proposed project, the increase in traffic will only result in an addition of 2 trips during peak hour traffic (worst case scenario). Based on the traffic counts discussed in Section 14.3 of this Chapter, the ADT for this area is between 35 - 41 vehicles. The R27 is designed for 1000 units per day and therefore, the additional traffic generated during the construction phase will have a **low** negative impact.

The operational phase will have a lower traffic generation since only the personnel permanently employed on site would need to go to site every day. It is not expected that this would exceed 4 trips per day. This negative impact would therefore be **very low.**

Since is it unclear at this stage what the traffic numbers will be in the Kenhardt area in 20 years' time and the amount of trucks required for decommissioning, the impacts associated with this phase of the project were based on the construction phase details given that this is the worst case scenario in terms of traffic generation. Therefore, the significance of the impact would be **low** negative.

Proposed mitigation
Even though the traffic generated would not be significant, the following requirements should still be met by the developer during the construction and decommissioning phases:

- Should abnormal loads have to be transported by road to the site, a permit needs to be obtained from the Provincial Government Northern Cape (PGNC) Department of Public Works, Roads and Transport;
- Provide a Transport Traffic Plan to SANRAL;
- Ensure that roadworthy and safety standards are implemented at all time for all construction vehicles; and
- Plan trips so that it occurs during the day but avoid construction vehicles movement on the regional road during peak time (06:00-10:00 and 16:00-20:00).

Requirements to be met during the operational phase:

- Adhere to requirements made within Transport Traffic Plan;
- Limit access to site to personnel; and
- Ensure that where possible, staff members carpool to site.

14.6.2 Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads.

During all phases, vehicles will need to access the site via the R27 and the Transnet Service Road/alternative gravel access road. As shown in the photo plate in Section 14.3, the Transnet Service Road intersects with the R27 just outside of Kenhardt. There is the potential that should vehicles not indicate soon enough that they are turning off from the R27, an accident can occur. In addition, not adhering to the relevant speed limits may cause accidents with other drivers and collisions with animals.

Significance of impacts without mitigation
The significance of causing an accident with pedestrians, animals and other drivers would have a **high** negative impact significance since the probability of the impact occurring would be likely and could be fatal and therefore would cause irreplaceable loss.

Proposed mitigation
- Road kill monitoring programme (inclusive of wildlife collisions record keeping) should be established and fences installed, if needed to direct animals to safe road crossings;
- Adhere to speed limits applicable to all roads used; and
- Implement clear and visible signalisation indicating movement of vehicles and when turning off or onto the Transnet Service Road to ensure safe entry and exit.

Significance of impact with mitigation
By implementing the abovementioned mitigation measures the probability of the impact occurring would be lowered significantly which would reduce the significance of the impact to **moderate** negative impact during all the phases of the project.

14.6.3 Impact on air quality due to dust generation, noise and release of air pollutants from vehicles and construction equipment

During all the phases of the projects, there will be a decrease in air quality due to the noise created by and pollutants released from vehicles coming to site during all phases of the projects, construction activities occurring on site and dust created from driving on the Transnet Service Road or gravel farm road. Since the site is located in a very rural setting, no sensitive receptors are present within close proximity of the proposed project. Therefore, the extent of the impact would remain local.

Significance of impacts without mitigation
As discussed above, the decrease in air quality would be local in extent. The worst case scenario for impacts on air quality is that no dust suppression is implemented on the Transnet Service Road, gravel access road, on site or that construction activities occur throughout very windy conditions. This negative impact would be **moderate** for all phases of the project, without mitigation.

Proposed mitigation
- Implement management strategies for dust generation e.g. apply dust suppressant on the Transnet Service Road, exposed areas and stockpiles;
- Postpone or reduce dust-generating activities during periods with strong wind;
- Limit noisy maintenance/operational activities to daytime only;
- Earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased;
- Ensure that all construction vehicles are roadworthy and respect the vehicle safety standards implemented by the Project Developer; and
- Avoid using old and noisy construction equipment and ensure equipment is well maintained.

Significance of impact with mitigation
With the implementation of the mitigation measures detailed above, the probability of noise emissions and dust realised would be lowered and the impact would be of a **low** significance.

14.6.4 Change in quality of surface condition of the roads

The Transnet Service Road or gravel farm road is going to be used as the main access road to the site. As discussed in Section 14.3. The Transnet Service Road and farm road are gravel roads and would require additional maintenance to ensure that the traffic generated would not decrease the surface condition of the road.

Significance of impacts without mitigation
The Transnet Service Road is currently being maintained by Transnet and it is unclear whether any maintenance is currently being undertaken on the gravel farm road. Since the Developer is going to use these roads during all phases of the project, it is expected that, should no mitigation measures be implemented, the road's surface condition would decrease significantly. This would have a **low** negative impact on the road (due to the local spatial extent of the impact).

Proposed mitigation

- Construction activities will have a higher impact than the normal road activity and therefore the road should be inspected on a weekly basis for structural damage;
- Ensure that road network is maintained in a good state for the entire operational phase;
- Implement management strategies for dust generation e.g. apply dust suppressant on the Transnet Service Road, exposed areas and stockpiles; and
- A Road Maintenance Plan should be developed for the section of the Transnet Service Road that will addresses the following:
  - Grading requirements;
  - Dust suppressant requirements;
  - Drainage requirements;
  - Signage; and
  - Speed limits.

Significance of impact with mitigation
Provided that the above mitigation measures are implemented and agreed to by Transnet and the land owner whose farm road will be used, the impact would be a **low** positive impact since this section of the road would be well maintained.

14.6.5 Cumulative impact of traffic generation

The cumulative impact assessment assumes that all the projects outlined within the cumulative impact section occur at the same time. Even though there will most likely be overlap in the operational phases of these projects, it is unlikely that the construction phases for all these projects would occur at the same time. Since the construction phase will give rise to the most amount of trucks coming to site, this would be considered the worst case scenario in terms of traffic generation. The projects that are proposed within close proximity of each other are detailed within Table 14.1 below. The estimates detailed within the table below have been obtained from the Developers. Based on these current estimates, the total amount of additional trips that would occur on the R27 during the construction phase is 261.81, which is still well below the daily average limit of 1000 units. The impact on this road is therefore not anticipated to be significant but should the Transnet Service Road be used for all the projects, a maintenance plan, agreed upon all parties involved must be implemented to ensure that the road's quality and integrity is maintained.

Significance of cumulative impacts
It is assumed that the mitigation measures discussed in the Section 14.6 of this TIS and included in Table 14.2 below are implemented, that the traffic generation impacts would be suitable managed to ensure that the traffic impacts are suitably managed. Based on this, the cumulative negative impact is **low**.

Table 14.1: Cumulative daily traffic generation estimates for all PV projects proposed north-east of Kenhardt

Project name		Daily traffic generation estimates		
		Construction Phase	**Operational Phase**	**Decommission Phase**
1	Proposed construction of Gemsbok PV1 75 MW Solar PV facility	20	10	20
2	Proposed construction of Gemsbok PV2 75 MW Solar PV facility	20	10	20
3	Proposed construction of Boven PV1 75 MW Solar PV facility	20	10	20
4	Proposed development of a 75 MW Solar PV Facility (Kenhardt PV 1) and proposed development of a 132 kV Transmission Line to connect to the proposed 75 MW Solar PV Facility (Kenhardt PV 1)	20.62	4.14	20.62
5	Proposed development of a 75 MW Solar PV Facility (Kenhardt PV 2) and proposed development of a 132 kV Transmission Line to connect to the proposed 75 MW Solar PV Facility (Kenhardt PV 2)	20.62	4.14	20.62
6	Proposed development of a 75 MW Solar PV Facility (Kenhardt PV 3) and proposed development of a 132 kV Transmission Line to connect to the proposed 75 MW Solar PV Facility (Kenhardt PV 3)	20.62	4.14	20.62
7	Proposed construction of the Mulilo Solar Development consisting of seven 75 MW PV or Concentrated PV Solar Energy Facilities and associated infrastructure	140	70	140
	Total	**261.86**	**112.42**	**261.86**

Table 14.2: Traffic Impact Assessment Table

Aspect/ Impact Pathway	Nature of impact	Status	Spatial Extent	Dura-tion	Conse-quence	Proba-bility	Reversi-bility	Irreplac-eability	Mitigation Measures	Significance of Impact/Risk = Consequence x Probability		Ranking of Impact/ Risk	Confi-dence Level
										Without Mitigation	*With Mitigation*		
CONSTRUCTION AND DECOMMISSIONING PHASES													
Traffic gene-ration	Increase in traffic	Nega-tive	Regional	Short term	Moderate	Very likely	Yes	Replace-able	• Should abnormal loads have to be transported by road to the site, a permit needs to be obtained from the Provincial Government Northern Cape (PGNC) Department of Public Works, Roads and Transport • Provide a Transport Traffic Plan to SANRAL • Ensure that roadworthy and safety standards are implemented at all time for all construction vehicles • Plan trips so that it occurs during the day but avoid construction vehicles movement on the regional road during peak time (06:00-10:00 and 16:00-20:00).	Low	Low	4	Medium
	Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	Nega-tive	Local	Long term	Extreme	Likely	No	High irreplace-ability	• Road kill monitoring programme (inclusive of wildlife collisions record keeping) should be established and fences (such as Animex fences) installed, if needed to direct animals to safe road crossings. • Adhere to all speed limits applicable to all roads used. • Implement clear and visible signalisation indicating movement of vehicles and when turning off or onto the Transnet Service Road to ensure safe entry and exit.	High	Moderate	3	Medium
	Impact on air quality due to dust generation, noise and release of air pollutants from vehicles and construction equipment	Nega-tive	Local	Medium term	Moderate	Unlikely	Yes	Replace-able	• Implement management strategies for dust generation e.g. apply dust suppressant on the Transnet Service Road, exposed areas and stockpiles. • Postpone or reduce dust-generating activities during periods with strong wind. • Earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased.	Moderate	Low	4	Medium

Aspect/ Impact Pathway	Nature of impact	Status	Spatial Extent	Dura-tion	Conse-quence	Proba-bility	Reversi-bility	Irreplac-eability	Mitigation Measures	Significance of Impact/Risk = Consequence x Probability		Ranking of Impact/ Risk	Confi-dence Level
										Without Mitigation	*With Mitigation*		
									• Ensure that all construction vehicles are roadworthy and respect the vehicle safety standards implemented by the Project Developer. • Avoid using old and noisy construction equipment and ensure equipment is well maintained.				
	Change in quality of surface condition of the roads	Posi-tive	Local	Long term	Slight	Likely	Yes	Replace-able	• Construction activities will have a higher impact than the normal road activity and therefore the road should be inspected on a weekly basis for structural damage; • Implement management strategies for dust generation e.g. apply dust suppressant on the Transnet Service Road, exposed areas and stockpiles; and • A Road Maintenance Plan should be developed for the section of the Transnet Service Road that will be used to addresses the following: - Grading requirements; - Dust suppressant requirements; - Drainage requirements; - Signage; and - Speed limits.	Low	Low	4	Medium
OPERATIONAL PHASE													
Traffic gene-ration	Increase in traffic	Nega-tive	Regional	Short term	Slight	Very likely	High	Replace-able	• Adhere to requirements made within Transport Traffic Plan; • Limit access to the site to personnel; and • Ensure that where possible, staff members carpool to site.	Very low	Very low	5	Medium
	Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	Nega-tive	Local	Long term	Extreme	Likely	No	High irreplace-ability	• Road kill monitoring programme (inclusive of wildlife collisions record keeping) should be established and fences installed, if needed to direct animals to safe road crossings. • Adhere to all speed limits applicable to all roads used.	High	Moderate	3	Medium

Aspect/ Impact Pathway	Nature of impact	Status	Spatial Extent	Dura-tion	Conse-quence	Proba-bility	Reversi-bility	Irreplac-eability	Mitigation Measures	Significance of Impact/Risk = Consequence x Probability		Ranking of Impact/ Risk	Confi-dence Level
										Without Mitigation	*With Mitigation*		
									• Implement clear and visible signalisation indicating movement of vehicles and when turning off or onto the Transnet Service Road to ensure safe entry and exit.				
	Impact on air quality due to dust generation, noise and release of air pollutants from vehicles and construction equipment	Nega-tive	Local	Medium term	Moderate	Unlikely	Yes	Replace-able	• Implement management strategies for dust generation e.g. apply dust suppressant on the Transnet Service Road, exposed areas and stockpiles; • Limit noisy maintenance/operational activities to daytime only.	Moderate	Low	4	Medium
	Change in quality of surface condition of the roads	Posi-tive	Local	Long term	Slight	Likely	Yes	Replace-able	• Implement requirements of the Road Maintenance Plan.	Low	Low	4	Medium
CUMULATIVE IMPACTS													
Traffic genera-tion	Increase in traffic	Nega-tive	Regional	Long term	Mode-rate	Very likely	High	Replace-able	n/a	Low	Low	4	Medium

14.7 TRAFFIC IMPACT STATEMENT

Based on the assessment of the potential impacts that can be associated with the traffic to be generated during the construction, operation and decommissioning phases of these projects, the overall impact from traffic generation is deemed to be **low** when implementing suitable mitigation measures, discussed in Section 14.5 and 14.6 of this Statement. The highest traffic will be generated during the construction phase.

The measures included within the EMPr must be adhered to, with the main requirements outlined below:

- Should abnormal loads have to be transported by road to the site, a permit needs to be obtained from the Provincial Government Northern Cape (PGNC) Department of Public Works, Roads and Transport.
- Provide a Transport Traffic Plan to SANRAL.
- Ensure that roadworthy and safety standards are implemented at all time for all construction.
- Adhere to all speed limits applicable to all roads used.
- Implement clear and visible signalisation indicating movement of vehicles and when turning off or onto the Transnet Service Road to ensure safe entry and exit.
- Implement management strategies for dust generation e.g. apply dust suppressant on the Transnet Service Road, exposed areas and stockpiles.
- Construction activities will have a higher impact than the normal road activity and therefore the road should be inspected on a weekly basis for structural damage.
- A Road Maintenance Plan should be developed for the section of the Transnet Service Road.
- Ensure that road network is maintained in a good state for the entire operational phase.

EIA REPORT

CHAPTER 15:

Summary of Electromagnetic Interference Technical Report (Cumulative Topographical Analysis of Proposed PV Projects in AGA Area)

Scoping and **Environmental Impact Assessment** for the Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province

Report prepared for:

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March 2016

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15 CUMULATIVE TOPOGRAPHICAL ANALYSIS OF PROPOSED PV PROJECTS IN AGA AREA

15.1 INTRODUCTION

MESA Solutions (Pty) Ltd (MESA Solutions) was appointed by the Developer to undertake a topographical analysis of the terrain profiles between various photovoltaic (PV) project locations in the Astronomy Geographic Advantage (AGA) area and the closest and core-site SKA telescopes. A total of three Scatec Solar sites (Kenhardt PV 1 to PV 3), as well as ten Mulilo sites (Boven PV1 to PV4; Gemsbok PV1 to PV6) in close proximity (as described in Chapter 4 of this EIA Report), are considered in this cumulative assessment. For each of the additional Mulilo sites, a preferred and an alternative site location was considered in terms of the total path loss to the closest and core SKA telescopes, in order to identify the recommended site location based on minimum potential impact. The full report, dated 10 February 2016, is included in Appendix K of this EIA Report. This technical report aims to inform the potential impact that the proposed project will have on the SKA project and to determine suitable mitigation measures to manage the risk (if any) posed to the SKA project by the development of this project.

This chapter provides a summary of the technical study that was undertaken.

15.1.1 Background to the AGA Area

The Astronomy Geographic Advantage (Act 21 of 2007) aims is to provide for the preservation and protection of areas within the Republic that are uniquely suited for optical and radio astronomy; to provide for intergovernmental co-operation and public consultation on matters concerning nationally significant astronomy advantage areas; and to provide for matters connected therewith. The purpose of the AGA Act is to preserve the geographic advantage areas that attract investment in astronomy. The AGA Act also notes that declared astronomy advantage areas are to be protected and properly maintained in terms of RFI.

The Kenhardt PV 1, Kenhardt PV 2 and Kenhardt PV 3 projects fall within the Karoo Central Astronomy Advantage areas, which are protected against unnecessary EMI under the AGA Act. The closest SKA station is located within 20 km of the project sites, and according to the SKA Project Office, based on distance to the nearest SKA station, the location of the station, and the information currently available on the design of the proposed PV installation, the proposed facility poses a medium to high risk of detrimental impact on the SKA.

The SKA recommended (as shown in Appendix G of this EIA Report) that any transmitters that are to be established at the site for the purposes of voice and data communication will be required to comply with the relevant AGA Act Regulations (currently out for public comment) concerning the restriction of use of the radio frequency spectrum that applies in the study area. Furthermore, the SKA Project Office recommended that further EMI and RFI studies be undertaken.

In general, the dominating EMI produced by PV facilities are mainly in the form of switching noise from power electronics in the inverters or conditioning units, as well as clock signals from microprocessor control boards.

15.2 APPROACH AND METHODOLOGY

15.2.1 Approach

EMI Characterisation of the Representative Plant was determined by undertaking the following:

- *Conducted Measurements*
  - TD conducted measurements on supply cables to the Tracking Units show large pulses when the plant is ON.
  - Majority of the pulse energy extends up to at least 500 MHz.
  - Equivalent FD measurements on the wireless antenna and pressure switch cables agree.
  - Comparison with radiated results show higher frequencies radiate into the environment more efficiently.
  - Better part of noise is likely to emanate from the inverter.
  - Tracking Unit emissions are somewhat aggravated by the wireless communication.
  - Switching noise associated with the tracking of the panels creates broadband interference.
  - Biggest part of switching interference is generated by the pump contactor and relays.

- *Radiated Measurements*
  - Radiated results for the plant ON and in STANDBY mode show similar emissions levels.
  - This confirms that interference producing systems are never completely OFF.
  - Emissions associated with the Inverter units are dominant and occupy frequencies between 300 MHz and 2 GHz
  - Peak levels identified range between 30 - 35 dBµV/m as measured at 10 m below 1 GHz and at 3 m above 1 GHz for both polarisations.
  - For purposes of RFI mitigation, the fixed line communication would be the preferred implementation.
  - The String Cabinet shows mostly broadband interference between 300 MHz and 800 MHz for both polarisations.
  - Comparative measurements made with the doors to the Inverters and Tracking Units open show the limited levels of shielding provided by these enclosures.
  - It is possible to improve the shielding by incorporating conductive gasketting.

Propagation Analysis was undertaken by looking at a Scatec Solar Kenhardt PV 1, PV 2 and PV 3 sites, and a preferred and alternative site location for the ten Mulilo proposed developments in terms of the total path loss to the SKA receivers. This study attempted to define an E-field upper limit, as a function of frequency, at which the plants are allowed to radiate without exceeding emission limits (SARAS protection and receiver saturation limits) at the various SKA telescope locations. The conformance of the plant can be determined by comparing representative measured results, made at Scatec Solar's 75 MW Dreunberg Solar Plant, to the calculated levels provided.

15.2.2 Findings

From the results it is found that:

- Radiated emissions at levels below that of CISPR 11/22 Class B are required (especially in the case of the closest telescope).
- Negligible terrain loss exists between majority of sites and closest SKA telescope.
- Predictions for the maximum allowed E-field level, as measured according to CISPR 11/22 Class B, are given in Figs. (a) to (c) below. A comparison with measured emission levels for each plant is shown.
- Based on plant emission and maximum allowed levels, the required (red) mitigation or surplus (green) attenuation for the closest, second closest and core-site telescopes (refer to Tables 15.1 to 15.3 below).

The tables below show a comparison between measured plant RFI and maximum allowed emission levels and outlines the approximate required mitigation (red), or surplus attenuation (green) for each recommended plant in relation to the closest, second closest and core-SKA telescopes. Required mitigation or surplus attenuation varies based on plant location and frequency. However, mitigation measures will have to be applied based on the highest required level. The required 50 dB of shielding at Boven PV1 at 942 MHz, for example, would require significant attention to detail to achieve.

Table 15.1: The required (red) mitigation or surplus (green) attenuation for the closest telescope.

Site Location	387.38 MHz	399.19 MHz	409.52 MHz	871.57 MHz	942.42 MHz	1223.81 MHz	1441.27 MHz	1584.12 MHz	1728.57 MHz	1819.05 MHz
Kenhardt PV1	12.55	18.03	14.58	23.06	23.28	1.96	-5.57	-10.4	-12.54	-2.51
Kenhardt PV2	25.23	30.77	27.38	37.53	37.99	17.28	10.17	5.52	3.5	13.6
Kenhardt PV3	6.94	12.37	8.87	15.98	16.03	-5.57	-13.22	-18.11	-20.3	-10.3
Boven PV1	36.02	41.47	37.99	47.05	47.43	26.85	19.92	15.43	13.61	23.82
Boven PV2	23.16	28.66	25.23	34.35	34.79	13.48	5.88	0.97	-1.29	8.67
Boven PV3	32.07	37.73	34.44	47.17	47.95	27.69	20.76	16.27	14.45	24.66
Boven PV4	35.48	40.95	37.5	46.79	47.17	26.59	19.66	15.17	13.35	23.56
Gemsbok PV1	14.85	20.36	16.94	26.52	26.91	5.98	-1.29	-6.01	-8.08	1.99
Gemsbok PV2	18.72	24.26	20.87	31.2	31.68	11.01	3.92	-0.72	-2.73	7.38
Gemsbok PV3	14.75	20.25	16.81	25.63	25.9	4.6	-2.93	-7.77	-9.92	0.09
Gemsbok PV4	31.52	37.06	33.66	43.06	43.38	22.1	14.54	9.64	7.38	17.34
Gemsbok PV5	24.01	29.42	25.92	32.36	32.29	9.96	1.69	-3.63	-6.27	3.43
Gemsbok PV6	26.8	32.34	28.94	39.25	39.73	19.02	11.88	7.2	5.14	15.21

Table 15.2: The required (red) mitigation or surplus (green) attenuation for the second closest telescope.

Site Location	387.38 MHz	399.19 MHz	409.52 MHz	871.57 MHz	942.42 MHz	1223.81 MHz	1441.27 MHz	1584.12 MHz	1728.57 MHz	1819.05 MHz
Kenhardt PV1	-1.38	4.07	0.59	7.05	6.94	-15.35	-23.55	-28.78	-31.31	-21.52
Kenhardt PV2	12.74	18.24	14.81	23.39	23.6	2.36	-5.07	-9.89	-12.05	-2.03
Kenhardt PV3	3.57	9.07	5.63	13.31	13.36	-8.6	-16.59	-21.69	-24.06	-14.19
Boven PV1	14.73	20.23	16.8	25.52	25.77	4.64	-2.72	-7.48	-9.58	0.46
Boven PV2	3.73	9.21	5.76	13.68	13.81	-7.7	-15.32	-20.25	-22.51	-12.57
Boven PV3	3.73	9.21	5.76	13.68	13.81	-7.7	-15.32	-20.25	-22.51	-12.57
Boven PV4	6.95	12.43	8.98	17.08	17.24	-4.17	-11.73	-16.61	-18.82	-8.84
Gemsbok PV1	6.64	12.1	8.64	14.75	14.56	-7.66	-15.72	-20.84	-23.23	-13.37
Gemsbok PV2	6.39	11.91	8.49	15.91	15.87	-6.01	-13.88	-18.9	-21.21	-11.29
Gemsbok PV3	7.22	12.7	9.25	15.89	15.77	-6.42	-14.51	-19.67	-22.11	-12.27
Gemsbok PV4	10.1	15.65	12.27	21.01	21.18	-0.36	-8.05	-13.0	-15.27	-5.33
Gemsbok PV5	4.92	10.42	6.99	14.78	14.84	-7.04	-14.98	-20.04	-22.4	-12.51
Gemsbok PV6	12.72	18.28	14.91	24.24	24.5	3.19	-4.35	-9.23	-11.45	-1.48

Table 15.3: The required (red) mitigation or surplus (green) attenuation for the core-site telescope.

Site Location	387.38 MHz	399.19 MHz	409.52 MHz	871.57 MHz	942.42 MHz	1223.81 MHz	1441.27 MHz	1584.12 MHz	1728.57 MHz	1819.05 MHz
Kenhardt PV1	-21.33	-15.96	-19.51	-14.15	-14.35	-36.27	-44.03	-48.97	-51.19	-41.21
Kenhardt PV2	-18.46	-13.12	-16.7	-12.06	-12.35	-34.46	-42.33	-47.32	-49.57	-39.61
Kenhardt PV3	-24.93	-19.53	-23.04	-16.73	-16.81	-38.43	-46.01	-50.85	-52.99	-42.97
Boven PV1	-15.48	-10.18	-13.79	-9.87	-10.25	-32.51	-40.46	-45.49	-47.77	-37.84
Boven PV2	-19.45	-14.12	-17.69	-13.13	-13.44	-35.56	-43.45	-48.44	-50.7	-40.74
Boven PV3	-19.45	-14.12	-17.69	-13.13	-13.44	-35.56	-43.45	-48.44	-50.7	-40.74
Boven PV4	-15.58	-10.28	-13.89	-10.0	-10.38	-32.64	-40.59	-45.62	-47.89	-37.95
Gemsbok PV1	-26.86	-21.45	-24.96	-18.6	-18.67	-40.28	-47.85	-52.69	-54.83	-44.81
Gemsbok PV2	-25.18	-19.78	-23.3	-17.06	-17.15	-38.81	-46.41	-51.27	-53.42	-43.41
Gemsbok PV3	-22.2	-16.84	-20.39	-15.06	-15.27	-37.2	-44.97	-49.91	-52.13	-42.16
Gemsbok PV4	-16.1	-10.82	-14.44	-10.79	-11.19	-33.51	-41.49	-46.53	-48.82	-38.89
Gemsbok PV5	-22.7	-17.32	-20.87	-15.26	-15.43	-37.26	-44.97	-49.88	-52.07	-42.09
Gemsbok PV6	-16.36	-11.07	-14.68	-10.91	-11.31	-33.62	-41.61	-46.65	-48.94	-39.0

15.3 MITIGATION MEASURES

It is strongly recommended that the following mitigation practises be incorporated into the plants design:

- The inverter units, transformers, communication and control units for an array of panels all be housed in a single shielded environment.
- For shielding of such an environment ensure:
- RFI gasketting be placed on all seams and doors.
- RFI Honeycomb filtering be placed on all ventilation openings.
- Cables to be laid directly in soil or properly grounded cable trays (not plastic sleeves).
- The use of bare copper directly in soil for earthing is recommended.
- Assuming a tracking PV plant design, care will have to be taken to shield the noise associated with the relays, contactors and hydraulic pumps of the tracking units.
- All data communications to and from the plant to be via fibre optic.

15.4 SUMMARY OF THE MAIN FINDINGS OF THE TECHNICAL STUDY

The three proposed Kenhardt plants are shown in Table 15.1 to exceed the SARAS protection levels by up to **38 dB toward the closest SKA telescope**. This includes the cumulative effect of a total of 13 PV plants developed. However, Boven PV1, PV3 and PV4 exceed this limit by approximately 50 dB in this scenario (these projects are not proposed by the Developer). For the case where only the three Kenhardt plants are developed, the exceedance will be reduced to 31.6 dB with a cumulative effect for N = 3 plants considered.

It is MESA's expectations that, if the mitigation measures that are specified are implemented correctly, attenuation of between **20 dB and 40 dB can be achieved**. The required maximum mitigation 50 dB for some plants, especially towards the closest telescope, would require significant attention to detail. It is important to note that the success of the mitigation measures cannot be guaranteed or confirmed until measurements on the post-mitigated operating plants (or representative installations) are performed. Furthermore, the findings from this assessment are for the client's own edification, and will be taken into account by SKA-SA during their own propagation analysis. This study is therefore not meant to supersede any investigation done by SKA-SA or relevant RFI working groups. It remains the responsibility of the developer to meet compliance to the SKA requirements, and MESA Solutions cannot accept responsibility for any assessments made in this report which could cause non-compliance.

EIA REPORT

CHAPTER 16:

Conclusions and Recommendations

Scoping and **Environmental Impact Assessment** for the Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province

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16 CONCLUSIONS AND RECOMMENDATIONS

This chapter contains the main conclusions and recommendations from the EIA Process, provides the key findings of the specialist studies (i.e. outlines the most significant impacts identified, together with the key management actions required to avoid or mitigate the negative impacts or enhance positive benefits), an integrated summary of impacts that will influence decision-making by the Competent Authority (i.e. the DEA) and the associated management actions. In addition, the chapter also includes the EAP's opinion on the environmental suitability of the project and whether the project should receive EA.

16.1 SUMMARY OF IMPACT SIGNIFICANCE: MAIN IMPACTS AND KEY RECOMMENDATIONS

The 2014 NEMA EIA Regulations define a significant impact as "*an impact that may have a notable effect on one or more aspects of the environment or may result in non-compliance with accepted environmental quality standards, thresholds or targets and is determined through rating the positive and negative effects of an impact on the environment based on criteria such as duration, magnitude, intensity and probability of occurrence*".

Based on the definition above, this section provides a summary of significant impacts identified and assessed by the specialists in Chapters 7 to 13 of this EIA Report (as noted in Table 16.1 below). The significant impacts and corresponding impact significance ratings before and after mitigation and associated mitigation and management measures are summarised in this section.

Table 16.1: Specialist Studies

Name	Organisation	Specialist Study Undertaken	Chapter in this EIA Report
Simon Bundy	Sustainable Development Projects cc	Ecological Impact Assessment (including Terrestrial Ecology, Aquatic Ecology and Avifauna)	Chapter 7
Henry Holland	Private	Visual Impact Assessment	Chapter 8
Dr. Jayson Orton	ASHA Consulting (Pty) Ltd	Heritage Impact Assessment (Archaeology and Cultural Landscape)	Chapter 9
Dr. John Almond	Natura Viva cc	Desktop Palaeontological Impact Assessment	Chapter 10
Julian Conrad	GEOSS	Geohydrological Assessment	Chapter 11
Johann Lanz	Private	Soils and Agricultural Potential Assessment	Chapter 12
Rudolph du Toit	CSIR	Social Impact Assessment	Chapter 13
Surina Laurie	CSIR	Traffic Impact Statement (*Refer to the explanation provided below*)	Chapter 14
P. S. van der Merwe and A. J. Otto	MESA Solutions (PTY) Ltd	Electro Magnetic Interference and Radio Frequency Interference Surveys (*Refer to the explanation provided below*)	Chapter 15

It must be reiterated that the Social Impact Assessment specialist study (included in Chapter 13 of this EIA Report) was subject to a peer review process by an external reviewer (Ms. Liza van der Merwe, a private consultant), as requested by the DEA. This external review report is included as an appendix to the Social Impact Assessment.

A Traffic Impact Statement was also compiled by the EAP and is included in Chapter 14 of this EIA Report, however it serves as a general description of the existing and predicted traffic associated with the proposed project and does not classify as a specialist study in terms of Appendix 6 of the 2014 NEMA EIA Regulations. Furthermore, this statement considered the full development (i.e. the development of the three Solar PV Facilities (i.e. Kenhardt PV 1, 2 and 3) and the associated electrical infrastructure (which are the subjects of separate BA Processes).

In addition, an Electro Magnetic Interference (EMI) and Radio Frequency Interference (RFI) Survey Technical Study was commissioned by the Project Applicant to determine the impact of the proposed project on the SKA, as requested by the SKA Project Office. This report is not a standard specialist study in terms of Appendix 6 of the 2014 NEMA EIA Regulations, as it is a detailed, technical report which provides a cumulative topographical analysis of the proposed PV projects in the Astronomy Geographic Advantage Area and was undertaken to determine appropriate mitigation and management measures to reduce the risk of a detrimental impact on the SKA project.

It should be noted that all the mitigation and management measures proposed by the specialists, including those additional impacts and management measures identified by the EAP (such as impacts on traffic, air quality, stockpiling recommendations, waste management and the management of dangerous goods on site) have been included in the EMPr (Part B of this EIA Report).

16.1.1 Ecological Impact Assessment

As noted above, an Ecological Impact Assessment (Chapter 7 of this EIA Report) has been undertaken in order to provide supporting information (relating to ecological features and associated impacts) in terms of the proposed construction of the Kenhardt PV 3 Solar Facility and associated infrastructure. The assessment included desktop evaluations, as well as site evaluations.

Table 16.2 illustrates a summary of the total number of impacts identified in the Ecological Impact Assessment.

Table 16.2: Summary of Ecological Impacts

		Significance Before Mitigation				Significance After Mitigation			
	Total Impacts	Very Low	Low	Moderate	High	Very Low	Low	Moderate	High
Construction Phase - Direct Impacts	8	4	3	1	0	6	2	0	0
Construction Phase - Indirect Impacts	6	4	1	1	0	5	1	0	0
Construction Phase - Cumulative Impacts	7	2	2	3	0	3	4	0	0
Operational Phase - Direct Impacts	6	3	2	1	0	4	2	0	0
Operational Phase - Indirect Impacts	3	1	0	2	0	1	2	0	0
Operational Phase - Cumulative Impacts	5	1	2	1	1	2	2	1	0
Decommissioning Phase - Direct Impacts	4	0	3	1	0	0	4	0	0
TOTAL IMPACTS	39								

It is important to note that in most cases, were the impacts have been rated with a low or very low significance before the implementation of mitigation measures, mitigation in this case has not been provided in the Ecological Impact Assessment.

The majority of the impacts in the Ecological Impact Assessment were rated with a negative status. No positive impacts have been identified in the assessment. Overall, as indicated in Table 16.2, the impacts identified in the Ecological Impact Assessment (Chapter 7 of this EIA Report) are predicted to be of a **moderate to very low** significance without the implementation of mitigation measures. Overall, as derived from Table 16.2 above, no impacts were assessed as being of high significance after the implementation of mitigation measures.

The Ecological Impact Assessment concludes that based on the consideration of the site and its present ecological state, as well as the nature of the proposed development, it is in the specialists opinion that the development cannot be precluded from the site on ecological grounds, provided that suitable measures, as noted in the study (Chapter 7 of this EIA Report) are implemented. The following main mitigation measures were identified in the Ecological Impact Assessment specialist study and noted in the EMPr (Part B of the EIA Report):

Pre-Construction and Construction Phases:

- Carry out a second assessment of the site in or around February to March (subsequent to the issuing of an EA and the completion of the detailed engineering) in order to identify any additional plant specimens of significance that may be evident on site. Such specimens may be relocated/removed (i.e. search and rescue) or avoided (with the relevant permits and approvals in place) prior to the commencement of construction.
- The detailed design of the laydown footprint of the arrays should take consideration of the minor drainage lines present on site and any additional significant plant species that may be identified prior to the commencement of construction. Other features of the site should be incorporated into the PV array design.
- Major drainage lines must be excluded from the development footprint.
- An initial pre-construction clearance of all exotic vegetation on site should be undertaken to reduce the possibility of further exotic weed invasion. Continued exotic weed control measures should be implemented during the construction phase and may be incorporated into an exotic weed control plan for the site.

Operational Phase:

- Provision of critter paths within the fencing should be considered in the design.
- Promote and support faunal presence and activities within the proposed PV facility, where applicable.
- Adopt “dry” cleaning methods, such as dusting and sweeping the site before washing down.
- Conduct regular (daily) inspections of the fence line to address any animals that may be affected by the electric fence (i.e. tortoise).

Decommissioning Phase:

- Conduct monitoring of the land conditions and redress of exotic weeds found present on site.
- Implement the stabilisation of disturbed lands immediately after the clearance of the land (for the arrays and related infrastructure.

16.1.2 Visual Impact Assessment

As noted above, a Visual Impact Assessment specialist study was conducted (included in Chapter 8 of this EIA Report) for the proposed construction of the Kenhardt PV 3 Solar PV facility. The assessment concluded that the landscape surrounding the proposed site has a rural agricultural character which has been transformed by extensive stock farming and large scale infrastructure in the form of the Sishen-Saldanha ore railway line and Eskom Nieuwehoop Substation (currently being constructed).

Table 16.3 illustrates a summary of the total number of impacts identified in the Visual Impact Assessment.

Table 16.3: Summary of Visual Impacts

		Significance Before Mitigation				Significance After Mitigation			
	Total Impacts	Very Low	Low	Moderate	High	Very Low	Low	Moderate	High
Construction Phase: Direct Impacts	1	0	0	1	0	0	1	0	0
Operational Phase: Direct Impacts	3	2	0	1	0	2	1	0	0
Decommissioning Phase: Direct Impacts	1	0	0	1	0	0	1	0	0
Cumulative Impacts	2	1	1	0	0	1	1	0	0
TOTAL IMPACTS	7								

It is important to note that in some cases, were the impacts have been rated with a low or very low significance before the implementation of mitigation measures, mitigation has not been provided in the Visual Impact Assessment. No indirect or positive impacts were identified in the Visual Impact Assessment. The majority of the impacts identified in the Visual Impact Assessment were rated with a negative status.

Overall, as indicated in Table 16.3, the impacts identified in the Visual Impact Assessment (Chapter 8 of this EIA Report) are predicted to be of a **moderate to very low** significance without the implementation of mitigation measures.

The following main mitigation measures were identified in the Visual Impact Assessment specialist study:

Construction Phase:

- Preparation of the solar field area (i.e. clearance of vegetation, grading, contouring and compacting) and solar field construction should be phased in a way that makes practical sense in order to minimise the area of soil exposed and duration of exposure.

Operational Phase:

- The project developer should maintain re-vegetated surfaces until a self-sustaining stand of vegetation is established and visually adapted to the undisturbed surrounding vegetation. No new disturbance should be created during operations without approval by the Environmental Officer;
- Restoration of disturbed land should commence as soon after disturbance as possible;
- A lighting plan that documents the design, layout and technology used for lighting purposes should be prepared, indicating how nightscape impacts will be minimised.

Decommissioning Phase:

- Disturbed and transformed areas should be contoured to approximate naturally occurring slopes to avoid lines and forms that will contrast with the existing landscapes.

16.1.3 Heritage Impact Assessment (Archaeology and Cultural Landscape)

A Heritage Impact Assessment (HIA) was undertaken as part of the EIA Process (included in Chapter 9 of this EIA Report).

Table 16.4 illustrates a summary of the total number of impacts identified in the HIA.

Table 16.4: Summary of Heritage Impacts

		Significance Before Mitigation				Significance After Mitigation			
	Total Impacts	Very Low	Low	Moderate	High	Very Low	Low	Moderate	High
Construction Phase: Direct Impacts	3	0	2	0	1	2	1	0	0
Operational Phase: Direct Impacts	1	0	1	0	0	0	1	0	0
Decommissioning Phase: Direct Impacts	1	0	1	0	0	0	1	0	0
Cumulative Impacts	3	0	3	0	0	2	1	0	0
TOTAL IMPACTS	8								

All the above impacts were rated with a negative status. Overall, the above impacts are predicted to be of a **low significance** without the implementation of mitigation measures. No impacts were assessed as being of high significance with the implementation of mitigation.

The HIA concluded that because the potential impacts are few and entirely manageable, it is recommended that the proposed project be allowed to continue, however subject to the following conditions:

- If they cannot be avoided with a buffer of at least 25 m, the two significant archaeological sites should be excavated;
- The potential grave should be avoided with a buffer of at least 5 m or else tested and, if necessary, exhumed prior to construction;
- The construction team should be made aware of the potential to locate more graves and instructed to report any suspicious stone features prior to disturbance;
- The built elements of the facility should be painted in an earthy colour to minimise visual contrast in the landscape; and
- If any archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

An additional management measure includes ensuring that all works occur inside the approved development footprint.

16.1.4 Desktop Palaeontological Impact Assessment

A desktop Palaeontological Impact Assessment was undertaken as part of the EIA Process (included in Chapter 10 of this EIA Report) to provide an assessment of potential impacts on local palaeontological (i.e. fossil) heritage within the proposed Kenhardt PV 3 facility area.

Table 16.5 illustrates a summary of the total number of impacts identified in the Palaeontological Impact Assessment.

Table 16.5: Summary of Palaeontological Impacts

		Significance Before Mitigation				Significance After Mitigation			
	Total Impacts	Very Low	Low	Moderate	High	Very Low	Low	Moderate	High
Construction Phase: Direct Impacts	1	1	0	0	0	1	0	0	0
Cumulative Impacts	1	1	0	0	0	1	0	0	0
TOTAL IMPACTS	2								

No significant impacts on palaeontological heritage are anticipated during the operational and decommissioning phases of the proposed development. The above impacts were rated with a negative status. It is clear from Table 16.5 above that the impacts were assessed as being of **very low** significance without and with the implementation of mitigation.

The following main mitigation measures were identified in the Palaeontological Impact Assessment:

Construction Phase:

- All substantial bedrock excavations (into sedimentary rocks) should be monitored for fossil material by the responsible ECO. Should significant fossil remains - such as vertebrate bones and teeth, plant-rich fossil lenses, petrified wood or dense fossil burrow assemblages - be exposed during construction, the responsible ECO should safeguard these, preferably in situ. The SAHRA should be alerted as soon as possible, so that appropriate action can be taken by a professional palaeontologist.
- Appoint a professional palaeontologist to record and sample any chance fossil finds. Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (e.g. stratigraphy, sedimentology, taphonomy) by a professional palaeontologist. The palaeontologist concerned with mitigation work will need a valid fossil collection permit from SAHRA and any material collected would have to be curated in an approved depository (e.g. museum or university collection).

The Palaeontological Impact Assessment concludes that there are no fatal flaws in the proposed development, nor are there objections to its authorisation as far as fossil heritage conservation is concerned, since significant impacts on scientifically valuable fossils or fossil sites are not anticipated.

16.1.5 Geohydrological Assessment

A Geohydrological Assessment (Chapter 11 of this EIA Report) was conducted as part of the EIA Process in order to identify and assess impacts associated with the construction and operation of the proposed project on the groundwater and geohydrological resources.

Table 16.6 illustrates a summary of the total number of impacts identified in the Geohydrological Assessment.

Table 16.6: Summary of Geohydrological Impacts

		Significance Before Mitigation				Significance After Mitigation			
	Total Impacts	Very Low	Low	Moderate	High	Very Low	Low	Moderate	High
Construction Phase: Direct Impacts	**3**	3	0	0	0	3	0	0	0
Construction Phase: Indirect Impacts	**3**	3	0	0	0	3	0	0	0
Operational Phase: Direct Impacts	**2**	2	0	0	0	2	0	0	0
Operational Phase: Indirect Impacts	**2**	2	0	0	0	2	0	0	0
Decommissioning Phase: Direct Impacts	**1**	1	0	0	0	1	0	0	0
Decommissioning Phase: Indirect Impacts	**1**	1	0	0	0	1	0	0	0
TOTAL IMPACTS	**12**								

As derived from Table 16.6 above, it is clear that all impacts were identified with a **very low significance** without and with the implementation of mitigation measures. The impacts identified above are all rated with a neutral status.

The following main mitigation measures were identified in the Geohydrological Assessment:

Construction, Operational and Decommissioning Phases:

- All reasonable measures must be taken to prevent soil, storm water outflows and groundwater contamination.
- Emergency measures and plans must be put in place and rehearsed in order to prepare for accidental spillage.
- Vehicle and washing areas must also be on paved surfaces and the by-products correctly managed.
- If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilled material. Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes.

The Geohydrological Assessment concludes that from a groundwater perspective the proposed activity can be authorised and no specific measures are applicable other than all measures to prevent soil and groundwater contamination, especially by hydrocarbons, must be in place.

16.1.6 Soils and Agricultural Potential Assessment

A Soils and Agricultural Potential Assessment (Chapter 12 of this EIA Report) was conducted as part of the EIA Process in order to identify and assess all potential impacts of the proposed development on agricultural resources including soils and agricultural production potential, and to provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for all identified impacts.

Table 16.7 illustrates a summary of the total number of impacts identified in the Soils and Agricultural Potential Assessment.

Table 16.7: Summary of Soils and Agricultural Potential Impacts

		Significance Before Mitigation				Significance After Mitigation			
	Total Impacts	Very Low	Low	Moderate	High	Very Low	Low	Moderate	High
Construction Phase: Direct Impacts	**5**	4	1	0	0	5	0	0	0
Operational Phase: Direct Impacts	**3**	2	1	0	0	3	0	0	0
Decommissioning Phase: Direct Impacts	**5**	4	1	0	0	5	0	0	0
Cumulative Impacts	**1**	0	0	1	0	0	0	1	0
TOTAL IMPACTS	**14**								

It is important to note that in some cases, were the impacts have been rated with a low or very low significance before the implementation of mitigation measures, mitigation has not been suggested in the Soils and Agricultural Potential Assessment. No indirect impacts were identified. All of the above impacts were rated with a negative status, except for the impact relating to the generation of additional land use income through the rental of the land for the proposed solar energy facility, which was rated with a positive status.

All impacts apart from the cumulative impact were assessed as having a **very low or low significance**, and the overall agricultural impact for all phases of the development was assessed as being of a **low significance**.

The following main mitigation measures were identified in the Soils and Agricultural Potential Assessment:

Construction, Operational and Decommissioning Phases:

- Implement an effective system of stormwater run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion.

The study concludes that because of the low agricultural potential of the site, the development should, from an agricultural impact perspective, be authorised.

16.1.7 Social Impact Assessment

A Social Impact Assessment (included in Chapter 13 of this EIA Report) was undertaken as part of the EIA Process to investigate the potential social disruptors and associated social impacts likely to result from the proposed project.

Table 16.8 below illustrates a summary of the total number of impacts identified in the Social Impact Assessment.

Table 16.8: Summary of Social Impacts

		Significance Before Mitigation				Significance After Mitigation			
	Total Impacts	Very Low	Low	Moderate	High	Very Low	Low	Moderate	High
Construction Phase: Direct Impacts	**6**	0	2	4	0	1	3	2	0
Operational Phase: Direct Impacts	**6**	0	2	4	0	1	3	2	0
Decommissioning Phase: Direct Impacts	**1**	0	0	1	0	0	1	0	0
Cumulative Impacts	**1**	0	0	0	0	0	1	0	0
TOTAL IMPACTS	**14**								

No indirect or cumulative impacts have been identified in the specialist study. It is clear from Table 16.8 that no impacts were assessed as being of high significance with or without the implementation of mitigation. The overall significance rating of the negative socio-economic impacts associated with the proposed project is low to moderate; whereas the overall significance rating of the positive socio-economic impacts associated with the proposed development is moderate.

The following main mitigation measures were identified in the Social Impact Assessment:

Construction and Operational Phases:

- Develop and implement a Workforce Recruitment Plan;
- Clearly define and agree upon the Project Affected People (PAP);
- Develop a database of PAP and their relevant skills and experience, or use an existing legitimate database of skills and expertise;
- Develop and implement a Stakeholder Engagement Plan;
- Delivery on the Economic Development Plan must be contractually binding on the proponent;
- Procure goods and services, where practical, within the study area;
- The proponent should engage with local NGOs, CBOs and local government structures in the Kenhardt community to identify and agree upon relevant skills and competencies required;
- Such skills and competencies should then be included in the Economic Development Plan; and
- Where possible, align the Economic Development Plan with Local Municipality's IDP.

Decommissioning Phase:

- Scatec should also consider appropriate succession training of locally employed staff earmarked for retrenchment during decommissioning; and
- All project infrastructures should be decommissioned appropriately and thoroughly to avoid misuse.

16.1.8 Traffic Impact Statement

As noted above and included in Chapter 14 of the EIA Report, the Traffic Impact Statement (TIS) was produced by the CSIR to show the amount of traffic that can be expected during the construction and operational phase of the proposed development of the proposed Kenhardt PV 1, Kenhardt PV 2, and Kenhardt PV 3 solar energy projects (i.e. separate EIA Processes), as well as the proposed Kenhardt PV 1 – Transmission Line, Kenhardt PV 2 – Transmission Line, and Kenhardt PV 3 – Transmission Line projects (assessed as part of separate BA Processes). The TIS focuses on the regional setting in which these projects are proposed and the roads that will be utilised for these projects.

Overall, the above impacts identified as part of the TIS are predicted to be of a **moderate to low significance** without and with the implementation of mitigation measures. No impacts were assessed as being of high significance after the implementation of mitigation.

The following main mitigation measures were identified in the TIS:

Construction, Operational and Decommissioning Phases:

- Should abnormal loads have to be transported by road to the site, a permit needs to be obtained from the Provincial Government Northern Cape (PGNC) Department of Public Works, Roads and Transport.

- A Road Maintenance Plan should be developed for the section of the Transnet Service Road.

16.1.9 Cumulative Topographical Analysis of the proposed PV projects in the Astronomy Geographic Advantage Area

As noted above, MESA Solutions (Pty) Ltd (MESA Solutions) was appointed by the Scatec Solar to undertake a topographical analysis of the terrain profiles between various PV projects locations (assessed separately as part of EIA Processes) in the Astronomy Geographic Advantage (AGA) area and the closest and core-site SKA telescopes.

It is strongly recommended that the following mitigation practises be incorporated into the plants design:

- The inverter units, transformers, communication and control units for an array of panels all be housed in a single shielded environment.
- For shielding of such an environment ensure RFI gasketting be placed on all seams and doors and RFI Honeycomb filtering be placed on all ventilation openings.
- Cables to be laid directly in soil or properly grounded cable trays (not plastic sleeves).
- The use of bare copper directly in soil for earthing is recommended.
- Assuming a tracking PV plant design, care will have to be taken to shield the noise associated with the relays, contactors and hydraulic pumps of the tracking units.
- All data communications to and from the plant to be via fibre optic.

16.2 SUMMARY: COMPARATIVE ASSESSMENT OF POSITIVE AND NEGATIVE DIRECT AND INDIRECT IMPACTS

Section 16.1 provides a summary of the findings of the specialist studies (or inputs) that were sourced as part of this EIA Process. Table 16.9 summarises the overall significance of these impacts following the implementation of the recommended mitigation and management measures. From this table it can be seen that no negative impacts of high significance are predicted to occur as a result of this project provided the stipulated management actions are implemented effectively. The positive impacts generated by the project are associated with the economic benefits from employment opportunities, and the additional source of income from the rental of the land for the construction and operation of the PV facility. Considering that all the negative impacts would be appropriately managed and the positive impacts enhanced through mitigation measures and management actions via the EMPr (Part B of the EIA Report), the potential negative impacts associated with the proposed project are not anticipated to be significant.

Table 16.9: Comparative Assessment of Positive and Negative Direct and Indirect Impacts

Specialist Study	Overall Impact Significance Before Mitigation or Enhancement	Overall Impact Significance After Mitigation or Enhancement
Ecological Impact Assessment (including Terrestrial Ecology, Aquatic Ecology and Avifauna)	Negative: Moderate-Very Low	Negative: Very Low-Low
Visual Impact Assessment	Neutral: Moderate-Very Low	Neutral: Low-Very Low
Heritage Impact Assessment (Archaeology and Cultural Landscape)	Negative: High-Very Low	Negative: Low–Very Low
Desktop Palaeontological Impact Assessment	Negative: Very Low	Negative: Very Low
Geohydrological Assessment	Neutral: Very Low	Neutral: Very Low
Soils and Agricultural Potential Assessment	Negative: Very Low-Low	Negative: Very Low

Specialist Study	Overall Impact Significance Before Mitigation or Enhancement	Overall Impact Significance After Mitigation or Enhancement
	Positive: Very Low	Positive: Very Low
Social Impact Assessment	Negative: Moderate-Low	Negative: Low-Very Low
	Positive: Moderate-Low	Positive: Moderate-Low
Traffic Impact Statement	Negative: High-Low	Negative: Moderate–Low

16.3 SUMMARY OF CUMULATIVE IMPACTS

Table 16.10 below provides a summary of the cumulative impacts that the proposed Kenhardt PV 3 project (in conjunction with other proposed projects noted in Chapter 4, including those proposed by Scatec Solar) will have on the receiving environment. The mitigation and management measures to be implemented for the cumulative impacts are detailed in the relevant specialist chapters.

Table 16.10: Comparative Assessment of Cumulative Impacts

Specialist Study	Impact Description	Cumulative Impact Significance
Ecological Impact Assessment (including Terrestrial Ecology, Aquatic Ecology and Avifauna)	▪ Extensive alteration of habitat structure and composition over an extensive and wide area; ▪ Changes in fauna through exclusion of certain species and beneficiation of others over an extensive and wide area; ▪ Increased change in the geomorphological state of drainage lines on account of long term and extensive change in the nature of the catchment; ▪ The continued and cumulative loss of habitat at a landscape to regional level, with a particular impact on avifaunal behaviour; ▪ Changes in water resources and surface water in terms of water quality (i.e. impact on water chemistry) on account of extensive changes in the catchment; and ▪ Exotic weed invasion as a consequence of regular and continued disturbance across an extensive area of site.	Before Mitigation: High to Very Low After Mitigation: Very Low to Moderate
Visual Impact Assessment	▪ Cumulative impact of solar energy generation projects and large scale electrical infrastructure on the existing rural-agricultural landscape.	Before Mitigation: Very Low After Mitigation: No mitigation applicable
	▪ Cumulative visual impact of solar energy generation projects and large scale electrical infrastructure on existing views of sensitive visual receptors in the surrounding landscape.	Before Mitigation: Low After Mitigation: No mitigation applicable
Heritage Impact Assessment (Archaeology and Cultural Landscape)	▪ Damage to or destruction of archaeological resources.	Before Mitigation: Very Low After Mitigation: No mitigation applicable
	▪ Damage to or destruction of graves	Before Mitigation: Low After Mitigation: Very Low

Specialist Study	Impact Description	Cumulative Impact Significance
	▪ Impacts to the cultural and natural landscape	Before Mitigation: Low After Mitigation: Low
Desktop Palaeontological Impact Assessment	▪ Potential cumulative loss of palaeontological heritage resources through disturbance, damage or destruction of fossils and fossil sites (including associated geological contextual data) through surface clearance and excavation activities during the construction phase of several alternative energy facilities within the broader Kenhardt region and other key electrical infrastructure developments within a 20 km radius of the proposed project site.	Before Mitigation: Very Low After Mitigation: Very Low
Geohydrological Assessment	▪ As it is not recommended (based on the findings of the Geohydrological Assessment) to make use of the groundwater, the proposed development will have no cumulative impacts on groundwater.	Not Applicable
Soils and Agricultural Potential Assessment	▪ Occupation of the land by the infrastructure of multiple projects	Before Mitigation: Moderate After Mitigation: No mitigation applicable
Social Impact Assessment	▪ Exacerbated in-migration	Before Mitigation: Moderate After Mitigation: No mitigation applicable
Traffic Impact Statement	▪ Increased traffic generation	Before Mitigation: Low After Mitigation: No mitigation applicable

16.4 CONSIDERATION OF ALTERNATIVES

The alternatives that were considered as part of the EIA Phase for the Kenhardt PV 3 facility are included in Chapter 5 of this EIA Report.

16.4.1 No-go Alternative

The no-go alternative assumes that the proposed project will not go ahead i.e. it is the option of not constructing the proposed Kenhardt PV 3 project. This alternative would result in no environmental impacts on the site or surrounding local area. The following implications will occur if the “no-go” alternative is implemented:

- No benefits will be derived from the implementation of an additional land-use;
- No additional power will be generated or supplied through means of renewable energy resources by this project at this location. The proposed 75 MW facility is predicted to generate approximately 200 GW/h per year which could power 20 000 households;
- The “no go” alternative will not contribute to and assist the government in achieving its proposed renewable energy target of 17 800 MW by 2030;
- Additional power to the local grid will need to be provided via the Eskom grid, with approximately 90% coal-based power generation with associated high levels of CO_2 emissions and water consumption;
- Electricity generation will remain constant (i.e. no additional renewable energy generation will occur on the proposed site) and the local economy will not be diversified;

- Local communities will continue their dependence on agriculture production and government subsidies. The local municipality's vulnerability to economic downturns will increase because of limited access to capital;
- There will be no opportunity for additional employment in an area where job creation is identified as a key priority. Between 90 and 150 skilled and 400 and 460 unskilled employment opportunities are expected be created during the construction phase. Approximately 20 skilled and 40 unskilled employment opportunities will be created over the 20 year lifespan of the proposed facility;
- There will be lost opportunity for skills transfer and education/training of local communities;
- The positive socio-economic impacts likely to result from the project such as increased local spending, the proposed implementation of an Economic Development Plan and the creation of local employment opportunities will not be realised; and
- The local economic benefits associated with the REIPPPP will not be realised, and socio-economic contribution payments into the local community trust will not be realised.

Converse to the above, the following benefits could occur if the "no-go" alternative is implemented:

- There will be no development of solar energy facilities at the proposed location;
- Only the agricultural land use will remain;
- No threatened vegetation will be removed or disturbed during the development of these facilities;
- No change to the current landscape will occur i.e. the existing landscape will remain as is, without the visual impact of the proposed PV facility, but noting that the existing landscape would still change as Eskom plan to construct the Nieuwehoop substation and high voltage transmission lines for which an EA has been issued;
- No additional transmission lines and additional electrical infrastructure will be constructed, as a result of the proposed project (and associated transmission line which is assessed as part of a separate BA Process), which may cause bird collisions or fences/infrastructure that may restrict animal movement and create habitat fragmentation, but noting that Eskom will construct high voltage lines within the region;
- No additional water use during the construction phase and the cleaning of panels during the operational phase;
- No additional traffic would be generated from this project in this area; and
- No increase in social deviance and influx of job seekers into the Kenhardt area.

It is important to take into account that the country is facing serious power and water shortages due to its heavy dependency on fossil fuels such as coal. There is therefore a need for additional electricity generation options to be developed throughout the country. As discussed in Chapter 1 of this EIA Report, the purpose of the proposed Kenhardt PV 3 project is to feed electricity generated by a renewable energy resource into the national electricity grid. Many other socio-economic and environmental benefits will result from the development of this project such as development of renewable energy resources in the country and contribution to the increase of energy security, employment creation and local economic development (as noted above).

In addition, the Soils and Agricultural Potential Assessment (Chapter 12 of this EIA Report) notes that the land on which the proposed project will be constructed is of low agricultural potential and is not suitable for cultivation. Therefore, the current land-use (i.e. agricultural use) is not deemed as the preferred alternative and can still continue around the site for the lifetime of the project.

Hence, while the "no-go" alternative will not result in any negative environmental impacts; it will also not result in any positive community development or socio-economic benefits, nor will it generate an alternative land-use income from the solar energy facility. It will also not assist government in addressing climate change, reaching its set targets for renewable energy, nor will it assist in supplying the increasing electricity demand within the country. Hence the "no-go" alternative is not a preferred alternative.

16.4.2 Land-Use Alternative

As discussed above, the sole use of the land for agriculture is not a preferred alternative.

Where the “activity” is the generation of electricity, possible reasonable and feasible land-use alternatives for the proposed properties include Biomass, Hydro Energy and Wind Energy. However, based on the preliminary investigations undertaken by the Project Applicant, no other renewable energy technologies are deemed to be appropriate or suitable for the site. Furthermore, from an impact and risk assessment perspective, the implementation of a solar PV project on the remaining extent of Onder Rugzeer Farm 168 will result in fewer risks and low significance impacts in comparison to the implementation of wind energy, hydro power and biomass.

As previously noted, the proposed solar facility currently falls within the REDZ 7. The proposed project is therefore in line with the criteria of the SEA and located in an area of strategic importance for Solar PV development. It should be noted that even if a project falls within a REDZ, the proposed development still requires site specific assessments as per the site protocol (still in development and not yet promulgated) in order to determine the potential impacts of a project at a local and site specific level.

Therefore, the implementation of a solar energy facility at the proposed project site is more favourable and feasible than other alternative energy facilities (i.e. for generating 20 MW or more from a renewable resource). Therefore in terms of project and location compatibility, the proposed solar facility is considered to be the most feasible renewable energy land use alternative. Furthermore, it is important to note that solar energy development (i.e. not wind energy, hydro power and biomass) is the Project Applicant’s core business area and focus. The experience that the Project Applicant has within the solar energy development industry will positively benefit the proposed project.

16.4.3 Site and Location Alternatives

As discussed in Chapter 5 of this EIA Report, an alternative site was considered during the Scoping Phase, however only the preferred site for the Kenhardt PV 3 facility has been assessed in this EIA. From an impact and risk assessment perspective, the implementation of a solar PV project on the remaining extent of Onder Rugzeer Farm 168 will result in fewer risks in comparison to its implementation at the alternate sites (that were considered during the Scoping Phase) within the Northern Cape (i.e. regions with similar irradiation levels). The following risks and impacts will be likely in this case:

- There is no guarantee that suitable land will be available for development of a solar PV facility. Site geotechnical conditions, topography, fire potential and ready access to a site might not be suitable, thus resulting in negative environmental implications and reduced financial viability.
- There is no guarantee that the current land use of alternative sites (that were considered during the Scoping Phase) will be flexible in terms of development potential, for example the agricultural potential for alternative sites might be higher and of greater significance.
- There is no guarantee of the willingness of other landowners to allow the implementation of a solar facility on their land and if the landowners strongly object, then the project will not be feasible.
- There is no guarantee that other sites within the Northern Cape will be located close to existing or proposed electrical infrastructure to enable connection to the national grid. The further away a project is from the grid, the higher the potential for significant environmental and economic impacts.

As previously noted, the proposed Kenhardt PV 3 facility is one part of a bigger project by Scatec Solar to develop three Solar PV Facilities in total. The main determining points for Scatec Solar was to find suitable, developable land in one contiguous block to optimise design, minimise costs, and minimise sprawling development and impact footprints. In addition, the proximity to the Eskom Nieuwehoop Substation was a major determinant for identifying suitable sites for the proposed development.

Given the site selection requirements associated with solar energy facilities and the suitability of the land available on the remaining extent of Onder Rugzeer Farm 168, no other site alternatives were considered in the EIA Phase.

16.4.4 Layout Alternatives

Refer to Section 16.5 of this chapter which describes the Development Envelope approach which was used to select the location for the proposed PV facility.

16.4.5 Technology Alternatives

As discussed in Chapter 2 and Chapter 5 of the EIA Report, only the PV solar panel technology type has been considered in the EIA Phase.

In addition, four main mounting systems have been included in the proposed project description namely: single axis tracking systems; fixed axis tracking systems; dual axis tracking systems; and fixed tilt mounting structures. The type of mounting system will be confirmed during the detailed engineering phase and whichever mounting system is selected would have no impact on any aspect assessed within the EIA.

16.5 DEVELOPMENT ENVELOPE AND LAYOUT OF THE PROPOSED KENHARDT PV 3 FACILITY

As noted in Chapter 5 of this EIA Report, the Rochdale Envelope Approach[1] was applied to determine the preferred Development Envelope for the proposed PV facility. This entailed assessing a larger 450 ha area as part of the EIA. This 450 ha is shown in green in Figure 16.1 below.

[1] Infrastructure Planning Commission (IPC), Using the 'Rochdale Envelope'. February 2011

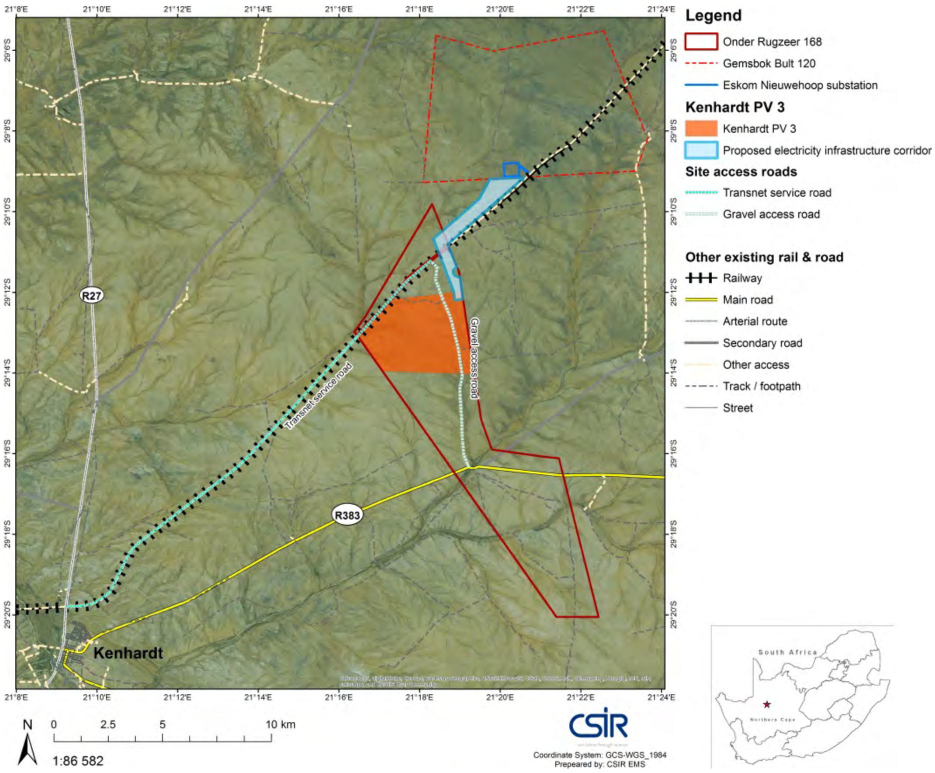

Figure 16.1: Map indicating the approximately 1341 ha site assessed for the Kenhardt PV 3 facility (and the Electrical Infrastructure Corridor (which is assessed as part of separate BA Processes)).

The Development Envelope was determined based on the environmental sensitivities present on the site, as identified by the specialists. The following sensitive areas were identified by the specialists for consideration in the Development Envelope and site layout:

- **Ecological Sensitivities:**
  - The zones that should be subject to exclusion from development within the study area include:
    - The major drainage features present towards the west and south of the Kenhardt PV 3 site. In terms of aquatic ecology and drainage features, the Wolfkopseloop drainage feature and its associated drainage lines, lying to the north and west of the Kenhardt PV 3 site, is considered a major hydrogeomorphic feature (as shown in blue in Figure 16.2 below). Three major drainage features serve the Wolfkopseloop drainage line (as shown in blue in Figure 16.2 below). The Rugseers River also occurs towards the south of the site (as shown in blue in Figure 16.2 below). A 32 m "buffer" or "setback" around the major drainage lines has been established and recommended by the specialist (as shown in Figure 16.2 below). As noted in the Ecological Impact Assessment, this buffer is understood to be the indicative norm recommended by the various authorities and is considered acceptable in light of the fact that hydrogeomorphic features are the primary dictate in the identification and delineation of the major drainage lines, rather than other functional features such as geohydromorphic soil conditions or botanical species diversity and compositional variation. The "minor" drainage features (shown in black in Figure 16.2 below) are not considered to require exclusion (as explained in the Ecological Impact Assessment included in Chapter 7 of the EIA Report).
    - The two identified quartzite kopjies towards the west of the Kenhardt PV 3 site, which are the most elevated portions of the site and show some habitat variation, comparative to the calcrete dominated flat lands that predominate on the site. These

quartzite kopjies are distinct topographic anomalies within the site and, in line with their geological divergence; they offer some variability to the prevailing habitat form. The kopjies are considered to be worthy of exclusion from the development footprint on account of the variation in habitat that these geological formations bestow upon a generally uniform landscape. A 250 m buffer from the highest point of these quartzite kopjies has been recommended, as indicated in Figure 16.2.

- An association which includes *Aloe claviflora* and *A dichotoma* is associated with those areas proximal to the two quartzite kopjies. As such the aloes found on and around the two quartzite kopjies in the Kenhardt PV 3 area (as shown in Figure 16.2 below), will be excluded from the development footprint, as the kopjies themselves require exclusion on the grounds of habitat preservation. It will be best practice for the laydown area to be located to the east of these quartzite areas and that the kopjies remain outside of the proposed PV facility.

- **Heritage Sensitivities:**
  - A flaked quartz outcrop with a few artefacts around it towards the west of the Kenhardt PV 3 site. This is part of a larger quartz hill/ridge. The HIA notes that on the crest of this quartz ridge there is a natural hollow of about 2.5 m by 1.5 m. Within this space is a pile of quartz blocks and in the hollow there are artefacts and many quartz flakes. To the northeast, just below the quartz outcrop, a semi-circular 'clearing' was found amongst the quartz rocks and gravel, however artefacts were not current. The hollow occurs within the Kenhardt PV 3 study area at waypoint 224, as explained in Chapter 9 of this EIA Report, at co-ordinates S 29°13 11.5 and E 21°17 23.5. This should be avoided with a buffer of at least 25 m (which has been included in Figure 16.2 below). If it cannot be avoided, archaeological excavations in the hollow need to be conducted to rescue artefacts and data. If necessary, conduct a test excavation and expand in the 'clearing' and map the whole site.
  - A large scatter of quartz artefacts was found in a sandy area along a river within the Kenhardt PV 3 study area at waypoint 229, as explained in Chapter 9 of this EIA Report, at co-ordinates S 29°13 36.5 and E 21°17 33.5. Nothing diagnostic seen but presumably it is LSA. This feature should be avoided with a buffer of at least 25 m. If it cannot be avoided with this 25 m buffer (which has been included in Figure 16.2 below), this archaeological site should be excavated to rescue artefacts and data.
  - A likely grave was found to be located within the Kenhardt PV 3 study area at waypoint 739, as explained in Chapter 9 of this EIA Report, at co-ordinates S 29°13 15.9 and E 21°16 44.5. The likely grave should be avoided with a buffer of at least 5 m (which has been included in Figure 16.2 below). If the grave cannot be avoided then a test excavation must be conducted to verify the presence of human remains. If it is determined to be a grave, then a decision needs to be made to avoid or exhume prior to construction in line with required process. As noted in the HIA, the likely grave is two loose 'mounds' of quartz in a sandy area but close to a quartz gravel patch.

As noted in Chapters 8, 10, 11, 12 and 13 of this EIA Report, no other sensitive areas or sensitive receptors, that require exclusion, were highlighted in the Visual Impact Assessment, Palaeontological Impact Assessment, Geohydrological Assessment, Soils and Agricultural Potential Assessment and Social Impact Assessment.

Based on the findings of the Ecological and Heritage Impact Assessments, an environmental sensitivity map has been produced, which is shown in Figure 16.2 below (and included Appendix J of this EIA Report). This map shows the sensitivities on site (terrestrial, aquatic, and sensitive heritage features) within the larger 1341 ha buildable area that was assessed.

Based on the boundaries of the Development Envelope and the constraints of the environmental sensitivities, a site layout has also been preliminary determined which is shown in Figure 16.3 (and Appendix J of this EIA Report). It is important to note that should the layout change subsequent to the issuing of an EA (should such authorisation be granted), any alternative layout or revisions to the layout occurring within the boundaries of the Development Envelope would not be regarded as a change to the scope of work or the findings of the impact assessments undertaken during the EIA Phase. This is based on the understanding that the specialists have assessed the larger area and have identified sensitivities, which have been avoided in the siting of the proposed infrastructure. The Development Envelope is considered to be a "box" in which the project components can be constructed at whichever location without requiring an additional assessment or change in impact significance. Any changes to the layout within the boundaries of the Development Envelope following the issuing of the EA (should it be granted) will therefore be considered to be non-substantive.

Therefore, the findings of the specialist studies have been used to inform the layout of the proposed facility within the preferred site, Kenhardt PV 3.

It is important to note that the sensitive features highlighted above (i.e. Aloes, two quartzite kopjies, major drainage lines, two archaeological sites and possible grave site) have been excluded from the proposed development footprint with the required buffers as the features are located towards the western edge of the Development Envelope (i.e. 1341 ha site), as indicated in Figures 16.2 and 16.3

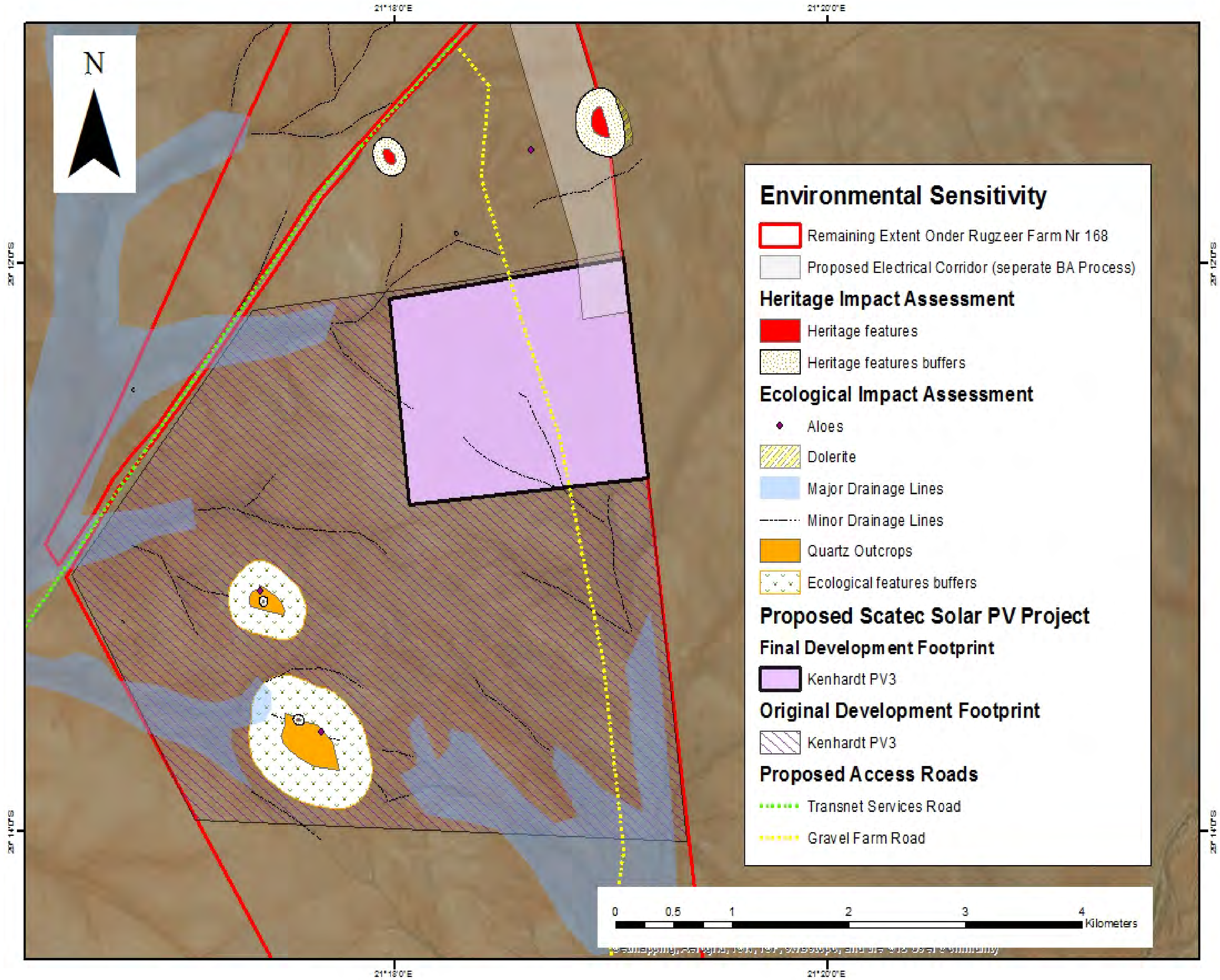

Figure 16.2: Environmental Sensitivity Map for the Proposed Kenhardt PV 3 Facility

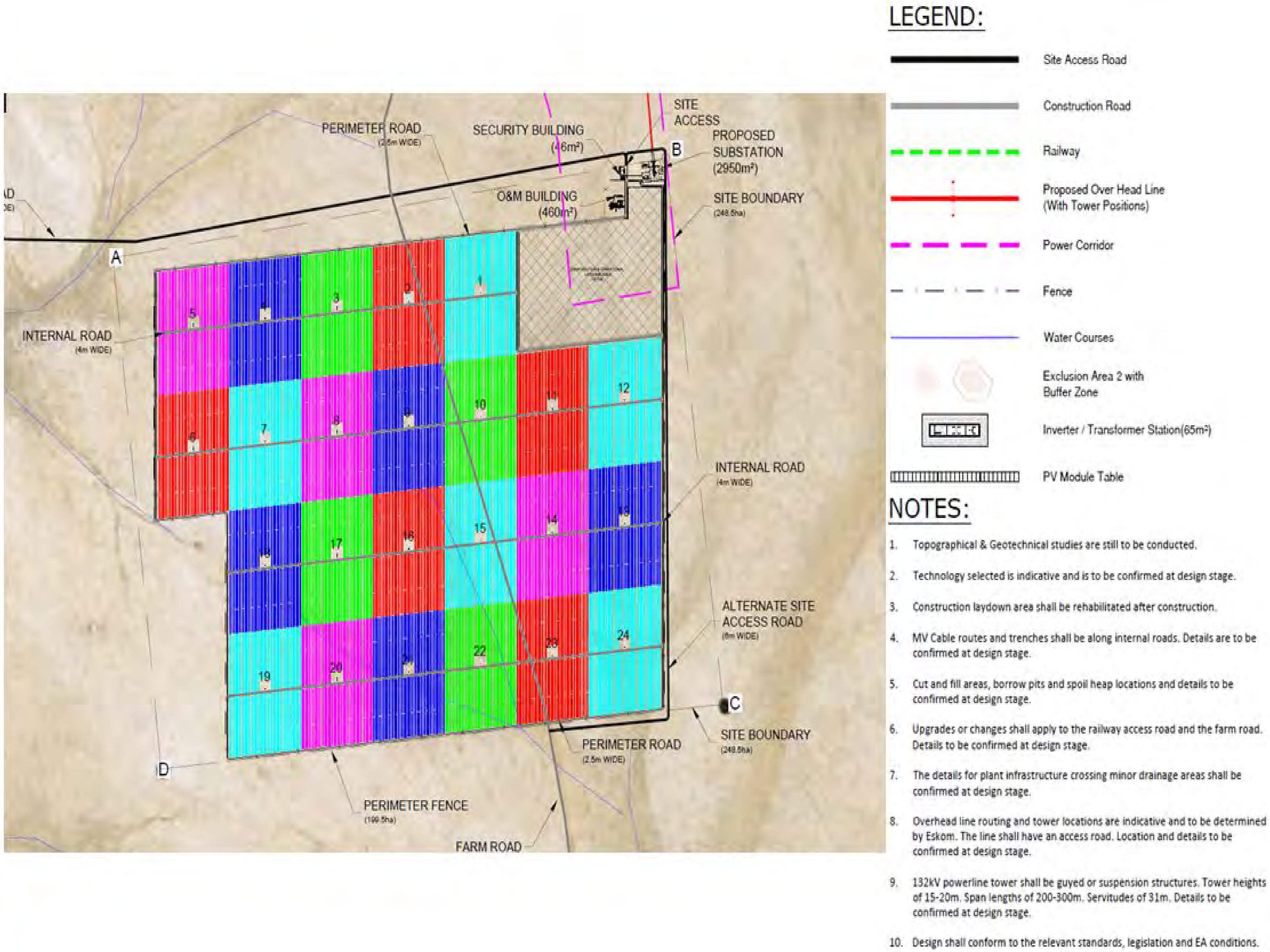

Figure 16.3: Preliminary Site Layout Plan

16.6 PERMITS AND LICENSES REQUIRED

16.6.1 NEMA and 2014 NEMA EIA Regulations

Before clearing of the proposed site is initiated, an EA must be granted by the DEA in terms of the NEMA and associated 2014 NEMA EIA Regulations. This report has been has been compiled to provide the DEA with the information required in order to make an informed decision on whether to grant or reject EA.

16.6.2 Permit in terms of the National Water Act (Act 36 of 1998)

The National Water Act (Act 36 of 1998) controls activities in and around water resources, as well as the general management of water resources, including abstraction of groundwater and disposal of water. As noted in Chapter 4 of this EIA Report, Section 21 of the Act lists the following water uses that need to be licensed:

a) taking water from a water resource;
b) storing water;
c) impeding or diverting the flow of water in a watercourse;
d) engaging in a stream flow reduction activity contemplated in section 36;
e) engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);
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 in any 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 the efficient continuation of an activity or for the safety of people; and
k) using water for recreational purposes.

The Ecological Impact Assessment states that authorisation for changes in land use up to 500 m from a defined water resource/wetland system will require an application for a Water Use Licence from the DWS. A Water Use Licence will be required in respect of the proposed development under Section 21 (c) and (i) of the Act, however such licence should not preclude this development. The DWS will be consulted with during the EIA Process to confirm the need for a WUL, as well as to seek comment on the proposed project.

16.6.3 Permit in terms of the National Forest Act (Act 84 of 1998)

The Ecological Impact Assessment notes that the National Forest Act (Act 84 of 1998) governs the removal, disturbance, cutting or damage and destruction of identified “protected trees”. Listed species that may be encountered with the site include Boscia spp and possibly *Acacia erioloba*. The assessment also notes that it is unlikely that an application for the “clearing of a natural forest”, as defined within the Act, will be required on the site.

The absence or presence of these species will be confirmed as part of the plant rescue and protection plan and should any species be present and determined that they will be impacted on, permits will be obtained from DAFF.

16.6.4 Permit in terms of the Northern Cape Nature Conservation Act (Act 9 of 2009)

The Ecological Impact Assessment notes that the Northern Cape Conservation Act (Act 9 of 2009) under its pertinent regulation governs the disturbance of species, or possibly other species not yet identified on site. A permit from the Provincial Department of Environment and Nature Conservation (DENC) will be required in order to disturb or translocate such species. The absence or presence of these species will be confirmed as part of the plant rescue and protection plan and should any species be present and determined that they will be impacted on, permits will be obtained from DENC.

16.6.5 Permit in terms of the National Heritage Resources Act (Act 25 of 1999) (NHRA)

Neither the Heritage Impact Assessment nor the Palaeontological Impact Assessment indicated that permits would be required at this stage.

As noted in the Heritage Impact Assessment (Chapter 9 of the EIA Report), the NHRA does not require the developer to obtain permits prior to construction. However, any archaeological mitigation work (i.e. test excavations, sampling etc.) that may be required (in the event of archaeological resources or graves of significance being found within the development footprint during construction) would need to be conducted under a permit issued to, and in the name of, the appointed archaeologist. The permit application process allows the heritage authorities to ensure that a suitably qualified and experienced archaeologist undertakes the work and that the proposed excavation/sampling methodology is acceptable. It should be noted that at this stage, a permit is not required as the grave identified within the larger 450 ha surveyed area is excluded from the development footprint and proposed layout.

In terms of palaeontology (as noted in the Palaeontological Impact Assessment (Chapter 10 of the EIA Report)), where palaeontological mitigation is required in the event of any fossil material found on site during construction, the palaeontologist concerned with mitigation work would need a valid fossil collection permit from SAHRA and any material collected would have to be curated in an approved depository (e.g. museum or university collection). All palaeontological specialist work should conform to international best practice for palaeontological fieldwork and the study (e.g. data recording fossil collection and curation, final report) should adhere as far as possible to the minimum standards for Phase 2 palaeontological studies recently developed by SAHRA (2013).

16.6.6 Astronomy Geographic Advantage (Act 21 of 2007)

As mentioned previously EMI and RFI studies have been undertaken and commissioned by the Project Applicant to determine appropriate mitigation and management measures to reduce the risk of a detrimental impact on the SKA project. This technical report, compiled by MESA Solutions (PTY) Ltd, is included in Appendix K of this EIA Report, with a summary provided in Chapter 15. The SKA Project Office will review this report during the 30 day review period and will provide any recommendations. The mitigation of all risk associated with RFI on the SKA must be confirmed by measurement following construction to the satisfaction of the SKA Office. Should the risk of radio interference still exist, based on measurements, further mitigation methods must be implemented to remove outstanding risk of radio frequency interference. Scatec has confirmed that this will be undertaken, should this project receive preferred bidder status.

16.7 OVERALL EVALUATION OF IMPACTS BY THE EAP

Based on the findings of the specialist studies, which all recommend that the proposed project can proceed and should be authorised by the DEA, the proposed project is considered to have an overall low negative environmental impact and an overall moderate positive socio-economic impact (with the implementation of respective mitigation and enhancement measures).

The proposed project will take place within the Development Envelope, as discussed in Section 16.5 of this chapter. The location of the approximately 250 ha PV facility within the assessed Development Envelope, as shown in Figure 16.3, will avoid the sensitive ecological and heritage features identified by the respective specialists.

In accordance with the Guideline on Need and Desirability (GN 891 of 2014), this EIA considered the nature, scale and location of the development as well as the wise use of land (i.e. is this the right time and place for the development of this proposed project). When considering the timing of this project, the IRP2010 proposes to secure 17 800 MW of renewable energy capacity by 2030. As noted in the preceding chapters of this EIA Report, in August 2011, the DOE launched the REIPPPP and invited potential IPPs to submit proposals for the financing, construction, operation and maintenance of the first 3 725 MW of various renewable energy project (including solar and wind) and it is the Project Applicant's intention to bid this project (along with Kenhardt PV 1 and PV 2) in the Round 5 bidding process.

On a provincial level, the Northern Cape Province is currently facing considerable constraints in the availability and stability of electricity supply. This is a consequence of South Africa's electricity generation and supply system being overstretched, and the reliance of the Northern Cape, as many other South African provinces, on the import of power to service its energy needs. The development of solar energy is important for South Africa to reduce its overall environmental footprint from power generation (including externality costs), and thereby to steer the country on a pathway towards sustainability. On a municipal planning level, the proposed project does not go against any of the objectives set within the !Kheis Municipality draft IDP 2012-2017. The proposed project will be in line with and will be supportive of the IDP's objective of creating more job opportunities. The proposed solar energy facility will assist in local job creation during the construction and operation phases of the project (if approved by the DEA). It should however be noted that employment during construction phase will be temporary. During the operational phase of the project (estimated to be more 20 years), long-term employment opportunities will be created.

The locality of the proposed project will fall within an area that has already been transformed due to the presence of the Sishen-Saldanha ore line, the Eskom Nieuwehoop Substation and Eskom transmission lines that will be constructed within this area. The locality of this project would not have a significant ("high") impact on any sensitive viewers (as determined in the Visual Impact Assessment included in Chapter 8 of this EIA Report), will not significantly negatively impact on any environmental features (as discussed above), and will have a very low significance negative impact on the current agricultural land use of the site.

Section 24 of the Constitutional Act 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 prevents pollution and ecological degradation; promotes conservation; and secures ecologically sustainable development and use of natural resources while promoting justifiable economic and social development". Based on this, this EIA was undertaken to ensure that these principles are met through the inclusion of appropriate management and mitigation measures and monitoring requirements. These measures will be undertaken to promote conservation by avoiding the sensitive environmental features present on site (as shown in Figures 16.2 and 16.3) and through appropriate monitoring and management plans included in the EMPr (Part B of the EIA Report).

The outcomes of this project therefore succeeds in meeting the environmental management objectives of protecting the ecologically sensitive areas and supporting sustainable development and the use of natural resources, whilst promoting justifiable socio-economic development in the towns nearest to the project site. The findings of this EIA show that all natural resources will be used in a sustainable manner (i.e. this project is a renewable energy project and the majority of the negative site specific and cumulative environmental impacts are considered to be of low significance with mitigation measures implemented), while the benefits from the project will promote justifiable economic and social development.

In order to ensure the effective implementation of the mitigation and management actions, an EMPr has been compiled and is included in Part B of this EIA Report. The mitigation measures necessary to ensure that the project is planned, constructed, operated and decommissioned in an environmentally responsible manner are listed in this EMPr. The EMPr is a dynamic document that should be updated regularly and provide clear and implementable measures for the establishment and operation of the proposed Solar PV facility.

Taking into consideration the findings of the EIA Process and given the national and provincial strategic requirements for infrastructure development, it is the opinion of the EAP that the project benefits outweigh the costs and that the project will make a positive contribution to steering South Africa on a pathway towards sustainable infrastructure development. Provided that the specified mitigation measures are applied effectively, it is recommended that the project receive EA in terms of the 2014 EIA Regulations promulgated under the NEMA.

EIA REPORT

CHAPTER 17:
References

Scoping and **Environmental Impact Assessment** for the Proposed Development of a 75 MW Solar Photovoltaic Facility (KENHARDT PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape Province

contents

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