ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

PROPOSED ESTABLISHMENT OF THE ILANGA CSP 7 PROJECT, NEAR UPINGTON, NORTHERN CAPE PROVINCE

COMMENT PERIOD:
08 July 2016 -08 August 2016

Prepared for:

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PROJECT DETAILS

Title	:	Environmental Impact Assessment Process Draft Environmental Impact Assessment Report for the proposed establishment of the Ilanga CSP 7 Project, Near Upington, Northern Cape Province
DEA Reference No.	:	N/A
Authors	:	Savannah Environmental (Pty) Ltd Jo-Anne Thomas Tebogo Mapinga Gabriele Wood
Sub-consultants	:	» Savannah Environmental » Simon Todd Consulting » Bird and Bat Unlimited Environmental Consultants » HCAC Heritage Consultants » Natura Viva cc » Afzelia Environmental Consultants & Environmental Planning and Design » Biodiversity company
Applicant	:	Emvelo Holdings (Pty) Ltd
Report Status	:	Draft Environmental Impact Assessment Report for public review

When used as a reference this report should be cited as: Savannah Environmental (2015) Draft Environmental Impact Assessment Report for the Proposed Ilanga CSP 7 near Upington, Northern Cape.

PURPOSE OF THIS DRAFT SCOPING REPORT

Emvelo Holdings (Pty) Ltd ("Emvelo"), an independent power developer of concentrating solar power (CSP) plants in South Africa, is proposing the development of a Concentrated Solar Power (CSP) Facility and associated infrastructure to form part of the Karoshoek Solar Valley Development located approximately 30 km east of Upington. The proposed site are located within the //Khara Hais Local Municipality and !Kheis Local Municipality, which fall within the jurisdiction of the greater Siyanda (ZF Mgcawu) District Municipality in the Northern Cape Province. The proposed project is to be known as the **Ilanga CSP 7** Project and is to make use of tower technology.

The project is being proposed in response to the requirement for additional electricity generation capacity at a national level and in response to identified objectives of the national and provincial government, and local and district municipalities to develop renewable energy facilities in this area. From a regional perspective, the greater Upington area is considered favourable for the development of concentrated solar power generating facilities by virtue of the prevailing climatic conditions (primarily as the economic viability of a concentrated solar power facility is directly dependent on the annual solar irradiation values for a particular area), relief and aspect, the extent of the site, and the availability of a direct grid connection (i.e. point of connection to the Eskom National grid). The area is designated as a Solar Corridor in terms of the Provincial Spatial Development Framework (PSDF) and has been classified as a Renewable Energy Development Zone (REDZ) for Solar Development (refer to Appendix O) through the Strategic Environmental Assessment (SEA) undertaken for renewable energy development by the Department of Environmental Affairs (DEA)[1].

It is the developer's intention to bid the Ilanga CSP 7 Project under the Department of Energy's (DoE) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme. The power generated from the Ilanga CSP 7 Project will be sold to Eskom and will feed into the national electricity grid. Ultimately, the project is intended to be a part of the renewable energy projects portfolio for South Africa, as contemplated in the Integrated Resource Plan 2030.

The nature and extent of the proposed facility, as well as potential environmental impacts associated with the construction, operation and decommissioning phases of a facility of this nature are explored in detail in this Environmental Impact Assessment Report. Site specific environmental issues are considered within specialist studies in order to test the environmental suitability of the site for the proposed development, delineate areas of sensitivity within the site, and

[1] It must be noted that the REDZ are expected to be promulgated in mid - 2016.

ultimately inform the placement of parabolic troughs and associated infrastructure on the site.

This EIA Report consists of 9 sections:

» **Chapter 1** provides background to the Project and the environmental impact assessment.
» **Chapter 2** provides the project description, need and desirability, site selection information and identified project alternatives.
» **Chapter 3** outlines the strategic legal context for the energy planning and the Project.
» **Chapter 4** outlines the approach to undertaking the environmental impact assessment process.
» **Chapter 5** describes the existing biophysical and socio-economic environment within and surrounding the Project development footprint.
» **Chapter 6** provides an assessment of the potential issues and impacts associated with the Project and presents recommendations for mitigation of significant impacts.
» **Chapter 7** provides an assessment of cumulative impacts.
» **Chapter 8** presents the conclusions and recommendations based on the findings of the EIA.
» **Chapter 9** provides a list of reference material used to compile the EIA Report.

The Scoping Phase of the EIA process identified potential issues associated with the proposed project, and defined the extent of the studies required within the EIA Phase. The EIA Phase addresses those identified potential environmental impacts and benefits associated with all phases of the project including design, construction and operation, and recommends appropriate mitigation measures for potentially significant environmental impacts. The EIA report aims to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed project.

The release of a draft EIA Report provides stakeholders with an opportunity to verify that the issues they have raised to date have been captured and adequately considered within the study. The Final EIA Report will incorporate all issues and responses prior to submission to the National Department of Environmental Affairs (DEA), the decision-making authority for the project

LEGAL REQUIREMENTS IN TERMS OF THE EIA REGULATIONS

Savannah Environmental has compiled a table (refer to Table 1 below) which outlines the DEA requirements as outlined in the acceptance of the scoping report dated 22 April 2016, and where in the final EIR the requirements have been addressed within this report for ease of reference. The acceptance of the scoping report is included in **Appendix B.**

TABLE 1: INFORMATION REQUESTED BY DEA

NO.	INFORMATION REQUIREMENTS	CROSS REFERENCE IN THIS EIA REPORT
General		
	EIA Process to proceed in accordance with the tasks contemplated in EIA Regulations 2014	The EIA process was conducted in accordance with the 2014 EIA regulations, see chapter 4 for details.
	All comments and recommendations made by all stakeholders and Interested and Affected Parties (I&APs) in the draft SR and submitted as part of the final SR must be taken into consideration when preparing an Environmental Impact Assessment report (EIAr) in respect of the proposed development. Please ensure that all mitigation measures and recommendations in the specialist studies are addressed and included in the final EIAr and Environmental Management Programme (EMPr).	i. All comment received from I&APs are included in Appendix C. ii. All mitigation measure and recommendations in specialist reports forms part of the EIAr report Chapter 6 to 8, and the EMPr (Appendix K).
	Please ensure that comments from all relevant stakeholders are submitted to the Department with the final EIAr. This includes but is not limited to the Northern Cape Department of Environmental Affairs and Nature Conservation, the Department of Agriculture, Forestry and Fisheries (DAFF), the provincial Department of Agriculture, the South African Civil Aviation Authority (SACAA), SENTECH, the Department of Transport, the !Kheis Local Municipality, the District Municipality, the Department of Water and Sanitation (DWS), the South African National Roads Agency Limited (SANRAL), the South African Heritage Resources Agency (SAHRA), the Endangered Wildlife Trust (EWT), BirdLife SA, the Department of Mineral Resources, the Department of Rural Development and Land Reform, the Department of Environmental Affairs: Directorate Biodiversity and Conservation, and the Square Kilometre Array (SKA).	"Listed in Chapter 4; and Appendix C includes all comments received so far - some comments to be included with EIR in cases where comment has not yet been received"

NO.	INFORMATION REQUIREMENTS	CROSS REFERENCE IN THIS EIA REPORT
	Ensure that EIAr and EMPr comply with Appendix 3 and Appendix 4 of the EIA Regulations, 2014 before submission to the Department.	The EIAr and EMPr comply with Appendix 3 and Appendix 4 of 2014 Regulations.
	You are also required to address all issues raised by Organs of State and I&APs prior to the submission of the EIAr to the Department.	All issues raised by organs of state and I&APs have been addressed in the comments and responses and included in Appendix C.
	Proof of correspondence with the various stakeholders must be included in the EIAr. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments.	Proof the attempts were made to obtain comments is included in Appendix C in cases where no comment could be obtained.
	The EAP must, in order to give effect to Regulation 8, give registered I&APs access to, and an opportunity to comment on the report in writing within 30 days before submitting the final EIAr to the Department. In addition, the following additional information is required for the EIAr:	Comment noted, the report will be available for public review from 8 July – 8 August 2016.
i.	Detailed motivation and reasons on the applicability of Activity 14 of GN R.983. Provide impacts, and any specialist study to assess the impacts for these activities in the draft EIAr.	In terms of Activity 6- A water use license will be required for the discharge of wastewater to the evaporation dams. In terms of Activity 4- The facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good will be required. The storage containers will have a combined capacity of 80 but not exceeding 500 cubic metres. The application form will be revised and resubmitted with the FEIAR. The impact associated with activity 4 and 6 have been assessed in Chapter 6 of this report.
ii	GN R. 983 Activity 19: With regards to infilling and excavation of watercourses for the CSP energy	The facility and/or associated infrastructure will

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	facility, this Department requires the applicant to provide an indication of the preferred and alternate locations from which 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 activity must be adequately assessed in the EIAr.	require the infilling or depositing of any material of more than 5 cubic metres into, or the excavation or moving of soil or rock of more than 5 cubic metres from a watercourse (ephemeral drainage lines). Excavated material will be sourced from the site. The impacts associated with Item 19 have been assessed in Chapter 6 of this report.
iii	Draft EIAr must provide an assessment of the impacts and mitigation measures for each of the listed activities applied for.	Draft EIAr provides an assessment of the impacts and mitigation measures for each of the listed activities applied for in Chapter 6.
iv	The listed activities represented in the EIAr and the application form must be the same and correct.	Comment noted. The application form will be amended if required and submitted with the final EIAr.
v	It is noted that no activity under GN R 985 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 from the relevant competent authority must be obtained and submitted to this Department. In addition, a graphical representation of the proposed development within the respective geographical areas and assessment of the significance of impacts on these areas must be provided.	
vi	The EIAr must provide the technical details for the proposed facility in a table format as well as their description and/or dimensions. A sample for the minimum information required is listed under point 2 of the EIA information required for CSP facilities below.	The EIAr provides the technical details for the proposed facility in a table format as well as their description and/or dimensions- refer to Chapter 2 Section 2.1.
vii	The EIAr must provide the four corner coordinate points for the proposed development site (note that if the site has numerous bend points, at each bend point coordinates must be provided) as well as the start, middle and end point of all linear activities.	The corner coordinate points for the proposed development site have been included in Table 2.1 in Chapter 2 of this report.

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viii	The EIAr must provide the following: » Clear indication of the envisioned area for the proposed CSP facility; placing of power tower, heliostats and all associated infrastructure should be mapped at an appropriate scale. » Clear description of all associated infrastructure.	The EIAr provides a clear indication of the envisioned area for the proposed concentrated solar power facility and a description of all associated infrastructure.
ix	This Department requires comments from the South African SKA Project Office to be included in the EIAr.	All comments received can be found in Appendix C.
x	The Department requires that an off-set be negotiated between the Northern Cape Department of Environment and Nature Conservation and the Department of Agriculture, Forestry and Fisheries. The offset must investigate and assess the cumulative loss of species from all eight facilities, and must be finalised, agreed to and included within the draft EIAr.	The project developer plans to implement greening initiatives that will empower local communities by creating potential income streams for communities. Where required, an offset will be provided to compensate for loss of vegetation. This will be implemented in consultation with DAFF and DENC in order to meet their specific requirements in this regard.
xi	The following specialist studies have been identified to be conducted as part of the environmental impact assessment reports: » Ecological study; » Avifaunal impact assessment; » Aquatic assessment; » Hydrology and hydraulic assessment; » Heritage impact assessment; » Visual impact assessment; » Cumulative impact study; and » Traffic impact assessment.	
xii	This Department requires comments from the Department of Water and Sanitation, from the Impact Management and Resource Management Directorates to be included in the EIAr.	All comments received can be found in Appendix C.
xiii	The terms of reference for the hydrological study appended to the SR extensively describes the surface aquatic state of the Orange River, but does not describe the surface aquatic state of the property affected by the proposed development. The terms of reference must comply with comment x of the Department's comments on the draft scoping report	

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	dated 29 February 2016.	
xiv	It is imperative that a reliable water source is secured for the success of this project. The Department requests proof of availability of water for the facility from the relevant authority.	The Department of Water and Sanitation (DWS) has been requested to provide an indication that water could be available from the Orange River for the project. This confirmation was still outstanding at the time of compiling this report.
xv	The EIAr must adequately assess and provide a comparative analysis for alternative water sources for the proposed development. The preferred water source alternative must further motivate the preferred technology choice for the facility.	A comparative analysis for alternative water sources and further motivate the preferred technology choice for the facility has been addressed in Chapter 2 section 2.3 of this report.
xvi	A cumulative assessment must be undertaken for the sourcing of water as there are numerous other facilities in the region.	A water resource report considering the proposed abstraction of water from the Orange River forms part of the report- refer to Appendix F.
xvii	Should a water abstraction point in the Orange River and a pipeline to pipe the water to the facility must be required, the impact of these must be assessed.	The impacts of a water abstraction point in the Orange River have been assessed in Chapter 6 and Appendix F of this report and a pipeline to pipe the water to the facility will be assessed in a separate BA process.
xviii	A cumulative assessment must be undertaken to assess the cumulative loss of agricultural land from eight facilities.	
xix	The following amendments must be made to the terms of references for the specialist studies: » Ecology o Site inspection to assess the site and in particular, the areas that are identified as potential risk areas. The site inspection must also gather the necessary information relating to the status of the drainage features (natural and man-made) and existing water storage	

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	facilities on site. o The ecological study must assess the viability of an off-set as required by DAFF and DENC and must be submitted to this Department for approval before the submission of the draft EIAr. » Avifaunal: The terms of reference for the avifaunal study must comply with condition xvi of the Department's comments on the draft scoping report dated 29 February 2016. » Social impact assessment: the terms of reference must indicate plans for social upliftment projects. These plans must be identified in consultation with the relevant local municipality department. » Traffic impact management: A significant amount of materials and equipment will be delivered to the site during the construction phase of the development and will thus have impacts on the environment. The impacts of this activity must be fully identified and assessed. A traffic impact assessment must form part of the EIAr and the terms of reference must include, inter alia the following: o Evaluate the impacts of the proposed development on existing road network and traffic volumes. The study must determine the specific traffic needs during the different phases of implementation, namely facility construction and installation, operation and decommissioning. o Identy the position and suitability of the preferred access road alternative. o Evaluate the roadway capacity of the road network. o Confirm the associated clearances required for the necessary equipment to be transported from the point of delivery to the various sites. o Confirm freight and transport requirements during construction, operation and maintenance. o Propose origins and detinations of equipment. o Determine (Abnormal) Permit requirements if any.	

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xx	Should in-house specialists be used for any specialist study, then the specialist study must be peer reviewed by external specialists. The format of the peer-review must address the following: » Acceptability of the ToRs; » Is the methodology clearly explained and acceptable? » Evaluate the validity of the findings (review data evidence); » Discuss the mitigation measures and recommendations; » Evaluate the appropriateness of the reference literature; » Is the article well-written and easy to understand? And » Identify any short comings.	The Social Assessment conducted by Candice Hunter of Savannah Environmental was peer reviewed by an external reviewer - Neville Bews. Refer to Appendix G-1 of this report.
xxi	The EIAr must also include a comments and response report in accordance with Appendix 2 h (iii) of the EIA Regulations, 2014.	The EIAr also includes a comment and response report in accordance with Appendix 2h (ii) of the EIA Regulations, 2014 - refer to Appendix C of this report.
xxii	The EIAr must include the detail inclusive of the PPP in accordance with Regulation 41 of the EIA Regulations.	The EIAr also includes the detailed inclusive of the PPP in Accordance with Regulation 41 of the EIA Regulation- refer to Appendix C of this report.
xxiii	Details of the future plans for the site and infrastructure after decommissioning in 20-30 years and the possibility of upgrading the proposed infrastructure to more advanced technologies.	Future plans for the site and infrastructure after decommissioning in 20-30 years and the possibility of upgrading the proposed infrastructure to more advanced technologies have been included in Chapter 2 Section 2.5.
xxiv	Information on services required on the site, e.g. sewage, refuse removal, water and electricity. Who will supply these services and has an agreement and confirmation of capacity been obtained? Proof of these agreements must be provided.	Information on services required on the site has been included Chapter 2 of this report.
xxv	The EIAr must provide a detailed description of the need and desirability, not only providing motivation	The ElAr provides a detailed description of the need and

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	on the need for clean energy in South Africa of the proposed activity. The need and desirability must also indicate if the proposed development is needed in the region and if the current proposed location is desirable for the proposed activity compared to other sites.	desirability - refer to Chapter 2.
xxvi	A copy of the final site layout map and alternatives. All available biodiversity information must be used in the finalisation of the layout map. Existing infrastructure must be used as far as possible e.g. roads. The layout map must indicate the following: » Power tower and heliostats positions and its associated infrastructure; » Positions of the power island, steam turbine and generator, molten slat storage tanks, water storage reservoir and tanks, lined evaporations ponds and water supply pipeline; » Permanent laydown area footprint; » Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible); » Wetlands, drainage lines, rivers, stream and water crossing of roads and cables indicating the type of bridging structures that will be used; » The location of sensitive environmental features on site e.g. CBAs, heritage sites, wetlands, drainage line etc. that will be affected by the facility and its associated infrastructure; » Substation(s) and/or transformer(s) sites including their entire footprint; » Connection routes (including pylon positions) to the distribution/transmission network; » All existing infrastructure on the site, especially roads; » Buffer areas; » Buildings, including accommodation; and » All "no-go" areas.	A copy of the final site layout map is included in Appendix N (A3 Maps) of this report. It must be noted that this design is subject to change dependent on the specifications of the project awarded by the Department of Energy through the REIPPP Programme. Therefore, the EIAr includes a recommendation for a final layout to be submitted to the DEA for approval prior to construction.
xxvii	An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.	An environmental sensitivity map indicating environmental sensitive areas and features identified during the ElA process is included in Appendix N (A3 Maps) of this report.

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xxviii	A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.	The Final site layout map superimposed (overlain) on the environmental sensitivity map has been included in Appendix N.
xxix	A shapefile of the preferred development layout/footprint must be submitted to this Department. The shapefile must be created using the Hartebeesthoek 94 Datum and the data should be in Decimal Degree Format using the WGS 84 Spheroid. The shapefile must include at a minimum the following extensions i.e. .shp; .shx; dbf; prj. and .xml (Metadata file). If specific symbology was assigned to the file, then the .avl and/or the .lyr file must also be included. Data must be mapped at a scale of 1:10 000 (please specify if an alternative scale was used). The metadata must include a description of the base data used for digitizing. The shapefile must be submitted in a zip file using the EIA application reference number as the title.	The required information will be Included on a CD on submission of the FEIR.
ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)		
i	All recommendations and mitigation measures recorded in the ElAr and the specialist studies conducted	All recommendations and mitigation measures recorded in the ElAr and the specialist studies conducted have been included in the EMPr (refer to Appendix M).
ii	The final site layout map.	The final site layout map has been included in Appendix A of the EMPr.
iii	Measures as dictated by the final site layout map and micro-siting.	Refer Appendix A of the EMPr.
iv	An environmental sensitivity map indicating environmental sensitive areas and features identified during the ElA process.	An environmental sensitivity map indicating environmental sensitive areas and features identified during the ElA process have been included as Figure 3.3 in the EMPr (Refer to Appendix A of the EMPr).
v	A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.	A map combining the final layout map superimposed (overlain) on the environmental sensitivity

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		map as Figure 3.3 in the EMPr (Refer to Appendix A of the EMPr).
vi	An alien invasive management plan to be implemented during construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken.	An alien invasive management plan has been compiled and is included in Appendix E of the EMPr.
vii	A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialist familiar with the site and be implemented prior to commencement of the construction phase.	A plant rescue and protection plan has been compiled and is included in Appendix G of the EMPr.
viii	A re-vegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.	A re-vegetation and habitat rehabilitation plan has been compiled and is included in Appendix F of the EMPr.
ix	An open space management plan to be implemented during the construction and operation of the facility.	An open space management plan has been compiled and is included in Appendix E of the EMPr.
x	A traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimize impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.	A traffic management plan has been compiled and is included in Appendix H of the EMPr.
xi	A storm management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface	A storm water management plan has been compiled and is included in Appendix I of the EMPr.

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	flows. Drainage measures must promote the dissipation of storm water run-off.	
xii	A fire management plan to be implemented during the construction and operation of the facility.	An Emergency Preparedness and Response Plan which addresses fire management has been compiled and is included in Appendix K of the EMPr.
xiii	An erosion management plan for monitoring and rehabilitating erosion events associated with the facility. Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.	An erosion management plan has been compiled and is included in Appendix J of the EMPr
xiv	An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems.	An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling use and storage has been addressed in Objective 13, Section 5.2 of the EMPr. An Emergency Preparedness and Response Plan which addresses spill management has been compiled and included in Appendix K of the EMPr.
xv	Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants.	Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants have been addressed in Objective 8, Section 5.2 of the EMPr. An Emergency Preparedness and Response Plan which addresses spill management has been compiled and included in Appendix K of the EMPr.

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xvi	The EAP must provide detailed motivation if any of the above requirements is not required by the proposed development and not included in the EMP.	All requirements listed above have formed part of the EMPr (refer to Appendix K).
xvii	The EAP must provide the final detailed Site Layout Plan as well as the final EMPr for approval with the final EIAr as this Department needs to make a decision on the EA, EMPr and Layout Plan.	The detailed Site Layout Plan as well as the EMPr form part of this EIAr and will be submitted to the competent authority for approval together with the final EIAr.
xviii	The EIAr must include a cumulative impact assessment of the facility since there are other similar facilities in and around the proposed site as well as in the region. The specialist studies as outlined in the PoSEIA which is incorporated as part of the SR must also assess the facility in terms of potential cumulative impacts.	The EIAr includes the assessment of cumulative impacts- refer to Chapter 7 of this report as well as specialist reports contained within Appendix D - J.
xix	Please ensure that all the relevant Listing Notice activities are applied for, that the Listing Notice activities applied for are specific and that they can be linked to the development activity or infrastructure in the project description.	All the relevant Listing Notice activities have been applied for and the Listing Notice activities applied for are specific and they are linked to the development activity or infrastructure in the project description. Refer to Chapter 4 and Chapter 7.
xx	The applicant is hereby reminded to comply with the requirements of Regulation 45 with regard to the time period allowed for complying with the requirements of the Regulations, and Regulations 43 and 44 with regard to the allowance of a comment period for interested and affected parties on all reports submitted to the competent authority for decision-making.	Comment noted.
xxi	Furthermore, it must be reiterated that, should an application for Environmental Authorisation be subject to the provisions of Chapter ll, Section 38 of the National Heritage Resources Act, Act 25 of 1999, then this Department will not be able to make nor issue a decision in terms of your application for Environmental Authorisation pending a letter from the pertinent heritage authority categorically stating that the application fulfils the requirements of the	Comment noted. A Heritage Impact Assessment has been undertaken (refer to Appendix G). Comment on this report has been requested from SAHRA. Any comments received from SAHRA will be provided to the DEA for consideration in

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	relevant heritage resources authority as described in Chapter ll, Section 38(8) of the National Heritage Resources Act, Act 25 of 1999. Authority as described in Chapter ll, Section 38(8) of the National Heritage Resources Act, Act 25 of 1999.	the decision-making process.
xxii	You are requested to submit two (2) electronic copies (CD/DVD and two (2) hard copies of the Environmental impact Report (ElAr) to the Department.	Comment noted Two (2) electronic copies and 2 hard copies have been submitted to the DEA.

INVITATION TO COMMENT ON THE DRAFT ENVIRONMIMPACT ASSESSMENT REPORT

This **Environmental Impact Assessment Report (EIAr)** has been made available for public review at the following places, which lie in the vicinity of the proposed project area from **08 July 2016 – 08 August 2016:**

- » Khara Hais (Upington) Public Library (Market Street)
- » !Kheis Local Municipal Offices (Oranje Street)

The report is also available for download on:

- » www.savannahSA.com

Please submit your comments to
Gabriele of **Savannah Environmental** PO Box 148, Sunninghill, 2157 Tel: 011 656 3237 Fax: 086 684 0547 Email: gabriele@savannahsa.com
The due date for comments on the Draft Scoping Report is **08 August 2016**

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

EXECUTIVE SUMMARY

Background and Project Overview

Emvelo Holdings (Pty) Ltd ("Emvelo"), an independent power developer of concentrating solar power (CSP) plants in South Africa, is proposing the development of a Concentrated Solar Power (CSP) Facility and associated infrastructure to form part of the Karoshoek Solar Valley Development located approximately 30 km east of Upington. The proposed site are located within the //Khara Hais Local Municipality and !Kheis Local Municipality, which fall within the jurisdiction of the greater Siyanda (ZF Mgcawu) District Municipality in the Northern Cape Province (refer to **Figure 1**). The proposed project is to be known as the **Ilanga CSP 7** Project and is to make use of tower technology. The Ilanga CSP 7 Project is proposed to generate up to 150MW in capacity and will be constructed over an area of approximately 1000 ha in extent within the broader property.

The **Ilanga CSP 7** Project under investigation through this Draft Scoping Report is proposed to generate up to 150MW in capacity and will be constructed over an area of approximately 1519.19 ha in extent within the broader property.

The project is proposed to be developed on Portion 2 of the Farm Matjiesrivier 41 and Portion 4 of the Farm Trooilaps Pan 53, located approximately 30 km east of Upington within the Khara Hais Local Municipality (ZF Mgcawu (previously Siyanda) District Municipality) in the Northern Cape.

The Ilanga CSP 7 Facility is proposed to utilise the solar tower and heliostats technology, using superheated steam, with a generation capacity of up to 150MW. The Ilanga CSP 7 Project will consist of a field of heliostats and a central receiver, known as a power tower. On-site storage using molten salts is proposed to extend the operating time of the facility into the night.

The following associated infrastructure will also be required for the proposed project:

- Central tower up to 270m with a molten salt receiver on top of the tower.
- Waste management infrastructure including evaporation dams and a wastewater treatment facility.
- Access roads[2] to the site and internal access roads;
- On-site substation and associated 132kV power line linking the facility to the Karoshoek Solar Valley substation or to the national electricity grid;
- Karoshoek Solar Valley substation and associated power lines 132 – 400kV lines connecting to the National Grid

[2] Note that the associated linear infrastructure, i.e. access road to the site, power line infrastructure and water supply pipeline will be assessed through a separate Basic Assessment process.

- A water supply pipeline from the Orange River (including water treatment and storage reservoirs);
- Operational buildings, including offices and workshops.
- The solar collector field consisting of heliostats, all systems and infrastructure related to the control and operation of the heliostats;
- The power block/power island comprising of a conventional steam turbine generator with an ACC and associated feed water system;
- Molten Salt Circuit which includes the thermal storage tanks for storing low and high temperature liquid salt, a central solar thermal tower receiver, pipelines and molten salt to steam heat exchangers; and
- Auxiliary facilities and infrastructure consisting of the switch yard, step up transformers, up to 132 kV power evacuation lines, access routes, water supplies and facility start up generators.

The following infrastructure will be **shared infrastructure** for all the proposed projects within the Karoshoek Solar Valley Development. This infrastructure is to be assessed within a separate Basic Assessment process:

- On-site substation and associated 132kV power line linking the facility to the national electricity grid;
- Access roads (main access roads within the property boundary); and
- A water pipeline from the Orange River (including abstraction point, water pre-treatment and storage reservoirs).

The project is being proposed in response to the requirement for additional electricity generation capacity at a national level and in response to identified objectives of the national and provincial government, and local and district municipalities to develop renewable energy facilities in this area. From a regional perspective, the greater Upington area is considered favourable for the development of concentrated solar power generating facilities by virtue of the prevailing climatic conditions (primarily as the economic viability of a concentrated solar power facility is directly dependent on the annual solar irradiation values for a particular area), relief and aspect, the extent of the site, and the availability of a direct grid connection (i.e. point of connection to the Eskom National grid). The area is designated as a Solar Corridor in terms of the Provincial Spatial Development Framework (PSDF) and has been classified as a Renewable Energy Development Zone (REDZ) for Solar Development (refer to Appendix O) through the Strategic Environmental Assessment (SEA) undertaken for renewable energy development by the Department of Environmental Affairs (DEA)[3].

[3] It must be noted that the REDZ are expected to be promulgated in mid - 2016.

It is the developer's intention to bid the Ilanga CSP 7 Project under the Department of Energy's (DoE) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme. The power generated from the Ilanga CSP 7 Project will be sold to Eskom and will feed into the national electricity grid. Ultimately, the project is intended to be a part of the renewable energy projects portfolio for South Africa, as contemplated in the Integrated Resource Plan 2030.

Evaluation of the Proposed Project

The preceding chapters of this report together with the specialist studies contained within **Appendices D – L** provide a detailed assessment of the environmental impacts that may result from the proposed project. This chapter concludes the EIA Report by providing a summary of the conclusions of the assessment of the proposed development area for the Ilanga CSP 9 Facility and the associated infrastructure. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental team during the course of the EIA and presents an informed opinion of the environmental impacts associated with the proposed project.

The assessment of potential environmental impacts presented in this report is based on a preliminary layout of the troughs and associated infrastructure provided by Emvelo Holdings (Pty) Ltd. A broader project site of approximately 11 173 ha is being considered, within which the development footprint for the proposed Ilanga CSP 7 Project of approximately 1000 ha in extent would be appropriately located. It is anticipated that the project and its associated infrastructure (i.e. on-site substation and internal roads, etc.) can be appropriately positioned to avoid areas of environmental sensitivity. The environmental sensitivities (ecological and avifauna sensitivities) identified during the EIA phase have informed the layout of the proposed facility (refer to **Figure 2**).

No environmental fatal flaws were identified to be associated with the proposed facility. However the following potentially significant environmental impacts have been identified through the EIA Phase.

- Local site specific impacts resulting from the physical modification/disturbance of the site primarily during the construction phase.
- Impact on soil and agricultural potential.
- Impacts on avifauna.
- Impact on Bats.
- Impacts on water resources.
- Visual impacts.
- Impacts on the social environment.
- Cumulative impacts.

Local site-specific impacts

The Ilanga CSP Tower 7 site consists of open *Stipagrostis* grassland on flat open plains considered to be largely of low to moderate sensitivity. Within this habitat type there are few listed

or protected plant species present and the significance of impacts on vegetation within these areas would be low. The density of protected species, largely *Boscia albitrunca* is fairly high and a relatively large number would be affected by the development. Due to the homogenous nature of the habitat for fauna, faunal diversity is likely to be low and faunal species of concern are not likely to be abundant at the site. There are no features at the site considered to be very high sensitivity or present a no go area.

Due to the large amount of development proposed in the area, the development of the site will contribute to cumulative impact. However, the affected Bushmanland Arid Grassland vegetation type is extensive and the extent of habitat loss (ca. 1500ha) resulting from the development would not significantly impact the remaining extent of this vegetation type at the national level, although some local impact on this vegetation type is likely given the large extent of development within this vegetation unit within the broader Karoshoek solar development area. Consequently the impact of the development on the future conservation potential of the area is considered moderate at a local level and low at the national level.

There are no highly sensitive features within the development footprint and the abundance of *Boscia albitrunca* is identified as the only significant feature of the site. As the development of the site would certainly lead to the loss of several hundred individuals of this species, an offset for the loss within the current as well as the other Karoshoek developments should be investigated. However, this should take place in an integrated manner for all the Karoshoek developments and not on a piecemeal basis for each development and should consider the broader connectivity and landscape level processes in the area. Although the development would result in the loss of fairly large numbers of *Boscia*, this is not a rare or threatened tree species and the development would not compromise the local populations of this species which remains widespread in the area.

Overall, and with the suggested mitigation measures implemented, the impacts of the development are likely to be of moderate to low significance and no impacts of high significance are likely. As a result, there are no ecological fatal flaws or impacts that cannot be mitigated that should prevent the development from being approved.

Impacts on Avifauna

Potential impacts on avifauna as a result of the proposed project include displacement of nationally important species from their habitats by the presence of the heliostat mirrors, loss of habitats for such species due to direct habitat destruction, disturbance during construction of the array and

feather singeing, or direct mortality, if aerial birds fly through the solar flux.

From the monitoring undertaken on the site, the impact zone of the CSP Tower 7 site lies on the interface of Nama Karoo and Kalahari Savanna. Bird atlas data, combined with our own, indicates that the Karoshoek Solar Valley area supports up to 114 bird species, including 14 species ranked in the top 100 collision-prone species. Six of these species are also red-listed: Black Harrier *Circus maurus*, Lanner Falcon *Falco biarmicus,* Kori Bustard *Ardeotis kori,* Ludwig's Bustard *Neotis ludwigi*, Verreaux's Eagle *Aquila verreauxi* and Secretarybird *Saggitarius serpentarius.* Harriers, eagles and bustards are highly collision-prone species, and the raptors are highly aerial birds, and may be impacted the CSP solar flux. Similarly, the proximity to the Orange River may attract wetland species seeking other wetland areas, and cause mortality as birds attempt to land on the heliostats. In addition, resident birds will lose habitat totaling ~950 ha in the increased area.

Since the degree and significance of bird impacts will be related to the abundance and movements of key species, we calculated bird densities in the expanded site footprint and the passage rate of the collision-prone birds through the site. In total we recorded 30 species on the CSP Tower 7 site. Our 1 km surveys revealed a similar species richness of smaller birds in both the wet season and dry season (15.3 v 13.2 species km^{-1}).

The **Passage rate** of larger collision-prone birds was medium-low at 0.42 birds per hour of observation, and it was higher the wet season than the dry season. Two red-data bustards were recorded on site and two high-sensitivity areas were apparent on the CSP Tower 7 area. No wetland birds were seen. Sandgrouse regularly traversed the site (2.7 birds h^{-1}) in both seasons and those commuting at high levels are at risk from the solar flux. Some large Sociable Weaver nests were present on site, and displaced birds may attempt to build on the heliostat mirror infrastructure. This represents a high impact site, and medium-high with appropriate mitigation.

With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of avifaunal impacts of the Ilanga CSP 7 Facility are of moderate to low. The Ilanga CSP 7 Project can be developed and impacts on avifauna managed by taking the following into consideration:

» The CSP tower site avoid the two high sensitivity areas identified.
» Bird scaring techniques are used on the mirrors and the tower, including rotating prisms, avian distress calls and experimental use of Torri lines (ribbons used on trawlers to deter albatrosses from taking baited hooks and drowning), if birds are found to impact the CSP infrastructure.
» Systematic monitoring during construction and post-construction of the CSP facility is

recommended by trained ornithologists given the high probability of avian impacts at the CSP Tower 7 facility on collision-prone birds.

Impacts on Bats

Potential impacts on bats as a result of the proposed CSP Tower 1 Facility could include:

» Reductions in the extent of bat foraging and roosting habitat; and
» Mortality as a result of the interaction with the proposed infrastructure.

Impacts are expected to be limited as a result of the limited potential of the vegetation on the site to provide foraging and roosting habitat as well as a result of the proposed design of the facility.

As impacts of solar thermal facilities on bats is poorly understood, it is considered important to document any impacts which may be identified during operation. It is recommended that any bat carcasses recorded are also documented during operational bird monitoring and the cause of such mortality investigated by an appropriate specialist. As is proposed for the facility design, buildings housing steam condensers should be closed up thoroughly and have no overhanging roofs or overlapping sheets with holes of 1.5cm or more in diameter.

Impact of Soil and Agricultural Potential

The overall impacts of the proposed facility on agriculture and soil conditions will be low, principally because of the climatic conditions and the low agricultural and grazing potential of the site. The project site is currently used for livestock farming. However, the grazing capacity is very low (approximately 40-50 ha/large stock unit), which is due to the dominant climatic conditions and prevailing soil conditions. Rainfall is erratic, both locally and seasonally and therefore cannot be relied on for agricultural practices. Very low rainfall, along with other soil-related factors lead to low vegetative cover throughout the area. The area consist of shallow soil with rock outcrops and sandy soils and the whole site can be better utilised for development (such as power generation) in comparison to any other practise. This project site is not regarded as a viable commercial farming site and would be suited to house the facility.

There is the potential for the loss of soil resources through erosion, particularly during the construction phase. This impact can be effectively minimised through the implementation of appropriate management and mitigation measures including implementation of an appropriate stormwater management plan and regular monitoring of the occurrence, spread and potential cumulative effects of erosion. Impacts post-mitigation are expected to be of low significance.

Impacts on water resources

Impacts on water resources associated with the proposed facility relate largely to the abstraction of water from the Orange River System, as well as potential impacts on the water quality of the river due to sedimentation and/or contamination. Abstraction of water may result in modification of instream habitats which may in turn result in changes to the aquatic fauna and flora communities which includes species and ecosystems of conservation importance. The significance of potential impacts were rated as medium prior to implementation of mitigation measures. Potential mitigation measures include the careful management and re-use of process water thereby reducing the requirement for abstraction. A culture of water preservation should be developed and encouraged in the CSP facility. Implementation of the recommended mitigation measures will reduce the significance of the impact to low post-mitigation.

Visual impacts

The following potential visual receptors that have been identified include:

» A small number of homesteads that occur within the approximate limit of visibility of the heliostat field;
» A large number of homesteads and urban areas that could be affected by the power tower;
» Local road to the west (Kleinbegin and Kenhardt Roads) that could be affected by the heliostat field and the power tower;
» The N10 and N14 National roads to the north that could be affected by the power tower; and
» The FM Safaris ecotourism operation on the northern side of the Orange River.

The proposed project will have greatest impact on the Karoshoek Valley which is under development for similar projects. Outside the Karoshoek Valley where the majority of sensitive receivers are located impacts are likely to be low.

Within the Karoshoek Valley, the most critical sensitive receivers are likely to be residents of local homesteads. A small number of people are likely to be affected. Views over the development are unlikely to be possible due to the relative elevation of receivers. This means that the main impact will be a view of the tower set within a relatively natural landscape. Because of the relative elevation of receivers and the VAC of the surrounding landscape nuisance impacts such as glint and glare are unlikely and should be easily mitigated.

Given the changing character of the setting in which the development is proposed, the distances from the majority of sensitive receptors and the way in which surrounding landform helps to mitigate broader impacts, there is no reason on landscape and visual impact grounds why the proposed project should not be authorised.

Impacts on the social environment

The proposed development site is located within a rural setting and is removed from settlements and homesteads. Impacts on the social environment are expected during both the construction phase and the operation phase of the CSP facility. Impacts are expected at both a local and regional scale. Impacts on the social environment as a result of the construction of the CSP facility can be mitigated to impacts of low significance or can be enhanced to be of positive significance to the region.

Positive impacts associated with the project are largely due to job creation opportunities, business opportunities for local companies, skills development, and training. The proposed project could assist in alleviating poverty amongst some individuals in the study area through the provision of permanent employment opportunities. Should all proposed facilities within the Karoshoek Solar Valley Site be developed, the cumulative positive impacts would be of great value to the communities in the area.

The development of a renewable energy facility of this nature will have a positive impact at a national and international level through the generation of "green energy" which would lessen South Africa's dependency on coal generated energy and the impact of such energy sources on the bio-physical environment. The proposed project would fit in with the government's aim to implement renewable energy projects as part of the country's energy generation mix over the next 20 years as detailed in the Integrated Resource Plan (IRP).

Potential negative impacts which require mitigation relate to an influx of workers and jobseekers to an area (whether locals are employed or outsiders are employed) and an associated perceived risk of an increase in crime in the area, and traffic and intrusion influences during construction. As a limited number of workers are proposed to be housed on site, certain impacts could arise as a result of worker conduct at this site. Stringent mitigation is required to be implemented to reduce these impacts to acceptable levels.

Impacts on farming activities may occur as a result of the proposed development. However, due to the limited agricultural potential of the proposed development site, and the low rainfall in the area, the impact on agricultural potential as a result of the loss of land associated with the development is not expected to be significant. In fact, the proposed development may present opportunities for additional agriculture on the site and surrounds in that the water supply infrastructure could be utilised to transport water to irrigate crops within these areas. This would be a positive impact.

Assessment of Potential Cumulative Impacts

Based on the information available at the time of undertaking the EIA, there are at least 14 other facilities, 2 of

which are preferred bidder projects within a 30 km radius of the site all at various stages of approval. However, not all the CSP facilities presently under consideration by various developers will be constructed due to various reasons, as detailed in Chapter 7.

The cumulative impacts that have the potential to be compounded through the development of the CSP facility and its associated infrastructure in proximity to other similar developments include impacts such as those listed below. The role of the cumulative assessment is to test if such impacts are relevant to the Ilanga CSP 7 Project in the proposed location when considered together with other similar developments. The following can be concluded considering the Ilanga CSP 7 Project:

» The construction of the project will not result in the unacceptable loss of threatened or protected plant species. The proposed development is acceptable from an ecological perspective.
» The construction of the project will not result in unacceptable loss of or impact to the soil and agricultural potential in the area.
» Low risk to avifauna through loss of habitat, infringement on breeding areas, or risk to collision-prone species is expected.
» Low risk to bats through loss of habitat, infringement on roosting areas, or risk to fatalities is expected.
» The construction of the project will not result in the complete or whole-scale change in sense of place and character of the area nor will the project result in unacceptable visual intrusion. Two preferred bidder projects will be constructed in the area, which will create an existing impact and alteration to the current sense of place.
» The construction of the project will not result in unacceptable loss of or impact to heritage resources.
» The project will not significantly increase the negative impact on the social environment. However, an increase in positive impacts, specifically as a result of job creation and socio-economic benefits, can be expected.
» The project will contribute towards a reduction in greenhouse gas emissions from energy generation and will aid the country in meeting the commitments made under the COP 21 Agreement, to which the Government has committed to become a signatory.

Based on a detailed evaluation, the cumulative impacts associated with the construction and operation of the proposed Ilanga CSP Facility and other proposed renewable energy facilities in the region (with specific reference to the preferred bidder projects – Ilanga CSP 1 and the Upington Airport PV Solar Energy Facilities) are considered to be acceptable. The low potential for cumulative impacts and risks makes the location of this project within the REDZ a desirable location for further consideration provided that environmental impacts are mitigated to suitable standards as recommended

within this EIA Report. Cumulative impacts discussed above have been considered within **Chapter 7** and the detailed specialist studies (refer to **Appendices D - L**).

Environmental Sensitivity Mapping

From the specialist investigations undertaken for the proposed CSP Facility, a number of sensitive areas were identified (refer to **Figure 3** and the A3 map in **Appendix P**). The following sensitive areas/environmental features have been identified on the site:

» **Ecology:** The majority of the site consists of open plains considered to be medium-low sensitivity on account of the low abundance of species and habitats of concern within these areas. The main issue of concern within these areas is the abundance of *Boscia albitrunca* which has a moderately high density across the site. This species aside, the site is otherwise considered favourable for development as there are few other species or features of concern present. There is a limited area that receives some occasional runoff along the western margin of the site, but it has not developed into a drainage line and is considered only marginally more sensitive than the surrounding plains. The sensitivity of the site is very homogenous and overall it contains no significant features of higher sensitivity and there are no areas within the site that are considered no go or of very high sensitivity. Although there is a NFEPA river mapped through the site, the site visit confirms that this feature is not present on the ground and is not discernible on satellite imagery either.

» **Avifauna:** A total of 114 bird species were recorded on the 17 bird atlas cards from the Ilanga solar development and similar areas to the west (following the proposed Ilanga power line) submitted to the Animal Demography Unit from 2007 to 2014 (Appendix 1 of the Specialist Report). Of these, 8 were collision-prone as ranked by BARESG (2014), and only 2 were red-listed (Kori Bustard Ardeotis kori and Lanner Falcon Falco biarmicus).

» However, four additional red data species we noted in the two site visits: a Black Harrier Circus maurus, breeding Verreaux's Eagles Aquila verreauxii, a Secretarybird Sagittarius serpentarius, and numerous Ludwig's Bustards Neotis ludwigi. Thus, 6 red-data species occur in the development area. A further 8 collision-prone species were recorded, giving 14 collision prone/red data species in total for the greater Karoshoek Solar Valley development area. A total of 72 species were recorded which will be added to the SABAP2 data base. In summary, a total of 14 collision-prone species occur in the greater Karoshoek solar

development areas, of which six are red-listed.

Since the degree and significance of bird impacts will be related to the abundance and movements of key species, we calculated bird densities in the expanded site footprint and the passage rate of the collision-prone birds through the site. In total we recorded 30 species on the CSP Tower 7 site. Our 1 km surveys revealed a similar species richness of smaller birds in both the wet season and dry season (15.3 v 13.2 species km^{-1}). The **Passage rate** of larger collision-prone birds was medium-low at 0.42 birds per hour of observation, and it was higher the wet season than the dry season. Two red-data bustards were recorded on site and two high-sensitivity areas were apparent on the CSP Tower 7 area. No wetland birds were seen. Sandgrouse regularly traversed the site (2.7 birds h^{-1}) in both seasons and those commuting at high levels are at risk from the solar flux. Some large Sociable Weaver nests were present on site, and displaced birds may attempt to build on the heliostat mirror infrastructure. This represents a high impact site, and medium-Low with appropriate mitigation.

Not much research in South Africa is presently available to determine the impact of CSP trough and tower technology on the South African avian community, so a minimum of 12 months' post-construction monitoring at this site by trained ornithologists is strongly recommended. The specialist also recommend that all available precautions are taken to avoid threatened species and wetland birds being attracted to the troughs. If species are attracted and collide with the CSP troughs by mistaking them for open water then it is recommend that innovative bird deterrent techniques are used, such as the Torri lines mentioned above and in the avian Scoping Report (Simmons and Martins 2015).

If these recommendations can be followed and prove effective, it is believed that the Ilanga CSP 7 Facility can be allowed to proceed with minimal impact to the avifauna of the area.

Environmental (natural environment, economic and social) costs can be expected to arise from the project proceeding. This could include:

» Direct loss of biodiversity, flora and fauna due to the clearing of land for the construction and utilisation of land for the Ilanga Tower 1 Facility (which is limited to the development footprint of 703ha). The cost of loss of biodiversity is expected to be limited as a result of the wide distribution of the affected vegetation type and the limited presence of species of conservation concern within the development area.
» Visual impacts associated with the CSP Facility. The cost of loss of visual quality to the area is expected to be low as a result of the location of the facility in relation to sensitive visual

receptors, as well as the nature of the topography of the area.

» Change in land-use and loss of land available for agriculture on the development footprint. The cost in this regard is expected to be limited due to the limited footprint of the facility (less than 15% of the broader site), the low agricultural potential of the property and the fact that current agricultural activities can continue on the remainder of the property during construction and operation.

These costs are expected to occur at a local and site level and are considered acceptable provided the mitigation measures as outlined in the EMPr are adhered to. No environmental fatal flaws associated with the proposed project have been identified.

The positive implications of establishing the Ilanga CSP 7 Facility on the demarcated site include:

» The project will result in important socio-economic benefits at the local and regional scale through job creation, procurement of materials and provision of services and other associated downstream economic development (as detailed in Chapter 2 of this report). These will persist during the preconstruction, construction and operational phases of the project.
» The project is considered to be a suitable land use for the proposed site due to the low potential for commercial agriculture. Development of the facility will require the implementation of appropriate management actions which could have positive impacts on the surrounding areas specifically in terms of alien vegetation and erosion management.
» The project contributes towards the Provincial and Local goals for the development of renewable energy as outlined in the respective SDFs and IDPs.
» The project is located within an area demarcated for solar development at a Provincial and Local scale, and is located within an area where a number of CSP facilities are already authorised (facilitating consolidation of similar infrastructure). The location is therefore considered desirable
» The project serves to diversify the economy and electricity generation mix of South Africa by addition of solar energy to the mix. As a result of the on-site storage associated with the project, it has the potential to provide extended periods of power (for 18 hours a day) to the grid. This will assist in stabilising the power supply during the periods of the day when this is required most.

The benefits of the project are expected to occur at a national, regional and local level. As the costs to the environment at a site specific level have been largely limited through the appropriate placement of infrastructure on the site within lower sensitivity areas, the expected benefits of the project are expected to partially offset the localised environmental costs of the project.

Overall Conclusion (Impact Statement)

Global climate change is widely recognised as being one of the greatest environmental challenges facing the world today. How a country sources its energy plays a big part in tackling climate change. As a net off-setter of carbon, renewable energy technologies can assist in reducing carbon emissions, and can play a big part in ensuring security of energy supply, as other sources of energy are depleted or become less accessible. South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result, South Africa is one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer of carbon emissions. With the aim of reducing South Africa's dependency on coal generated energy, and to address climate change concerns, the South African Government has set a target, through the Integrated Resource Plan (IRP) for electricity to develop 17.8 GW of renewables (including 8.4GW solar) within the period 2010 – 2030.

The need for the project at a national scale has therefore been determined. The location of the proposed project is further supported by national and provincial planning initiatives in that it is located within a zone identified for such development (i.e. within REDZ 7 as defined by the national government and within the Solar Corridor as defined by the Provincial SDF).

Environmental (natural environment, economic and social) costs can be expected to arise from the project proceeding. This could include:

» Direct loss of biodiversity, flora and fauna due to the clearing of land for the construction and utilisation of land for the Ilanga CSP 7 Facility (which is limited to the development footprint of 1000 ha). The cost of loss of biodiversity is expected to be limited as a result of the wide distribution of the affected vegetation.
» Visual impacts associated with the CSP Facility. The cost of loss of visual quality to the area is expected to be low as a result of the location of the facility in relation to sensitive visual receptors, as well as the nature of the topography of the area.
» Change in land-use and loss of land available for agriculture on the development footprint. The cost in this regard is expected to be limited due to the limited footprint of the facility (less than 15% of the broader site), the low agricultural potential of the property and the fact that current agricultural activities can continue on the remainder of the property during construction and operation.

These costs are expected to occur at a local and site level and are considered acceptable provided the mitigation measures as outlined in the EMPr are

adhered to. No fatal flaws associated with the proposed project have been identified.

» The potential to harness and utilise solar energy resources within the Northern Cape Province.
» The project will assist the South African government in reaching their set targets for renewable energy and consequent reduction in greenhouse gas emissions from energy generation.
» The project will assist the South African government in the implementation of its green growth strategy and job creation targets.
» The project will assist the district and local municipalities in reducing level of unemployment through the creation of jobs and supporting local business.
» The National electricity grid in the Northern Cape Province will benefit from the additional generated power.
» Promotion of clean, renewable energy in South Africa.
» Creation of local employment, business opportunities and skills development for the area.

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated from the proposed project conclude that:

» There are **no environmental fatal flaws** that should prevent the proposed CSP Plant and associated infrastructure from proceeding on the identified site, provided that the recommended mitigation and management measures are implemented, and given due consideration during the process of finalising the facility layout.
» The proposed development on the site will create a localised reduction of indigenous trees and shrubs, geophytes and other species of conservation concern, but not to a degree that the current conservation status of such species will be negatively affected.
» From an **ecological** perspective, there are no features at the site considered to be very high sensitivity or present a no go area and the abundance of species of concern within the development area is also low. While there are some protected species present, there are no species of high conservation concern present and no significant impacts can be expected on the local populations of the protected species present. Overall and with the implementation of the recommended mitigation measures, the impacts of the development are likely to be of moderate to low significance and no impacts of high significance are likely. As a result, there are no ecological fatal flaws or impacts that cannot be mitigated that should prevent the development from being approved.
» From a **soil** and **agricultural** perspective, the overall impacts of the proposed facility on agriculture and soil conditions will be low,

principally because of the climatic conditions and the low agricultural and grazing potential of the site. There have never been any substantial farming practices (agriculture or grazing) on the property because of the dominant climatic conditions and prevailing soil conditions. Very low rainfall, along with other soil-related factors lead to low vegetative cover throughout the area. The soil and rock type properties tend to be very homogenous in the area and the whole site can be better utilised for development (such as that for power generation) in comparison to any other practise. This project site is not regarded as a viable commercial farming site and would be suited to house the facilities. There is the potential for the loss of soil resources through erosion, particularly during the construction phase. This impact can be effectively minimised through the implementation of appropriate mitigation measures including implementation of an appropriate stormwater management plan and regular monitoring of the occurrence, spread and potential cumulative effects of erosion. Impacts post-mitigation are expected to be of low significance.

» The **avifauna** of the area may be affected by the infrastructure of the CSP plant. However, the significance will be high to low since few collision-prone species are expected to occur on the site. The interaction of Sandgrouse (recorded in abundance on the site) with the proposed facility is unknown. However, a well-structured and systematic construction and post-construction assessment, as laid out in the Environmental Management Programme in conjunction with Management interventions will determine this and can provide appropriate mitigations.

» From a **bat** perspective, Potential impacts on bats as a result of the proposed Ilanga CSP 7 Facility. Impacts are expected to be limited as a result of the limited potential of the vegetation on the site to provide foraging and roosting habitat as well as a result of the proposed design of the facility. As impacts of solar thermal facilities on bats is poorly understood, it is considered important to document any impacts which may be identified during operation. It is recommended that any bat carcasses recorded are also documented during operational bird monitoring and the cause of such mortality investigated by an appropriate specialist. As is proposed for the facility design, buildings housing steam condensers should be closed up thoroughly and have no overhanging roofs or overlapping sheets with holes of 1.5cm or more in diameter.

» From a **heritage** perspective, widely dispersed individual scatters of stone tools are known to occur in the larger study area. Artefact density at these scatters

are so low that they do not represent individual sites but rather background scatter or find spots. However several Stone Age sites occur in the larger area. The sites consist of a LSA artefact scatter around depressions that contain seasonal water and stream bed margins that was utilised in the past. The impacts to heritage resources by the proposed development are not considered to be highly significant and the impact on archaeological sites is acceptable.

» From a **visual** perspective, the proposed extension to the authorised project will not result in visual impacts that were not considered in the original application for authorisation. Due to the nature of the site and the surrounding area, impacts of the proposed extension of the project will marginally increase visual impacts associated with the authorised project.

» The development will have both positive and negative **social** impacts. It will create employment and business opportunities for locals during both the construction and operational phases and represent an investment in clean, renewable energy infrastructure. The potential for cumulative impacts also exists due to the proximity of the other authorised and proposed CSP within the Karoshoek Valley, one of which is already under development (i.e. Ilanga CSP facility on Site 1.2)., however, these impacts are not considered to represent a fatal flaw, and in addition, there is no indication if (or when) other developments will take place.

The significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures. With reference to the information available at this planning approval stage in the project cycle, the **confidence** in the environmental assessment undertaken is regarded as **acceptable**.

Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the impacts associated with the development of the Ilanga CSP 7 Facility can be managed and mitigated to an acceptable level. In terms of this conclusion, the EIA project team support the decision for environmental authorisation. The layout plan as presented is considered acceptable.

The following conditions would be required to be included within an authorisation issued for the project:

» Following the final design of the facility, a revised layout must be submitted to DEA for review and approval prior to commencing with construction.

- An independent Environmental Control Officer (ECO) should be appointed to monitor compliance with the specifications of the EMPr for the duration of the construction period.
- Areas disturbed during construction should be rehabilitated as quickly as possible and an on-going monitoring programme should be established to detect and quantify any alien species.
- During construction, unnecessary disturbance to habitats should be strictly controlled and the footprint of the impact should be kept to a minimum.
- All mitigation measures detailed within this report and the specialist reports contained within Appendices **D** to **L** to be implemented.
- The draft Environmental Management Programme (EMPr) as contained within **Appendix M** of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed solar energy facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project.
- A comprehensive stormwater management plan should be compiled for the developmental footprint prior to construction.
- An ecological walk through survey for the CSP plant and associated infrastructure (such as pipeline, power line and access roads) must be undertaken prior to construction.
- A permit to be obtained for removal of protected trees and provincially protected flora that are affected.
- Post-construction avifaunal and bat monitoring (12 months) should be started as the facility becomes operational, bearing in mind that the effects of the CSP facility may change over time. The results of this monitoring programme should be considered after the first year to inform the need to continue with the programme and/or implement additional mitigation measures.
- A Water Use License for relevant water uses is to be obtained from DWS prior to commencement of the water use.
- All other relevant and required permits must be obtained from the relevant regulating authorities.

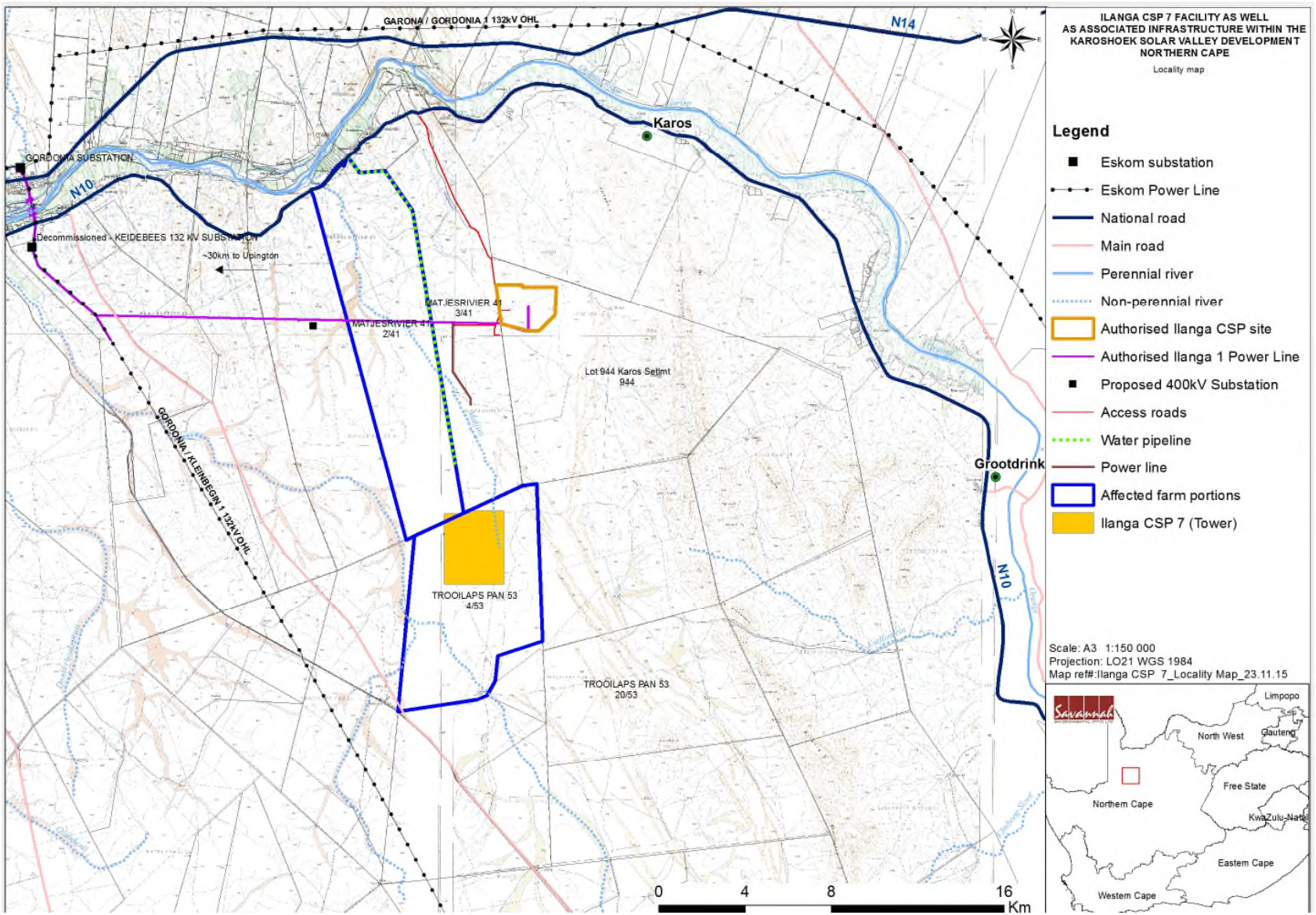


Figure 1: Locality Map of the proposed Ilanga CSP 7 Project(Refer to Appendix P A3 Maps)

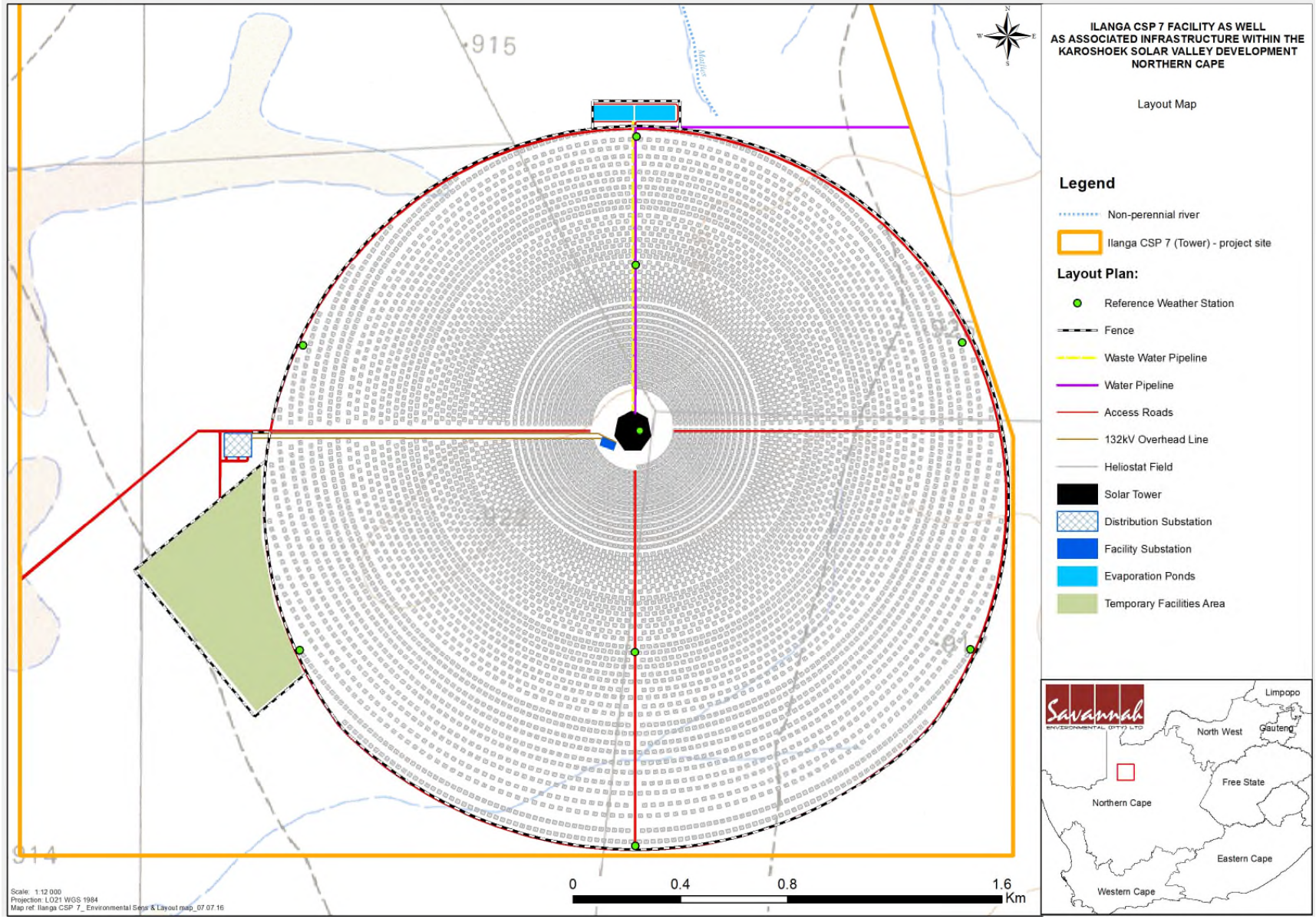
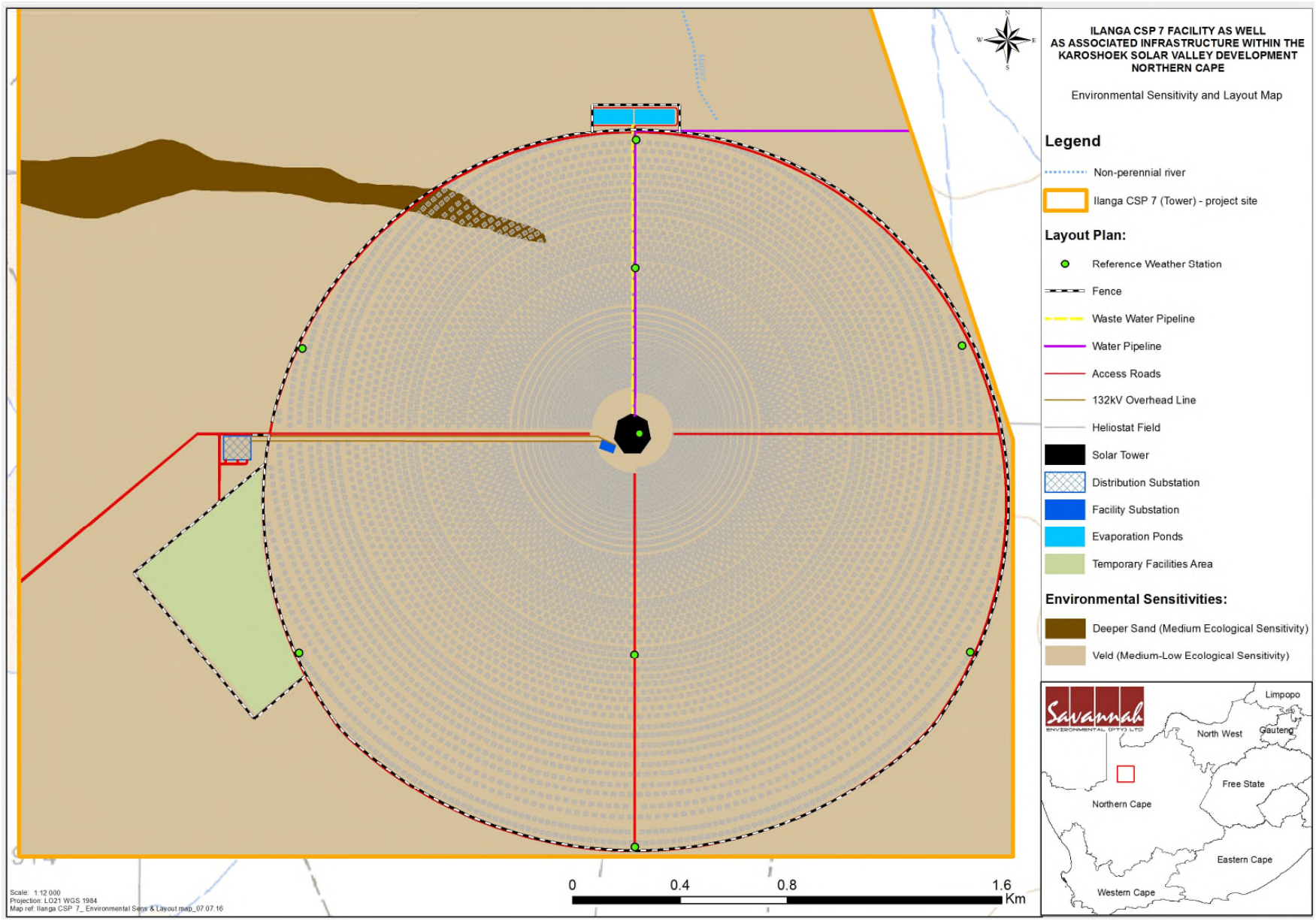


Figure 2: Preliminary Layout Map for the proposed Ilanga CSP 3 Facility(Refer to **Appendix P** A3 Maps)- to be approved by DEA



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DEFINITIONS AND TERMINOLOGY

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

Concentrating solar power: Solar generating facilities use the energy from the sun to generate electricity. Concentrating Solar Power facilities collect the incoming solar radiation and concentrate it (by focusing or combining it) onto a single point, thereby increasing the potential electricity generation.

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

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

Commissioning: Commissioning commences once construction is completed. Commissioning covers all activities including testing after all components of the wind turbine are installed.

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

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

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

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

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

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

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

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

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

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

Environmental impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment, as defined in the NEMA EIA Regulations and in relation to an application to which scoping

must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

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

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

Hazardous waste: Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment (Van der Linde and Feris, 2010;pg 185).

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

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

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

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

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

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

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

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

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

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

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

Waste: Any substance, whether or not that substance can be reduced re-used, recycled and recovered; that is surplus, unwanted, rejected, discarded, abandoned or disposed of which the generator has no further use for the purposes of production. Any product which must be treated and disposed of, that is identified as waste by the minister of Environmental affairs (by notice in the Gazette) and includes waste generated by the mining, medical or other sectors, but: A by-product is not considered waste, and portion of waste, once re-used, recycled and recovered, ceases to be waste (Van der Linde and Feris, 2010; p186).

ABBREVIATIONS AND ACRONYMS

BID	Background Information Document
CBOs	Community Based Organisations
CDM	Clean Development Mechanism
CSIR	Council for Scientific and Industrial Research
CO_2	Carbon dioxide
D	Diameter of the rotor blades
DAFF	Department of Forestry and Fishery
DEA	National Department of Environmental Affairs
DENC	Department of Economic Development and Nature Conservation
DME	Department of Minerals and Energy
DOT	Department of Transport
DWS	Department of Water and Sanitation
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
GIS	Geographical Information Systems
GG	Government Gazette
GN	Government Notice
Ha	Hectare
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IEP	Integrated Energy Planning
km^2	Square kilometres
km/hr	Kilometres per hour
kV	Kilovolt
m^2	Square meters
m/s	Meters per second
MW	Mega Watt
NEMA	National Environmental Management Act (Act No 107 of 1998)
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act (Act No 25 of 1999)
NGOs	Non-Governmental Organisations
NIRP	National Integrated Resource Planning
NWA	National Water Act (Act No 36 of 1998)
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited
SDF	Spatial Development Framework

INTRODUCTION CHAPTER 1

Emvelo Holdings (Pty) Ltd ("Emvelo"), an independent power developer of concentrating solar power (CSP) plants in South Africa, is proposing the development of a Concentrated Solar Power (CSP) Facility and associated infrastructure to form part of the Karoshoek Solar Valley Development located approximately 30 km east of Upington. The proposed site is located within the //Khara Hais Local Municipality and !Kheis Local Municipality, which fall within the jurisdiction of the greater ZF Mgcawu District Municipality in the Northern Cape Province (refer to Figure 1.1). The proposed project is to be known as the **Ilanga CSP 7** Project and is to make use of tower technology. The Ilanga CSP 7 Project is proposed to generate up to 150MW in capacity and will be constructed over an area of approximately 1519.19 ha in extent within the broader property.

The project is being proposed in response to the requirement for additional electricity generation capacity at a national level and in response to identified objectives of the national and provincial government, and local and district municipalities to develop renewable energy facilities in this area. From a regional perspective, the greater Upington area is considered favourable for the development of concentrated solar power generating facilities by virtue of the prevailing climatic conditions (primarily as the economic viability of a concentrated solar power facility is directly dependent on the annual solar irradiation values for a particular area), relief and aspect, the extent of the site, and the availability of a direct grid connection (i.e. point of connection to the Eskom National grid). The area is designated as a Solar Corridor in terms of the Provincial Spatial Development Framework (PSDF) and has been classified as a Renewable Energy Development Zone (REDZ) for Solar Development (refer to Appendix O) through the Strategic Environmental Assessment (SEA) undertaken for renewable energy development by the Department of Environmental Affairs (DEA)[4].

It is the developer's intention to bid the Ilanga CSP 7 Project under the Department of Energy's (DoE) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme. The power generated from the Ilanga CSP 7 Project will be sold to Eskom and will feed into the national electricity grid. Ultimately, the project is intended to be a part of the renewable energy projects portfolio for South Africa, as contemplated in the Integrated Resource Plan 2030.

[4] It must be noted that the REDZ are expected to be promulgated in mid - 2016.

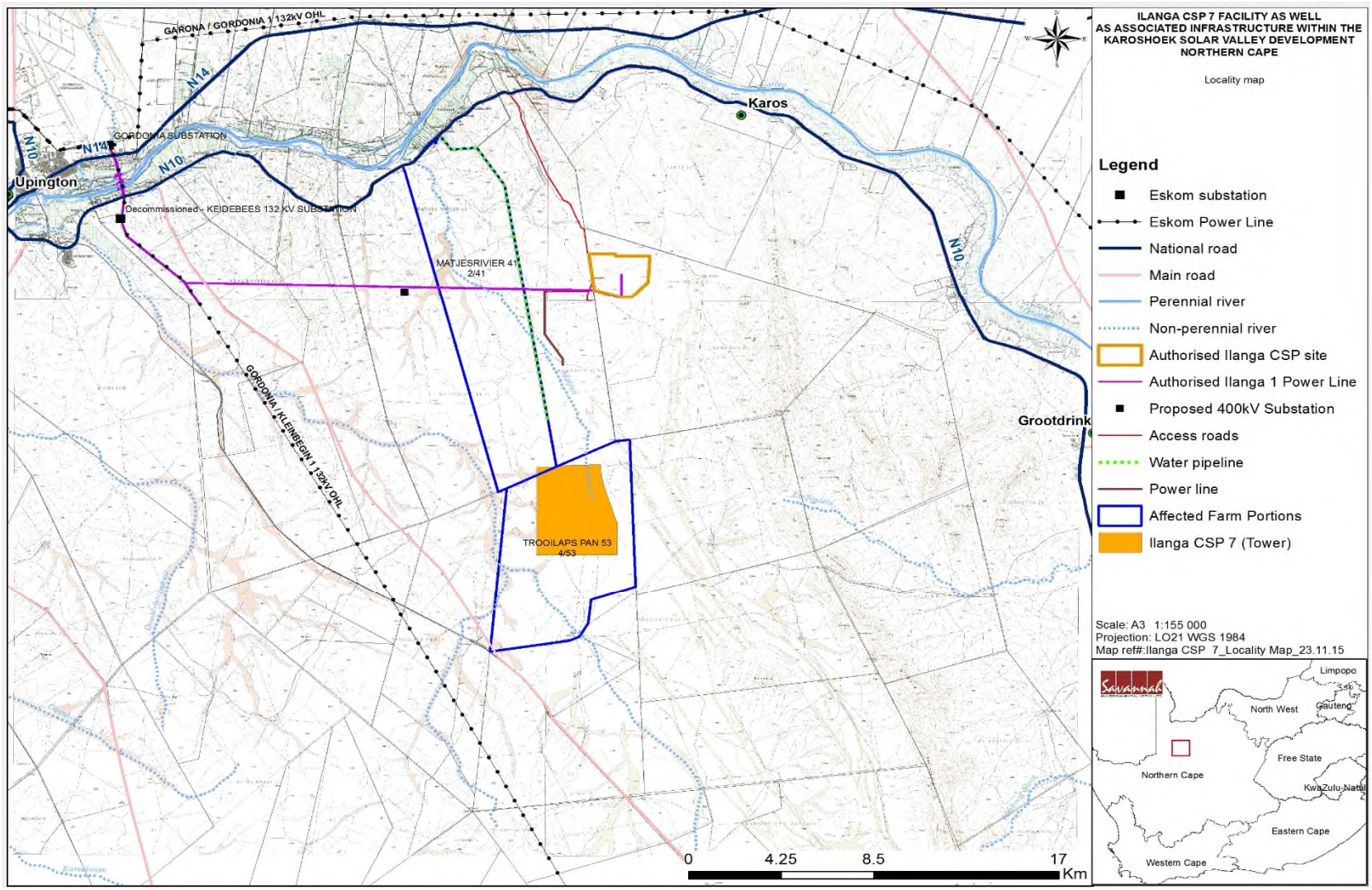

Figure 1.1: Locality map illustrating the proposed location of Ilanga CSP 7 Project on Portion 2 of Matjiesrivier 41 and Portion 4 Trooilaps Pan 53 (Refer to Appendix N)

The nature and extent of the proposed facility, as well as potential environmental impacts associated with the construction, operation and decommissioning phases of a facility of this nature are explored in detail in this Environmental Impact Assessment Report. Site specific environmental issues are considered within specialist studies contained in Appendix D – L in order to test the environmental suitability of the site for the proposed development, delineate areas of sensitivity within the site, and ultimately inform the placement of the project infrastructure on the site.

This EIA Report consists of the following sections:

» **Chapter 1** provides background to the Project and the environmental impact assessment.
» **Chapter 2** provides the project description, need and desirability, site selection information and identified project alternatives.
» **Chapter 3** outlines the strategic legal context for the energy planning and the Project.
» **Chapter 4** outlines the approach to undertaking the environmental impact assessment process.
» **Chapter 5** describes the existing biophysical and socio-economic environment within and surrounding the Project development footprint.
» **Chapter 6** provides an assessment of the potential issues and impacts associated with the Project and presents recommendations for mitigation of significant impacts.
» **Chapter 7** provides an assessment of cumulative impacts.
» **Chapter 8** presents the conclusions and recommendations based on the findings of the EIA.
» **Chapter 9** provides a list of reference material used to compile the EIA Report.

1.1. Legal Requirements as per the EIA Regulations for the undertaking of an Environmental Impact Assessment Report, 2014

This EIA report has been prepared in accordance with the requirements of the EIA Regulations published on 08 December 2014 promulgated in terms of Chapter 5 of the National Environmental Management Act (Act No 107 of 1998). This chapter of the EIA report includes the following information required in terms of Appendix 3: Content of Environmental Impact Assessment Reports.

Requirement	Relevant Section
3(a) the details of the EAP who prepared the report and (ii) the expertise of the EAP, including a curriculum vitae.	The details and expertise of the EAP who prepared the report has been included in Section 1.6 and Appendix A of this EIA report.

3(b) the location of the activity including (i) the 21 digit Surveyor General code of each cadastral land parcel, (ii) where available the physical address and farm name and (iii) where the required information in items (i) and (ii) is not available, the co-ordinates of the boundary of the property or properties.	The location of the proposed Ilanga CSP 9 facility is included in section 1.2 and Table 2.1 in this report. The information provided includes the 21-digit Surveyor General code of the affected property and the farm name (i.e. Portion 2 of the Farm Matjiesrivier 41 and Portion 4 of the Farm Trooilaps Pan 53).

1.2. Background to the project

The Ilanga CSP 7 facility is proposed to utilise the solar tower technology, using superheated steam, with a generation capacity of up to 150MW. The Ilanga CSP 7 Project will consist of a field of heliostats and a central receiver, known as a power tower. On-site storage using molten salts is proposed to extend the operating time of the facility into the night. The Ilanga CSP 7 Project is proposed to generate up to 150MW in capacity and will be constructed over an area of approximately 1519.19 ha in extent within the broader property.

The facility will include the following infrastructure:

» Central tower up to 270m with a molten salt receiver on top of the tower.
» Waste management infrastructure including evaporation dams and a wastewater treatment facility.
» Access roads[5] to the site and internal access roads.
» On-site substation and associated 132kV power line linking the facility to the Karoshoek Solar Valley substation or to the national electricity grid.
» Karoshoek Solar Valley substation and associated power lines 132 – 400kV lines connecting to the National Grid.
» A water supply pipeline from the Orange River (including water treatment and storage reservoirs).
» Operational buildings, including offices and workshops.
» The solar collector field consisting of heliostats, all systems and infrastructure related to the control and operation of the heliostats.
» The power block/power island comprising of a conventional steam turbine generator with an ACC and associated feed water system.
» Molten Salt Circuit which includes the thermal storage tanks for storing low and high temperature liquid salt, a central solar thermal tower receiver, pipelines and molten salt to steam heat exchangers.

[5] Note that the associated linear infrastructure, i.e. access road to the site, power line infrastructure and water supply pipeline will be assessed through a separate Basic Assessment process.

» Auxiliary facilities and infrastructure consisting of the switch yard, step up transformers, up to 132 kV power evacuation lines, access routes, water supplies and facility start up generators.

The overarching objective for the Ilanga CSP 7 Project is to maximise electricity production through exposure to the solar resource, while minimising infrastructure, operational and maintenance costs, as well as social and environmental impacts.

1.3. Conclusions from the Scoping Phase

Several desktop specialist studies were undertaken during the scoping phase for the purposes of identifying potential impacts relating to the proposed CSP facility. The majority of potential impacts identified to be associated with the construction of the CSP facility and associated infrastructure were anticipated to be localised and restricted to the proposed site itself (apart from social impacts – job creation which could have more of a regional positive impact), while operation phase impacts range from local to regional and national (being the positive impact of contribution of clean energy as part of the energy mix in South Africa).

Although no environmental fatal flaws were identified to be associated with the project, areas of potential environmental sensitivity were identified through the scoping phase **Figure 1.2** (Sensitivity Map). Specific sensitivities identified during the scoping phase are summarised below:

» **Visual receptors:** The desktop specialist assessment indicates that the proposed CSP facility will impact on relatively natural areas surrounding the development area. However the character of affected areas will change due to the extent of existing and authorised solar power projects in the area. These will have the effect of industrialising the character of the landscape surrounding them. The proposed development is unlikely to add significantly to the visual impact associated with the already existing and authorised facilities.

  The natural bushveld that covers the majority of the affected area could provide significant screening effect particularly if trees and tall shrubs extend above eye- level. The distance between possible sensitive receivers and the facility also means that intervening vegetation is likely to combine to provide a cumulative screening effect. This is particularly important for the heliostat field at the base of the Power Tower. It is possible therefore that the affected landscape has a degree of visual absorption capacity although the likely scale of the Power Tower will be such that it will be obvious in the landscape over a considerable area.

Possible visual receptors that have been identified include:

- The urban areas of Upington, Karos and Leerkrans as well as a large number of homesteads that occur within the approximate limit of visibility;
- FM Safaris which is a game farm and eco-tourism attraction to the north-west of the Orange River;
- There are a number of homesteads surrounding and in close proximity to site 7, which will be affected, having views of the heliostats and Power Tower. The homesteads in the closest proximity will be the most affected (six homesteads, with one of these being particularly close). The majority of these homesteads are located to the west.
- The N10 and N14 to the north; and
- Two local roads to the west.

The proposed development is likely to be highly visible in the landscape. It will be visible from extensive sections of the N10, N14 and two local roads to the west. It will also be visible to the majority of identified homesteads and settlement areas although mitigating effects of surrounding development are likely to screen views from within settlement areas. It is also possible that vegetation and landform will at least partially screen the tower from the majority of identified homesteads that are located in the Orange River Corridor, particularly the north-eastern corridor. There are a number of homesteads in close proximity, which the project is likely to be highly obvious to.

The lower heliostats that surround the base of the tower are likely to be screened from the majority of receptors due to their relatively low level, minor undulations in the relatively flat landscape and the cumulative screening effect of vegetation over a distance.

It is possible that the effects of glint and glare could be obvious particularly from the north, east and west of the development. There are a small number of homesteads that are located at a distance of approximately 9 – 19km from the development that may be impacted by this. Subject to the degree of screening afforded by the landscape, this impact could also extend to the two local roads.

» **Archaeological resources:** Archaeological Stone Age manifestations are expected within the study area. Those that are most sensitive are the Later Stone Age grave sites that may be recognised by variously shaped stone cairns. Where these have been disturbed/removed variations in the soil may include ashy or stony patches, and could signify the locations of ancient graves. Patches of soil, stained red with specula rite or ochre, may also be an indication of the presence of a grave site. LSA artefact scatters can be expected around depressions that contain seasonal water and stream bed

margins that was utilised in the past. Stone circles or ovals demarcating Later Stone Age living or activity sites, and engraved boulders or stones may occur throughout the area. Concentrations of stone tools point to activities that took place at various stages over the past 1.5 million years, representing the different groups of people who inhabited or moved across the landscape over time. Historical finds include middens, structural remains and cultural landscape. The study area has been fallow for a number of years and no agricultural activities occur on the farm. It is assumed that the farm was utilised for grazing in the past and features dating to this period associated with farming can occur but is doubtful to be older than 60 years. Graves and informal cemeteries can be expected anywhere on the landscape. Family cemeteries can be expected close to farmsteads while stone cairns could represent graves as recorded in the wider area. Based on the current information obtained for the area at a desktop level, it is anticipated that any sites that occur within the proposed development area can be mitigated.

» **Ecological sensitive features:** The largest portion of the proposed development footprint area appears to be covered by natural Bushmanland Arid Grassland which have been classified as **Medium Sensitivity**, whereas all drainage lines and depression wetlands have been classified as **Very High Sensitivity** due to the ecological functioning of these areas which include, below-ground water storage, supporting of higher shrubs, corridor for water, seed and nutrient flow, nesting sites provided by high shrubs and burrowing sites (softer and deeper substrates) for fauna. Natural areas of Gordonia Duneveld have been classified as **High Sensitivity** due to the threat to erosion and the potential presence of the protected and endemic tree, *Acacia haematoxylon*.

It was recommended that the placement of infrastructure should consider the identified sensitive areas to minimise the potential for environmental impact.

No environmental or social fatal flaws that would prevent the project from being assessed further were identified to be associated with the broader site during the Scoping stage of the EIA process. The Final Scoping Report was accepted by DEA on 22 April 2016 (reference number: 14/12/16/3/3/2/905).

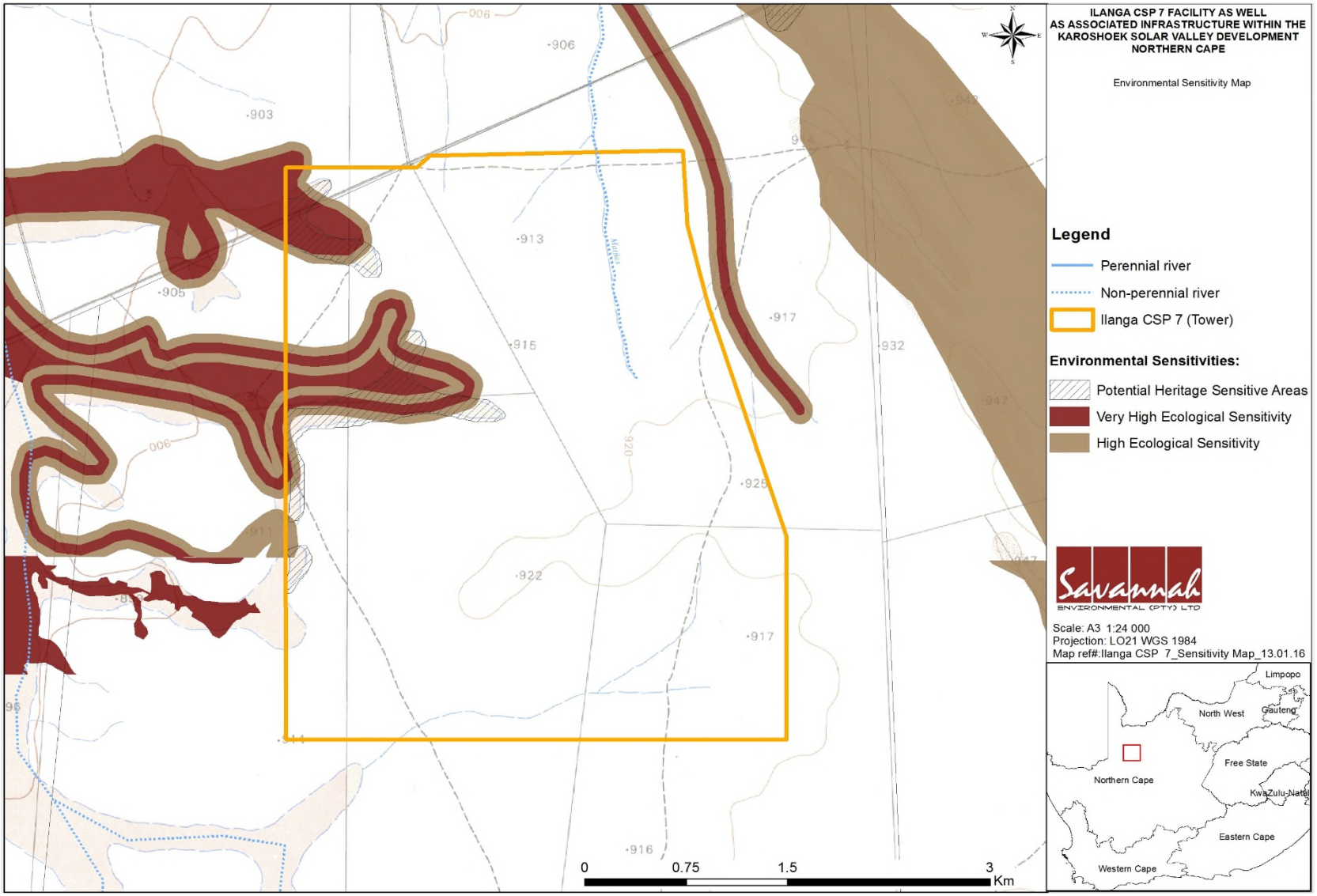

Figure 1.2: Preliminary sensitivity map of the CSP Facility based on sensitivities identified at Scoping Phase

1.4. Requirement for an Environmental Impact Assessment Process

The construction and operation of the proposed Ilanga CSP 7 Project is subject to the requirements of the EIA Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA) 107 of 1998. This section provides a brief overview of the EIA Regulations and their application to this project.

NEMA is the national legislation that provides for the authorisation of 'listed activities'. In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these activities must be considered, investigated, assessed and reported on to the competent authority that has been charged by NEMA with the responsibility of granting environmental authorisations. As this is a proposed electricity generation project and thereby considered to be of national importance, the National Department of Environmental Affairs (DEA) is the competent authority[6] and the Northern Cape Department of Environment and Nature Conservation (DENC) will act as a commenting authority.

The need to comply with the requirements of the EIA Regulations ensures that the competent authority is provided with the opportunity to consider the potential environmental impacts of a project early in the project development process and to assess if potential environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required in accordance with the EIA Regulations to provide the competent authority with sufficient information in order to make an informed decision. Emvelo Holdings (Pty) Ltd has appointed Savannah Environmental as the independent environmental consulting company to conduct an EIA process for the proposed project. An application for authorisation for the CSP Facility has been accepted by the DEA (under Application Reference number: 14/12/16/3/3/2/905).

An EIA is also an effective planning and decision-making tool for the project developer as it allows for the identification and management of potential environmental impacts. It provides the opportunity for the developer to be fore-warned of potential environmental issues, and allows for resolution of the issues reported on in the Scoping and EIA Reports as well as dialogue with interested and affected parties (I&APs).

The EIA process comprises two phases – i.e. Scoping and Impact Assessment - and involves the identification and assessment of environmental impacts though

[6] In terms of the Energy Response Plan, the DEA is the competent authority for all energy related applications.

specialist studies, as well as public participation. The process followed in these two phases is as follows:

» The **Scoping Phase** includes the identification of potential issues associated with the proposed project through a desktop study (considering existing information), limited field work and consultation with affected parties and key stakeholders. This phase considers the broader site in order to identify and delineate any environmental fatal flaws, no-go or sensitive areas. Following public review of the report, this phase culminates in the submission of a final Scoping Report and Plan of Study for EIA to the competent authority for acceptance.
» The **EIA Phase** involves a detailed assessment of potentially significant positive and negative impacts (direct, indirect, and cumulative) identified in the Scoping Phase. This phase considers a proposed development footprint and includes detailed specialist investigations and public consultation. Following a public review period of the EIA report, this phase culminates in the submission of a Final EIA Report and an Environmental Management Programme (EMPr), including recommendations of practical and achievable mitigation and management measures, to the competent authority for review and decision-making.

1.5. Details of the Environmental Assessment Practitioner

Savannah Environmental was contracted by Emvelo Holdings (Pty) Ltd as the independent environmental consulting company to undertake and the required EIA process for the proposed project. Neither Savannah Environmental nor any of its specialist sub-consultants on this project are subsidiaries of or are affiliated to Emvelo Holdings (Pty) Ltd in any way. Furthermore, Savannah Environmental does not have any interests in secondary developments that could arise out of the authorisation of the proposed project.

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

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

» *Tebogo Mapinga* - the principle author of this report is a Principal Environmental Manager, holds a BSc degree with 9 years of experience in the environmental field in both public and private sectors. Her competencies lie in environmental impact assessments, compliance monitoring and public participation for small and large scale projects.
» ***Gabriele Wood -*** holds an Honours Degree in Anthropology, obtained from the University of Johannesburg. She has 7 years consulting experience in public participation and social research. Her experience includes the design and implementation of public participation programmes and stakeholder management strategies for numerous integrated development planning and infrastructure projects. Her work focuses on managing the public participation component of Environmental Impact Assessments and Basic Assessments undertaken by Savannah Environmental.
» *Jo-Anne Thomas* - a registered Professional Natural Scientist, holds a Master of Science degree. She has 19 years' experience consulting in the environmental field. Her key focus is on strategic environmental assessment and advice; management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines; compliance reporting; the identification of environmental management solutions and mitigation/risk minimising measures; and strategy and guideline development. She is currently involved in undertaking siting processes as well as EIAs for several renewable energy projects across the country.

In order to adequately identify and assess potential environmental impacts associated with the proposed project, the following specialist sub-consultants have provided input into this EIA report:

Specialist	Area of Expertise	Refer Appendix
Simon Todd of Simon Todd Consulting	Ecology	Appendix D
Dr Rob Simmons of Bird and Bat Unlimited Environmental Consultants	Avifauna	Appendix E
Peter Kimberg of the Biodiversity company	Aquatic Ecology	Appendix F
Jaco van der Walt of Heritage Contracts	Heritage	Appendix G
Garry Paterson of Agricultural Research Council (ARC)	Agricultural Potential & Soils	Appendix H
Candice Hunter of Savannah Environmental	Social	Appendix I
Dr Neville Bews of Dr Neville Bews & Associates	Social Peer Review	Appendix I-1
Jon Marshall of Afzelia Environmental Consultants & Environmental Planning and Design	Visual	Appendix J
Morné de Jager of Enviro Acoustic Research	Noise	Appendix K

Specialist	Area of Expertise	Refer Appendix
cc		
Werner Marais of the Animalia Zoological & Ecological Consultation CC	Bat	Appendix L

Appendix A includes the curricula vitae for the environmental assessment practitioners from Savannah Environmental and the specialist consultants.

DESCRIPTION OF THE PROPOSED PROJECT CHAPTER 2

This chapter provides an overview of the Ilanga CSP 7 Project and details the project scope which includes the planning/design, construction, operation and decommissioning activities. This chapter also explores site and technology alternatives as well as the 'do nothing' option. An overview of the grid connection for the construction, operation and decommissioning activities are also discussed. Lastly, it explores the use of solar energy as a means of power generation.

This chapter of the EIA report includes the following information required in terms of Appendix 3: Content of Environmental Impact Assessment Reports:

Requirement	Relevant Section
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 a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken	The layout for the development of the Ilanga CSP 7 Facility is included in Section 2.3.2.
3(d)(ii) a description of the proposed activity, including a description of the associated structures and infrastructure related to the development.	A description of the proposed development of the Ilanga CSP 7 Facility and the associated infrastructure is included in Section 2.1.
3(f) a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location.	The need and desirability for the development of the Ilanga CSP 7 Facility in the proposed location is included in Section 2.2.
3(g) a motivation for the preferred development footprint within the approved site.	A motivation for the location of the identified development area and the development footprint within the project site (i.e. Matjiesrivier 41, Trooilaps Pan 53) is included in Section 2.2.1-2.2.2.
3(h)(i) details of the development footprint considered.	The details of the development footprint considered for the Ilanga CSP 7 Facility is included in Section 2.1 and Table 2.1.
3(h)(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.	The positive and negative impacts of the proposed Ilanga CSP 7 Facility are included in Chapter 6 of this Report.
3(h)(ix) if no alternative development locations for the activity were investigated, the motivation for not considering such.	A motivation for not considering any alternative development locations is included in Section 2.3.1.

Requirement	Relevant Section
3(h)(x) a concluding statement indicating the preferred alternative development location within the approved site.	No alternative development locations within the preferred project site have been identified for the Ilanga CSP 7 Facility. The motivation for not considering alternative development locations within the project site is included in Section 2.3.1.

2.1 Nature and extent of Ilanga CSP 7 Project

The Ilanga CSP 7 project is proposed to be developed on Portion 2 of the Farm Matjiesrivier 41 and Portion 4 of the Farm Trooilaps Pan 53, located approximately
30 km east of Upington within the !Kheis Local Municipality and the Khara Hais Local Municipality which fall within the jurisdiction of the ZF Mgcawu District Municipality in the Northern Cape. This site is considered by the developer to be highly preferred from a technical perspective by virtue of climatic conditions, relief and aspect, the availability of land for the development, and proximity to a viable point of connection to the National grid through Eskom's Main Transmission Substation (MTS). The site is proposed to form part of the Karoshoek Solar Valley Development, which includes a number of already authorised CSP facilities including the Ilanga 1 CSP project, which is currently under construction. In addition, the site falls within the Solar Development Corridor identified within the Northern Cape PSDF, as well as within the proposed Zone 7 of the REDZ (refer to Appendix O). The site is therefore considered to be highly desirable for the proposed project from a technical perspective.

2.1.1 Components of the Proposed Project

The Ilanga CSP 7 Project will consist of heliostats and a molten salt tower system with a generation capacity of ~150MW. Infrastructure associated with the project includes:

» Central tower up to 270m with a molten salt receiver on top of the tower.
» Waste management infrastructure including evaporation dams and a wastewater treatment facility.
» Access roads[7] to the site and internal access roads.
» On-site substation and associated 132kV power line linking the facility to the Karoshoek Solar Valley substation or to the national electricity grid.
» Karoshoek Solar Valley substation and associated 132kV and 400kV power lines connecting to the National Grid.

[7] Note that the associated linear infrastructure, i.e. access road to the site, power line infrastructure and water supply pipeline will be assessed through a separate Basic Assessment process.

» A water supply pipeline from the Orange River (including water treatment and storage reservoirs).
» Operational buildings, including offices and workshops.
» The solar collector field consisting of heliostats, all systems and infrastructure related to the control and operation of the heliostats.
» The power block/power island comprising of a conventional steam turbine generator with an ACC and associated feed water system.
» Molten Salt Circuit which includes the thermal storage tanks for storing low and high temperature liquid salt, a central solar thermal tower receiver, pipelines and molten salt to steam heat exchangers.
» Auxiliary facilities and infrastructure consisting of the switch yard, step up transformers, 132 kV power evacuation lines, access routes, water supplies and facility start up generators.

Table 2.1: A detailed description of the project

Province	**Northern Cape Province**
District Municipality	ZF Mgcawu (Siyanda) District Municipality
Local Municipality	//Khara Hais Local Municipality (KHLM) !Kheis Local Municipality (KLM)
Ward number(s)	1 & 14
Nearest town(s)	Upington
Farm name(s) and number(s)	Matjiesrivier 41, Trooilaps Pan 53
Portion number(s)	Portion 2 of the Farm Matjiesrivier 41 Portion 4 of the Farm Trooilaps Pan 53
SG 21 Digit Code (s)	C03600000000004100002
	C03600000000005300004
Current zoning	Agricultural
Site corner Co-ordinates	North-West: 28° 34'30.69"S 21° 29'40.62"E North-East: 24° 34'25.90"S 21° 31'28.63"E South-West: 28° 36'52.53"S 21° 29'41.16"E South-East: 28° 36'52.02"S 21° 31'57.63"E
Contracted capacity of facility	150MW
Heliostat field	6m pedestal which will occupy up to 800ha
Details of the Power Tower	Approx. 50m in diameter (~10ha) and ~270m high
Power island and steam turbine and generator	Will occupy ~6.5ha and they are ~40m in high
Molten salt storage tanks	2 tanks each 40m in diameter, 30 to 40m high
Footprint of the CSP facility	1000 ha
Full extent of the CSP Facility	1519.19 ha
Extent of broader site	11 173 ha
Internal access roads	6m wide, 18 km in length
Site access	The study site is accessible via the N10 between Upington to Groblershoop. Access to the site will be

Province	Northern Cape Province
	off the N10 located to the north of the site via an existing gravel road, which will be upgraded for the purposes of the project[8].
Services required	» Water will be sourced from the Orange River (Gariep River). » Refuse material disposal - all refuse material generated from the proposed development will be collected by a contractor and will be disposed of at a licensed waste disposal site off site. This service will be arranged with the municipality and suitable contractors when required. » Sanitation – all sewage waste will be collected by a contractor and will be disposed of at a licensed waste disposal site during the construction phase. This service will be arranged with the municipality when required during the operational phase as sewage will be temporarily stored in septic tanks. » Wastewater during operation – wastewater from the power generation process will be disposed of within appropriately lines evaporation ponds.

2.2. Need and Desirability of the Development at the Preferred Site Location

The area surrounding Upington in the Northern Cape has been earmarked by the Province as a hub for the development of solar energy projects due to the viability of the solar resource for the area, and this area is included in the solar corridor which has been identified by the Northern Cape Spatial Development Framework. At a national level, this area has been earmarked as a Renewable Energy Development Zone (REDZ) for solar development. The area is therefore considered to be highly desirable for the development of projects such as that being proposed.

The overarching objective for the Ilanga CSP 7 Project is to maximise electricity production through exposure to the solar resource, while minimising infrastructure, operational and maintenance costs, as well as social and environmental impacts. From a regional site selection perspective, this region is considered to be preferred for solar energy development by virtue of its annual solar irradiation values (refer to **Figure 2.1**).

[8] The construction of this road is the subject of a separate Basic Assessment process

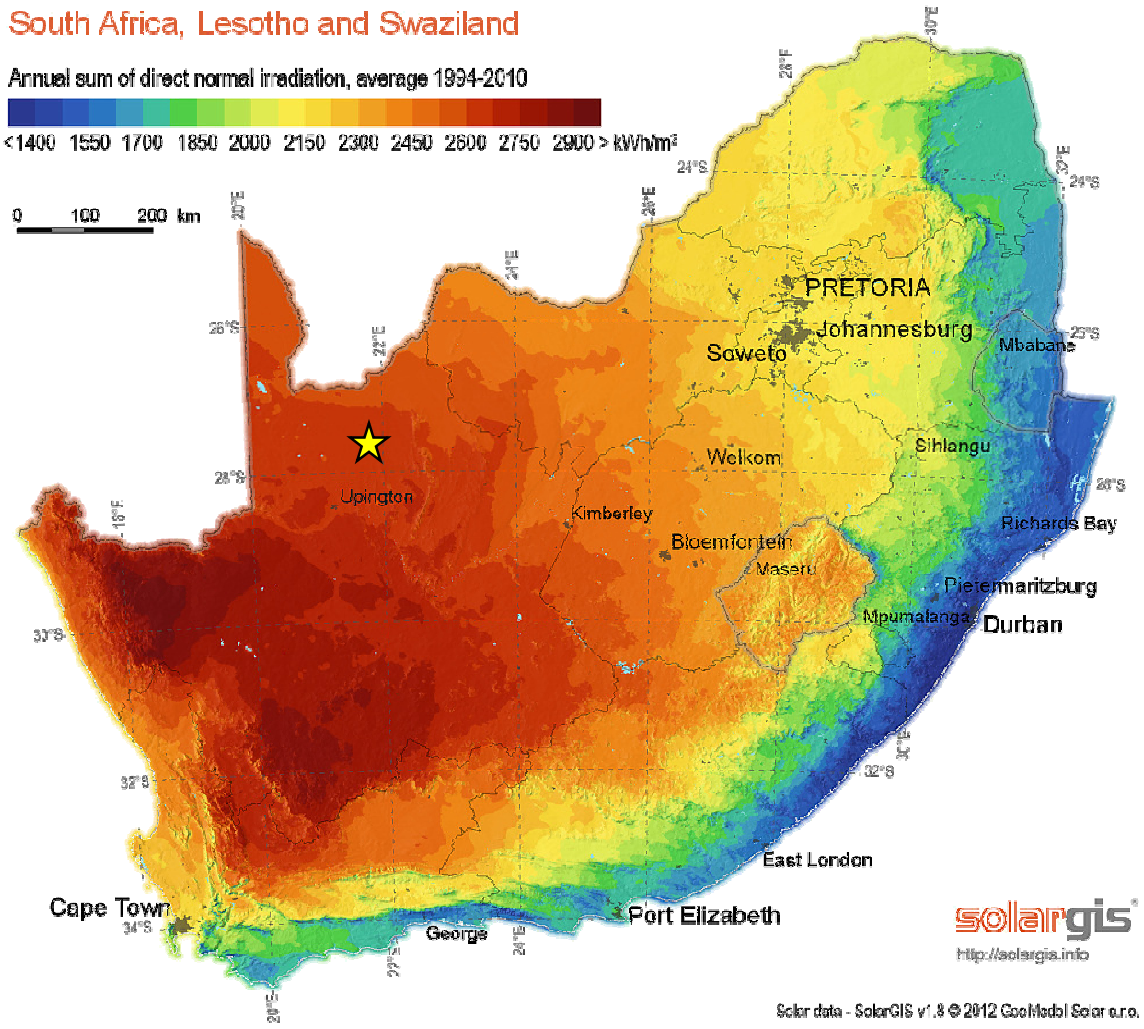

Figure 2.1: Solar irradiation map for South Africa; the location of the proposed Ilanga CSP 7 Project is shown by the yellow star on the map. (Source: adapted from GeoModel Solar, 2012).

From a local perspective, the site has specifically been identified by Emvelo Holdings (Pty) Ltd as being highly desirable for the development of a CSP Project due to its suitable topography (i.e. in terms of slope and local topography), site access (i.e. to facilitate the movement of machinery during the construction phase and operations staff in the long-term), land availability (i.e. the land is secured for the intended use), the extent of the site (i.e. the land parcels are able to accommodate the approximate 1519.19ha required for the facility, enabling optimal placement of the infrastructure considering potential environmental sensitivities or technical constraints), as well as the consolidation of renewable projects within an already identified node. These favourable technical characteristics are further explored in the sections below.

At a Provincial level, the Northern Cape has been identified as the area with highest potential for solar renewable energy generation; with high solar radiation

levels and the availability of vast tracts of land. There are already a number of CSP projects (and solar PV facilities) constructed and planned in the region. The development of another CSP project in the study area will be in line with the objectives of the Provincial Spatial Development Plan, !Kheis Local Municipality Integrated Development Plan (IDP) (2012-2017), Khara Hais Local Municipality Integrated Development Plan (IDP) (2012-2017) as well as the Siyanda (ZF Mgcawu) District Municipality IDF (2012-2017), as the need for the development of the renewable sector has been identified in both Municipal plans. A more detailed description of the mandates set out by the Municipalities has been explained further in Chapter 3.

The Ilanga CSP 7 Project is proposed to be constructed outside of the Upington urban edge. Portion 2 of the Farm Matjiesrivier 41 and Portion 4 of the Farm Trooilaps Pan 53 have not been considered for an alternative land use such as urban development, nor are these properties currently extensively used for agriculture as a result of limited potential due to the land not being viable for the cultivation of crops, or the raising of cattle or sheep because of the limited carrying capacity of the land. The site is located within an area which has become a node for renewable energy projects, with the following preferred bidder projects (PB) located within a 30km radius from the project development site: Upington Airport Solar Energy Facility and the Ilanga Solar Thermal Power Plant to the east of the site (within the Karoshoek Solar Valley Development area). Projects planned within 30km of the site include:

Project Name	DEA Ref. No	Location	Approximate distance from the Karoshoek Solar Valley Project development site	Project Status
Ilanga Solar Thermal Power Plant	12/12/20/2056	Lot 944 Karos Settlement	Within the Karoshoek Solar Valley development site	Preferred Bidder Round 3; under construction
Karoshoek Solar Valley Development	14/12/16/3/3/2/289 14/12/16/3/3/2/290 14/12/16/3/3/2/291 14/12/16/3/3/2/292 14/12/16/3/3/2/293 14/12/16/3/3/2/294 14/12/16/3/3/2/295 14/12/16/3/3/2/296	Matjesriver RE and 2/41, Annashoek 3/41, Karos 956 and Zandemm 944	All within the Karoshoek Solar Valley development site	Received Authorisation

Project Name	DEA Ref. No	Location	Approximate distance from the Karoshoek Solar Valley Project development site	Project Status
	14/12/16/3/3/2/297 14/12/16/3/3/2/298 14/12/16/3/3/2/299			
25MW Solar Energy Facility, North-East Of Upington, NC Province	12/12/20/2169	Remaining Extent of the Farm 418	20km north	Received Authorisation
Upington Airport PV Solar Energy Facility	12/12/20/2146	Upington International Airport	25km north west	Preferred Bidder Round 2; construction completed
Kheis Solar Phase 3 phases	14/12/16/3/3/2/569 14/12/16/3/3/2/570 14/12/16/3/3/2/571	Portion 7 and Portion 9 of the Farm Namakwari 656	30km south east	Received Authorisation
Albany Solar Energy Facility	14/12/16/3/3/2/639	Remainder of Farm Albany 405	25km north east	In Process
Avondale Solar Park 1	14/12/16/3/3/2/618	Portion 1 of the Farm Avondale No. 410	20km north	In Process
Ilanga CSP tower facilities 8 and 9 within Karoshoek solar valley development	14/12/16/3/3/2/904	Lot 944 Karos Settlement, Trooilaps Pan 4/53	Within the Karoshoek Solar Valley Development site.	Ilanga CSP 9 is in process and CSP 8 is currently on hold- the application form has not been submitted as yet.
Ilanga tower 1, Ilanga CSP 2, 3, 4 and 5 facilities within Karoshoek solar valley	14/12/16/3/3/2/861 14/12/16/3/3/2/862 14/12/16/3/3/2/864 14/12/16/3/3/2/866 14/12/16/3/3/2/868	Matjesriver RE and 2/41, Annashoek 3/41, Karos 956, Trooilaps Pan 4/53 and Zandemm 944	Within the Karoshoek Solar Valley Development site.	In Process

Project Name	DEA Ref. No	Location	Approximate distance from the Karoshoek Solar Valley Project development site	Project Status
development				

2.2.1 Receptiveness of the site to development of a CSP Project

Emvelo Holdings (Pty) Ltd undertook a high level feasibility investigation of the broader area in order to determine the most appropriate location of the facility from a technical perspective. Emvelo considers this area and specifically the demarcated farm, Portion 2 of the Farm Matjiesrivier 41 and Portion 4 of the Farm Trooilaps Pan 53, to be highly preferred for the development of a concentrated solar power project from a technical perspective. This conclusion is based on the following considerations:

Extent of the site: Availability of relatively level land of sufficient extent can be a restraining factor to CSP development, as the proposed 150 MW solar tower system and associated infrastructure requires up to 1000 ha of land space and the broader study areas is approximately 1519.19ha (65.8% of the broader study area). The larger farm portion is approximately 11 173 ha in extent, of which ~1519.19 ha (13.9% of the larger farm portions) is allocated for the siting of the proposed Ilanga CSP 7 Project and associated infrastructure. This site is, therefore, considered sufficient for the installation of the Ilanga CSP 7 Project allowing for avoidance of sensitivities within the greater study area.

***Power transmission considerations*:** The future Eskom transmission substation on Eskom's CSP site west of Upington, known as the Upington MTS, will be used to connect the Ilanga CSP 7 Project. To ensure that the project can be evacuate its power, the proposed network connection solution will connect the project onsite 132 kV switching station to the Karoshoek Solar Valley 132 kV collector switching station which will connect directly to a New 400/132 kV MTS via a double circuit (D/C) 132 kV, Twin Tern Line, +/- 25.5 km. The 400/132 kV MTS will be connected via a single circuit (S/C) Loop-in, Loop-Out 400 kV, Twin Dinosaur line, +/- 1.0 km into Upington – Nieuwehoop 400 kV Line. The New 400/132 kV MTS will be equipped with 1 x 400/132 kV, 500 MVA Transformer.

The DC 132 kV Twin Tern line can evacuate 832 MVA during N-0. The Karoshoek Solar Valley site already has an Environmental Authorisation of up to 400kV, which will make it easier to implement the strategic alternative solution.

In addition the proposed project site is situated within the proposed Central Corridor defined in terms of Eskom's Electricity Grid Infrastructure Strategic Environmental Assessment (SEA) conducted by the CSIR (refer to **Figure 2.2.**)[9].

[9] These corridors are expected to be gazetted in 2016.

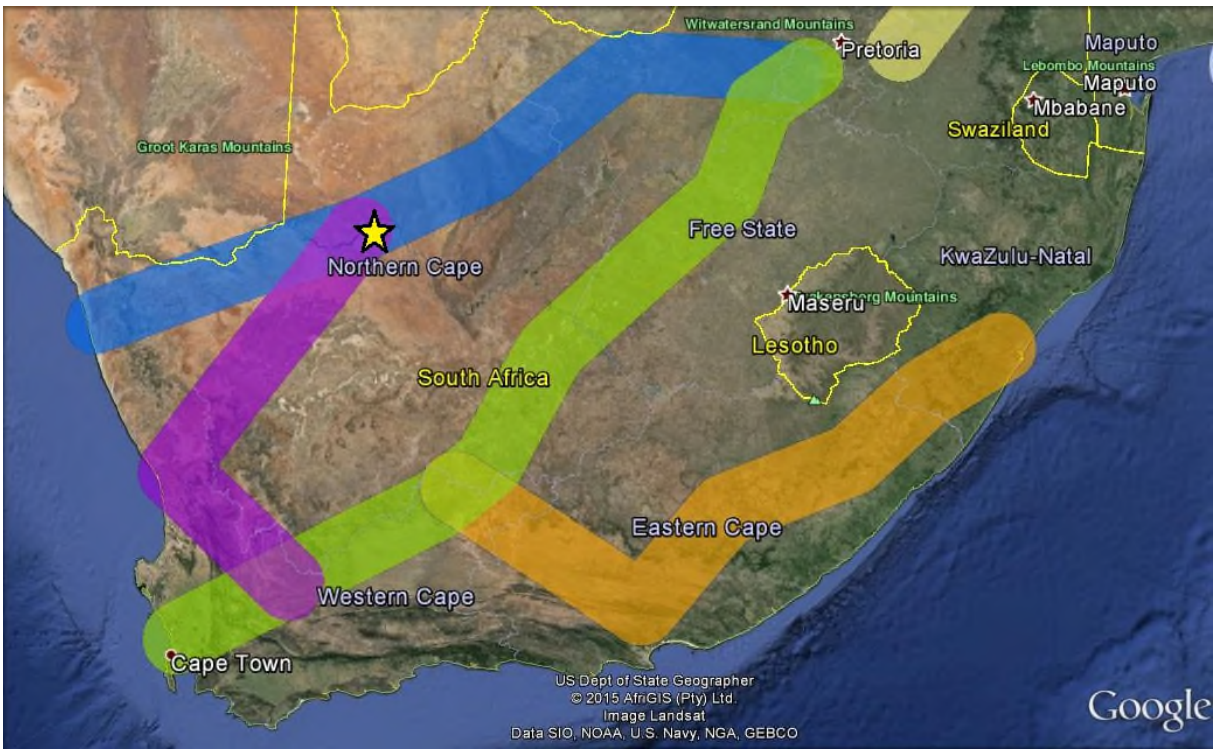

Figure 2.2: Eskom "Critical Power" Corridors as identified through the Eskom SEA. The Ilanga CSP 7 Project site is within the northern corridor as indicated on the map.

***Site access*:** The study site is accessible via the N10 between Upington to Groblershoop. Access off the N10 is proposed to be via a gravel road located on Portion 2 of the Farm Matjiesrivier 41. This road will need to be upgraded to accommodate the traffic associated with the construction of the facility. Alternatively, access can be gained via a main road situated to the west of the site.

Current Land use considerations and land availability: The farm portions are currently used mainly for livestock farming. Cultivation is only undertaken in close proximity to the Orange River, approximately 22km to the north of the proposed development area. No significant portion of the vegetation on the site has been transformed or altered to a semi-natural state due to current limited use of the site. A few twin tracks and gravel farm roads traverse the study site. In addition, the landowner has agreed to the use of the site for the development of a CSP facility.

Climatic conditions and Solar Irradiation: Climatic conditions determine the economic viability of a concentrated solar power project as it is directly dependent on the annual direct solar irradiation values for a particular area. The Northern Cape receives the highest average daily direct normal and global horizontal irradiation in South Africa which indicates that the regional location of the project is appropriate for a concentrated solar power project. In addition, the

area which lies to the east of Upington exhibits some of the best solar irradiation in South Africa, and the world (refer to **Figure 2.1**). Direct Normal irradiation (DNI) for the Upington region varies between 2700 and 2900 kWh/m^2/annum. The DNI for the Ilanga CSP 7 Project site is 2849 kWh/m^2/annum. Factors contributing to the preferred location of the project include the relatively high number of daylight hours and the low number of rainy days experienced in this region.

Topography: The site is situated within the described plains landscape with subtle landscape variations. The site is situated at elevations of between 901 m and 918 m above sea level (Avg. Elevation: 912 m) with an average slope of less than 1.5%. Maximum slopes (3% & -5.2%) may be associated with variations caused by outcroppings and small ephemeral tributary lines, running primarily in an east to west direction.

Proximity to Towns with a Need for Socio-Economic Upliftment: The Northern Cape Province, like most of South Africa, is marred by unemployment, inequalities and poverty. To this extent the Ilanga CSP 7 Project is situated in close proximity to the town of Upington and smaller settlements such as Ntsikelelo, Karos and Leerkrans and consequently, local labour would be easy to source, which fits in well with the REIPPPP economic development criteria for socio-economic upliftment. Currently, a large proportion of local labour is used in the mining and agricultural industry. A few negatives related to agricultural employment are that it is very seasonal and it is not always in close proximity to their homes, forcing workers to travel large distances on a daily basis to reach their place of employment. Owing to its proximity to preferred bidder projects, which are in various stages of the development and construction cycles, the project would present a new opportunity for local labour skilled through previous work experience on the preferred bidder plants.

Proximity to Access Road for Transportation of Material and Components: The proximity of the site to the N10 decreases the impact on secondary roads from traffic during the construction and operation phases. As material and components would need to be transported to the project site during the construction phase of the project, the accessibility of the site was a key factor in determining the viability of the project, particularly taking transportation costs (direct and indirect) into consideration and the impact of this on project economics and therefore the ability to submit a competitive bid under the DoE's REIPPPP programme.

2.2.2 Benefits of Renewable Energy

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

Increased energy security: The current electricity crisis in South Africa highlights the significant role that renewable energy can play in terms of power supplementation. In addition, given that renewables can often be deployed in a short timeframe and in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply quality in the short-term, while reducing expensive distribution losses. As a result of the power constraints in the first half of 2015, power generators meant to be the "barely-ever-used" safety net for the system (diesel-fired gas turbines) were running at > 30% average load factor in the first half of 2015. Load shedding occurred during 82 days in the first half of 2015 (out of 181 days). Results of a CSIR Energy Centre study for the period January to June 2015 (CSIR, August 2015), concluded that the already implemented renewable projects (wind and solar) within the country avoided 203 hours of so-called 'unserved energy'. During these hours the supply situation was so tight that some customers' energy supply would have had to be curtailed ('unserved') if it had not been for the renewables. The avoidance of unserved energy cumulated into the effect that during 15 days from January to June 2015 load shedding was avoided entirely, delayed, or a higher stage of load shedding prevented thanks to the contribution of the renewable energy projects[10].

Resource saving: Renewable energy also translates into revenue savings, as fuel for renewable energy facilities is free while compared to the continual purchase of fuel for conventional power stations. Results of a CSIR Energy Centre study for January – June 2015 (CSIR, August 2015) have quantified the contribution from renewable energy to the national power system and the economy over the first 6 months of 2015 compared to the 12 months of 2014:

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

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

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

Economics: As a result of the excellent solar and renewable resources within South Africa and the competitive procurement bidding processes, renewable energy projects are becoming are cheaper forms of energy generation than coal power. Renewables offer excellent value for money to the economy and citizens of South Africa.

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

Climate friendly development: The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner and thereby allows South Africa to contribute towards mitigating climate change through the reduction of greenhouse gas (GHG) emissions. South Africa is estimated to be currently responsible for approximately 1% of global GHG emissions (and circa half of those for which Africa is responsible) and is currently ranked 9th worldwide in terms of per capita carbon dioxide emissions. The renewable energy sector saved South Africa 1.4 million tons of carbon emissions over the first 6 months of 2015[11].

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

Employment creation: The development, procurement, installation, maintenance and management of renewable energy facilities have significant potential for job creation and skills development in South Africa. Employment for South African citizens including people from communities local to the IPP operations in the Northern Cape were 11 652 job years as at the end of June 2015 (Department of Energy. 2015).

[11](http://www.iol.co.za/capetimes/renewable-energy-saving-sa-billions-csir 1.1903409#.VkNjdJq6FeU).

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

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

Protecting the natural foundations of life for future generations: Actions to reduce the country's disproportionate carbon footprint can play an important part in ensuring our role in preventing dangerous anthropogenic climate change; thereby securing the natural foundations of life for generations to come. This is the basis of sustainable development.

2.3 Alternatives Considered for Ilanga CSP 7 Facility

In accordance with the requirements outlined in Appendix 3 of the EIA Regulations 2014, the consideration of alternatives including site, activity, technology and site access alternatives, as well as the "do-nothing" alternative should be undertaken. If no alternative development locations for the activity were investigated, the motivation for not considering such must be included. The follow sections address this requirement.

2.3.1 Site Alternatives

The consideration of the suitability of the site for the proposed project is in line with a typical mitigation hierarchy:

1. First Mitigation: avoidance of adverse impacts as far as possible by use of preventative measures (in this instance a sensitivity analysis assisted in the avoidance of identified ecological, avifaunal and bat sensitive areas)
2. Second Mitigation: minimisation or reduction of adverse impacts to 'as low as practicable' (in this instance minimisation of impact on identified ecological, avifaunal and bat sensitive areas through implementing mitigation)
3. Third Mitigation: remedy or compensation for adverse residual impacts, which are unavoidable and cannot be reduced further.

In determining the preferred site for the proposed facilities within the Karoshoek Solar Valley Development, a 'funnel-down approach' was used and commenced with the consideration of the larger ~11 173 ha site.

The siting of the Ilanga CSP 7 Project is strongly dependent on several factors including land availability, climatic conditions (solar radiation levels), topography,

the location of the site, grid connection, the extent of the site and the need and desirability for the project. The broader site is situated within the identified Solar Development Corridor as defined by the PSDF, as well as within a proposed REDZ (Zone 7) for solar development.

Based on the findings as described in Sections 2.2.1 and 2.3.2 above, the proposed site is considered to be highly favourable and acceptable from a technical perspective. The siting of the Ilanga CSP 7 Project is considered to be acceptable from an environmental perspective. Site specific impacts associated with the proposed site location are discussed in Chapter 6 of this report.

2.3.2. Layout and Design Alternatives

A broader study area of approximately 11 173 ha is being considered, within which the development footprint for the project of approximately 1519 ha in extent would be appropriately located. The site can adequately accommodate the proposed CSP Project with a contracted capacity of 150 MW CSP Project. It is anticipated that the project and its associated infrastructure (i.e. on-site substation and internal roads, etc.) can be appropriately positioned to avoid areas of environmental sensitivity. The environmental sensitivities (visual, ecological, avifaunal and heritage sensitivities) identified during the scoping phase have informed the layout of the proposed facility (refer to **Figure 2.3**). All identified sensitivities and their associated buffers were excluded from the proposed development footprint. The layout has been further refined based on the findings of the specialist studies undertaken within this EIA.

2.3.3 Technology Options

CSP technology was determined as the preferential technology for the proposed development site (i.e. over wind and photovoltaic (PV) technologies) based on the available resource and potential for power generation.

Tower technology has been identified as the preferred technology as this technology has the potential to be much more efficient than trough technology, because they have far higher concentration ratios. Troughs produce heat at around 400 degree Celsius, whereas towers have the potential to produce up to 550 degree Celsius, allowing more efficient use of turbines at higher temperatures. CSP has a huge potential for localisation in comparison to wind and PV. Therefore no technology alternatives will be considered. CSP is preferred over PV technology as it will provide power for longer periods (as a result of storage), and has the potential to provide baseload supply should this be required.

2.2.4 Water source alternatives

CSP technologies function through the generation of steam to drive a conventional steam turbine and generator. Therefore, suitable and sufficient water resources will be required over the life of the facility. During its operation the Ilanga CSP 7 Facility will require approximately 240 000m^3/annum of water during the 30 to 36 month construction phase and 300 000 to 400 000m^3/annum during the operational phase of the project.

The following alternative water sources were considered:

» Piping water from the //Khara Hais Local Municipality or the !Kheis Local Municipality;
» Abstraction from groundwater resources; or
» Abstraction from the Orange River.

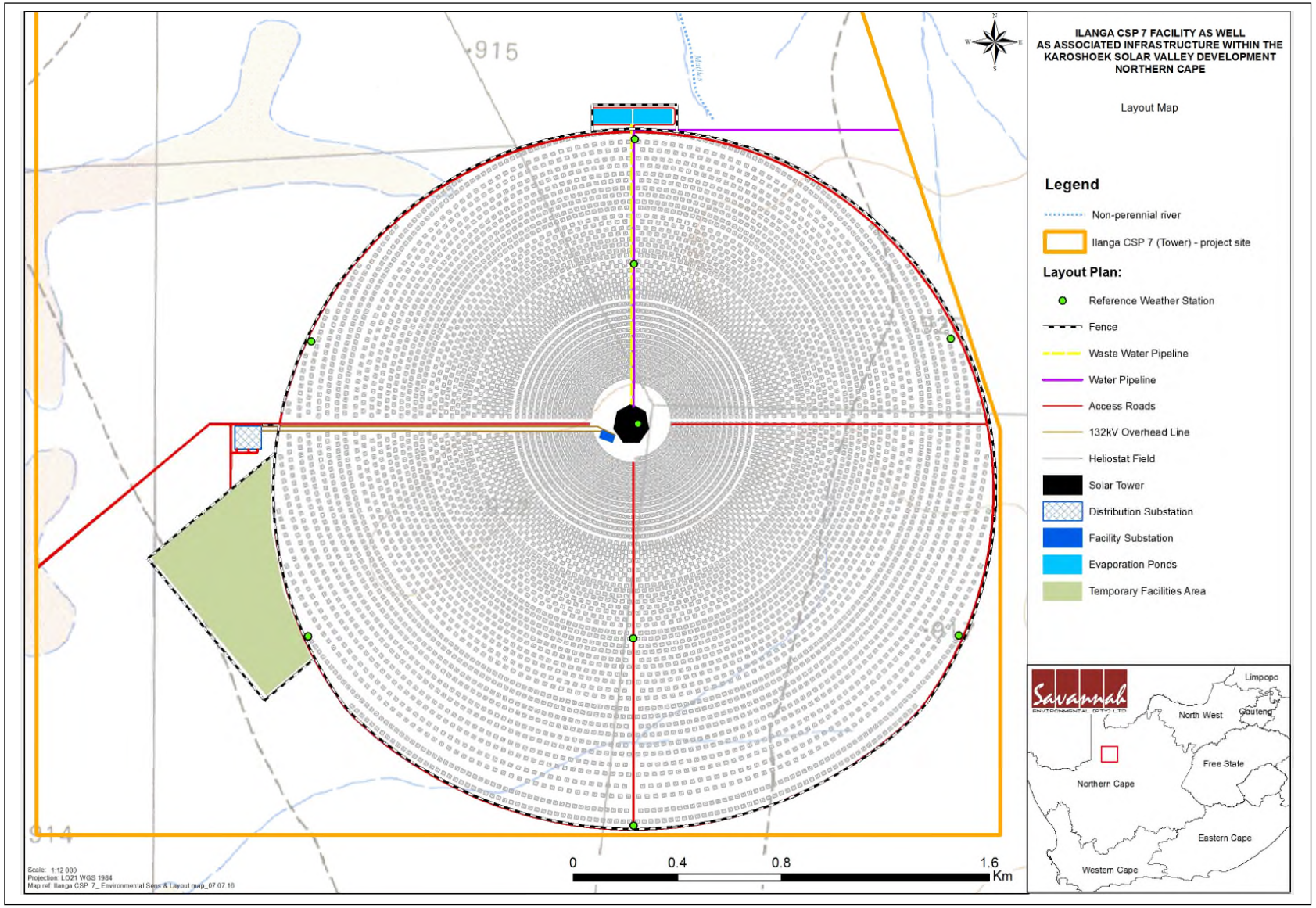

Figure 2.3 Layout Map for the proposed Ilanga CSP 7 Facility (Refer to Appendix P A3 Maps)

Following investigation of these water sources by the applicant, the following conclusions have been made:

» There are no municipal water pipelines within close proximity to the site. It would therefore be required that lengthy pipelines be constructed in order to provide water to the site. This alternative is not considered technically and economically feasible.
» As the area is arid in nature, groundwater supply is limited. Abstraction of this resource would most likely impact on the supply available to local users in the area as a result of the limited yield. This alternative is not considered to be feasible from a technical and environmental (social) perspective.
» The Department of Water and Sanitation (DWS) has been requested to provide an indication that water could be available from the Orange River for the project. This confirmation was still outstanding at the time of compiling this report. Based on previous correspondence with DWS, it is understood that power generation is considered to be a strategic priority and that water would therefore be made available for this purpose. Therefore the abstraction of water from the Orange River is considered a feasible alternative. A water supply pipeline is required to be constructed from the abstraction point to the facility, a distance of 21km. This infrastructure is assessed within a separate Basic Assessment process.

The abstraction of water from the Orange River is therefore considered as the only feasible alternative.

2.2.5 The 'Do-Nothing' Alternative

The 'do-nothing' alternative is the option of not constructing the proposed Ilanga CSP 7 Project. Should this alternative be selected then the benefits of this renewable energy Project will not be realised, even though the generation of electricity from renewable energy resources offers a range of socio-economic and environmental benefits for South Africa.

The electricity demand in South Africa is placing increasing pressure on the country's existing power generation capacity and the resultant restrictions are severely damaging the economy. There is, therefore, a need for additional electricity generation options to be developed throughout the country. The 'do nothing' option in terms of implementing renewable energy projects results in a scenario where a fossil fuel or nuclear facility must rather be developed to provide the required energy demands. Environmental considerations aside, these have long lead times (considerably longer than the time required to implement renewable energy projects) and therefore the implementation of these options would result in delayed implementation and subsequent impacts on the South African economy and its citizens. Furthermore, the development of a renewable energy source, as promoted by

the South African Government would also not be realised, and the reliance on fossil fuel energy sources would not be reduced, as has been committed to.

The purpose of the proposed Ilanga CSP 7 Project is to add new capacity for generation of renewable energy to the national electricity mix and to aid in achieving the goal of a 43% share of all new power generation being derived from independent power producers (IPPs), as targeted by the Department of Energy (DoE). It is fully aligned with government policy – aligns with policy at all three levels of government (see Chapter 3 of this EIA Report) and for it not to be implemented is at odds with said policies.

The 'do-nothing' alternative would result in the additional power from this highly efficient and competitive renewable energy facility not being added to the electricity grid and for the associated socio-economic benefits not being available to enhance the lives of South Africans.

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The "do nothing" option is assessed in Chapter 6 of this EIA Report.

2.4 Concentrated Solar Power as a Power Generation Technology

Concentrated Solar Power (CSP) systems use mirrors or lenses to collect and concentrate the incoming solar radiation (or solar thermal energy) onto a small area. Electricity is produced when the concentrated light is converted to heat, which drives a steam turbine connected to an electrical power generator.

2.4.1 Heliostats and Power Tower Technology proposed for the 150MW Project

The proposed Ilanga CSP 7 Project will consist of a field of heliostats and a central receiver. The project infrastructure will occupy an area of ~1000ha in extent, and will include the following:

» Power plant: A central receiver located on top of the tower and tracking heliostats, including a power block with a steam turbine generator and thermal storage tanks.
» Associated infrastructure: access roads, on-site substation, power line, water abstraction point and supply pipe line, water storage tanks, packaged wastewater treatment plant, lined evaporation ponds, salt or direct steam storage vessels, auxiliary fossil fuel boilers and workshop and office buildings.

Concentrated Solar Power (CSP) Tower technology uses thousands of mirrors to reflect and concentrate sunlight onto a central point to generate heat, which in turn is used to generate electricity. A tower system is comprised of two main component groups, i.e. a) a heat collection system, and b) a conventional generating plant portion. The heat collection system is comprised of mirrors which reflect concentrated sunlight onto a large heat exchanger called a receiver that sits on a tower with a maximum height of 270m high. Within the receiver, fluid flows through the piping that forms the external walls; this fluid absorbs the heat from the concentrated sunlight. The fluid utilised is molten salt, which is heated from 260° to over 538° Celsius.

The collected energy is used to generate steam through a conventional heat exchanger system that is in turn used for electricity generation in a conventional steam turbine and generator[12].

Molten salt is an ideal heat capture medium, as it maintains its liquid state even above 538 ° Celsius, allowing the system to operate at low pressure for convenient energy capture and storage. After passing through the receiver, the molten salt then flows down the piping inside the tower and into a thermal storage tank, where the energy is stored as high-temperature molten salt until electricity is needed.

This technology leverages liquid molten salt as both the energy collection and the storage mechanism, which allows it to separate energy collection from electricity generation. When electricity is required to be generated, the high-temperature molten salt flows into the steam generator, as water is piped in from the water storage tank, to generate steam. Once the hot salt is used to create steam, the cooled molten salt is then piped back into the cold salt storage tank where it will then flow back up the receiver to be reheated as the process continues.

After the steam is used to drive the steam turbine, it is condensed back to water and returned to the water holding tank, where it will flow back into the steam generator when needed. After the molten salt passes though the steam generator, it flows back to the cold tank and is re-used throughout the life of the project. The hot molten salt generates high-quality superheated steam to drive a standard steam turbine at maximum efficiency to generate reliable, non-intermittent electricity during peak demand hours and at night time.

In a typical installation, solar energy collection occurs at a rate that exceeds the maximum required to provide steam to the turbine. The thermal storage system can, therefore, be charged at the same time that the plant is producing power at full

[12] Water is heated, turns into steam and spins a steam turbine which drives an electrical generator. After it passes through the turbine, the steam is condensed in a condenser and recycled to where it was heated; this is known as a Rankine cycle.

capacity. The ratio of the thermal power provided by the heliostat field and receiver to the peak thermal power required by the turbine generator is called the solar multiple. A power tower could potentially operate for 40% - 65% of the year (as from such storage, the system could provide energy, even in cloudy conditions or at night) without the need for a back-up fuel source. However, without energy storage, solar technologies are limited to annual capacity factors near 25% - 30%. Today, the most used solution is the usage of steam or molten salt storage vessels that store the steam which is used when required to generate electricity. Determining the optimum storage size to meet power-dispatch requirements is an important part of the system design process. Storage vessels can be designed with sufficient capacity to power a turbine for up to 6 to 8 hours economically.

The final waste product from the entire plant will be effluent (brine) that will be handled in a zero discharge method i.e. the final effluent will be evaporated by means of an evaporation pond. A series of evaporation ponds will be constructed over an area of approximately 8ha.

2.5 Proposed Activities during the Project Development Stages

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

2.5.1. Design and Pre-Construction Phase

Conduct Surveys

Prior to initiating construction, a number of surveys will be required including, but not limited to:

» Geotechnical survey – a detailed survey of the geology and topography of the development footprint will be undertaken. The geotechnical study will focus on topographical constraints, foundation conditions, potential for excavations, and the availability of natural construction materials. The geotechnical examination will include surface and subsurface exploration, soil sampling and laboratory analysis.
» Site survey - will be done for the finalisation of the design layout of the solar arrays, and the other associated infrastructure. The micro-siting footprint considered the environmental sensitivity identified within this EIAr.

2.5.2. Construction Phase

Establishment of Access Roads to the Site

The study site is accessible via the N10 from Upington to Groblershoop. Access to the site will be off the N10 located to the north of the site.

Depending on the technology choices there will be a 1.5 km internal surfaced access road of approximately 8 m wide which will lead directly to the power island. Between the heliostats there will be a stabilised gravel track that would be used for maintenance purposes during the operational phase. The final layout of the access roads will be determined following the identification of site related sensitivities.

Undertake Site Preparation

Site preparation activities will include clearance of vegetation at the footprint of each component and the establishment of internal access roads. These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site.

Transport of Components and Equipment to Site

The components for the proposed project will be transported to site in sections by road. Some of the Project components may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)[13] by virtue of the dimensional limitations (i.e. length and weight). Components of various specialised construction and lifting equipment are required (e.g. for the power tower) and will need to be transported to site. In addition to the specialised lifting equipment/cranes, the typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.) as well as components required for the establishment of the substation and power line.

The equipment will be transported to the site using appropriate National, Provincial and local roads, and then the dedicated access/haul road to the site itself. In some instances, the dimensional requirements of the loads to be transported during the construction phase (length/height) may require alterations to the existing road infrastructure (e.g. widening on corners), and protection of road-related structures (i.e. bridges, culverts, etc.) as a result of abnormal loading.

Establishment of Laydown and Assembly Areas on Site

Laydown and assembly (including the mirror assembly area) areas including storage areas of approximately 10ha will be required for the typical construction equipment which will be required on site. Hardstand areas will need to be established for operation of cranes used on the site.

Construct Power Island and Substation

A steam turbine and generator will be housed within a building referred to as the power island. A generator transformer and a small substation will be established outside the building. The position of the power-island and substation within the site footprint will be informed by the final positioning of the solar generating components.

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

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

Establishment of Ancillary Infrastructure

Ancillary infrastructure includes water abstraction point and supply pipeline, packaged waste treatment plant, a water treatment plant and water storage facilities on the site, and a blow down or evaporation pond (for wastewater from the generation process). A heliostat assembly plant, temporary storage area, control room, office area, chemical storage area, security gate building, contractor's temporary offices, and critical staff accommodation, will also be required.

The establishment of these facilities/buildings will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction.

Water Usage Associated with the Ilanga CSP 7 Project

Water treatment works will be required, as well as blow down brine handling. The water treatment works will include a primary treatment or basic sand filtration plant at the supply source, as well as a reverse osmosis and deionisation packaged water treatment plant at the site. A water supply pipeline will be established from the abstraction point on the Orange River to the site. Abstracted water will be pumped to a holding reservoir for supply buffering. A second storage reservoir will be located on the identified site itself. The water use of the project will include (refer to Table 2.2):

» Makeup water for the steam generator
» Water for mirror washing
» Service water
» Potable water
» Fire protection water

Table 2.2: Estimated water consumption for one 150MW CSP Plant

Description: consumption	**Approximate annual use (m^3/year)**
Raw water consumption	Up to 400 000
Description: water uses	**Approximate annual use (m^3/year)**
Mirror washing	80 000
Boiler makeup	60 000
Potable and other	9 000
Evaporation losses	85 000
Wastewater to evaporation ponds	Up to 150 000

In order to reduce the overall water consumption and the requisite sizing of the evaporation ponds, service water will first be used as makeup. Water conditioning chemicals may be fed into the makeup water to minimise corrosion and to inhibit mineral scale formation. The blow down from the circulating water will be continually treated by lime-softening clarification and filtration processes and then delivered to a clear well where the water will be treated by reverse osmosis prior to being used for other plant requirements. Prior to the reverse osmosis process, ion-exchange softeners will be used to remove any dissolved hardness minerals that remain after the clarifier. The discard brine stream will be delivered to the evaporation ponds.

Undertake Site Rehabilitation

Once construction is completed and once all construction equipment is removed, the site must be rehabilitated where practical and reasonable. On full commissioning of the Project, any access points to the site which are not required during the operational phase must be closed and prepared for rehabilitation.

Storage and Handling of Hazardous substances

The construction phase will require the handling and storage of materials including hydraulic oil, fuel, cement and fly ash (for use in concrete batching plant) with an estimated volume of 300-400 m^3 (cubic meters) at any one time (mainly made up of the batching material).

2.5.3. Operational Phase

The proposed concentrated solar power project is expected to be operational for a minimum of 20 years. The project will operate continuously, 7 days a week, and has the ability to operate 18/7 (as a result of storage). While the project will be largely self-sufficient upon completion of construction, monitoring and periodic, as needed maintenance activities will be required. Key elements of the Operation and Maintenance plan include monitoring and reporting the performance of the project, conducting preventative and corrective maintenance, receiving visitors, and maintaining security of the project.

The operational phase is discussed in more detail below. A simplified flow chart of the general operation of a CSP Plant showing inputs and outputs of the process is shown in the table below.

Table: 2.3: Process Flow For A Solar Thermal Plant – Operational Phase Only

INPUT	PROCESS	OUTPUT
Solar energy	**Solar thermal energy generation process**	*Positive outputs:* Energy / electricity
Water		*Negative outputs:* Wastewater

Dosing chemicals for water treatment plant		*Negative outputs:* Waste water / brine stream to evaporation ponds

Water use and treatment

A small water treatment works will be required, as well as blow down brine handling. The water treatment works will include a primary treatment or basic sand filtration plant at the supply source, as well as a reverse osmosis and deionisation packaged water treatment plant at the site.

Water for the proposed facilities will be stored in a holding reservoir. A second storage reservoir will be located on the identified site itself. It is estimated that 400 000m^3 of water per annum will be required for the proposed project (150MW in total). The water use of the project will include:

» Makeup water for the steam generator
» Water for mirror washing
» Service water
» Potable water
» Fire protection water

Storage and Handling of Hazardous substances

The operation phase will require the handling and storage of materials such as sodium hydroxide, hydrochloric acid, sulphuric acid, ferric chloride, lubrication oil, amine, phosphate, carbohydrazide, closed corrosion inhibitor with an approximate total of 150 m^3 (cubic meters) at any one time, fuel for the auxiliary steam boiler with an estimated total of 50 m^3 (cubic meters) at any one time.

2.5.4 Decommissioning Phase

The CSP Project is expected to have a design lifespan of approximately 20 - 25years (extendable with appropriate refurbishment), and the power plant infrastructure would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the Project discussed in this EIA would comprise the disassembly and replacement of the individual components with more appropriate technology/infrastructure available at that time.

The following decommissioning activities will form part of the project scope.

Site Preparation

Site preparation activities will include confirming the integrity of the access to the site to accommodate the required equipment (e.g. lay down areas, construction platform) and the mobilisation of decommissioning equipment.

Disassemble and Replace Existing Components

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

Future plans for the site and infrastructure after decommissioning

One the site has be rehabilitated and can be returned to the agricultural or other beneficial land-use.

REGULATORY AND PLANNING CONTEXT CHAPTER 3

3.1. Legal Requirements as per the EIA Regulations for the undertaking of an Environmental Impact Assessment Report, 2014

This chapter of the EIA report includes the following information required in terms of Appendix 3: Content of Environmental Impact Assessment Reports:

Requirement	Relevant Section
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 responds to the legislation and policy context.	The policies and legislation associated with the development is included in Sections 3.2-3.4.

3.2. Strategic Electricity Planning in South Africa

The need to expand electricity generation capacity in South Africa is based on national policy and is informed by on-going strategic planning undertaken by the Department of Energy (DoE). The hierarchy of policy and planning documentation that support the development of renewable energy projects such as the Ilanga CSP 7 Project is illustrated in **Figure 3.1**. These policies are discussed in more detail in the following sections, along with the provincial and local policies or plans that have relevance to the development of the proposed Ilanga CSP 7 Project.

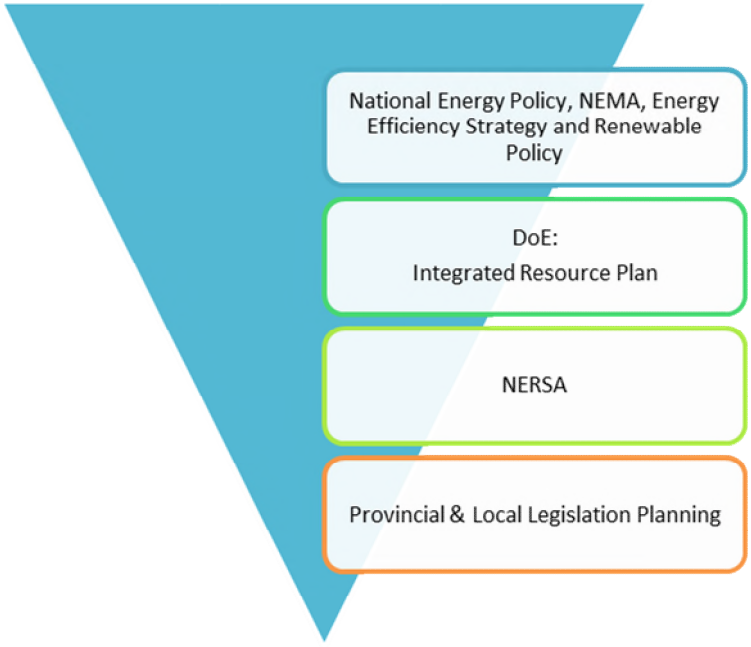

Figure 3.1: Hierarchy of electricity policy and planning documents

The regulatory hierarchy for an energy generation project of this nature consists of three tiers of authority who exercise control through both statutory and non-statutory instruments – that is National, Provincial and Local levels.

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

» *Department of Energy (DoE)*: This Department is responsible for policy relating to all energy forms, including renewable energy, and is responsible for forming and approving the IRP (Integrated Resource Plan for Electricity).
» *National Energy Regulator of South Africa (NERSA):* This body is responsible for regulating all aspects of the electricity sector, and will ultimately issue licenses for renewable energy developments to generate electricity.
» *Department of Environmental Affairs (DEA):* This Department is responsible for environmental policy and is the controlling authority in terms of NEMA and the EIA Regulations. The DEA is the competent authority for this project, and charged with granting the relevant environmental authorisation.
» *The South African Heritage Resources Agency (SAHRA):* SAHRA is a statutory organisation established under the National Heritage Resources Act, No 25 of 1999, as the national administrative body responsible for the protection of South Africa's cultural heritage.
» *Department of Transport – South African Civil Aviation Authority (SACAA):* This department is responsible for aircraft movements and radar, which are aspects that influence renewable energy development location and planning.
» *South African National Roads Agency Limited (SANRAL):* This Agency is responsible for the regulation and maintenance of all national routes.
» *Department of Water and Sanitation (DWS):* This Department is responsible for water resource protection, water use licensing and permits.
» *The Department of Agriculture, Forestry and Fisheries (DAFF):* This Department is the custodian of South Africa's agriculture, fisheries and forestry resources and is primarily responsible for the formulation and implementation of policies governing the Agriculture, Forestry and Fisheries Sector. This Department is also responsible for the issuing of permits for impacts on protected tree species.
» *The Department of Science and Technology:* This department is the administrating authority for the Astronomy Geographical Advantage Act (Act 21 of 2007).

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

» *Provincial Government of the Northern Cape – Department of Environment and Nature Conservation (Northern Cape DENC).* This department is the commenting authority for this project as well as being responsible for issuing of other biodiversity and conservation-related permits.

» *Department of Transport and Public Works - Northern Cape.* This department is responsible for roads and the granting of exemption permits for the conveyance of abnormal loads on public roads.
» *Northern Cape Department of Agriculture and Rural Development:* This is the provincial authority responsible for matters affecting agricultural land.
» *Ngwao Boswa ya Kapa Bokone (Northern Cape Heritage Authority):* This body is responsible for commenting on heritage related issues in the Northern Cape Province.

At **Local Level** the local and municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. In the Northern Cape, the //Khara Hais Local Municipality and !Kheis Local Municipality, which fall within the jurisdiction of the ZF Mgcawu (previously Siyanda) District Municipality play a role.

» In terms of the Municipal Systems Act (Act No 32 of 2000) it is compulsory for all municipalities to go through an Integrated Development Planning (IDP) process to prepare a five-year strategic development plan for the area under their control.
» *Namakwa District Biodiversity Sector Plan* (Desment & Marsh 2008) - Bioregional planning involves the identification of priority areas for conservation and their placement within a planning framework of core, buffer and transition areas. These could include reference to visual and scenic resources and the identification of areas of special significance, together with visual guidelines for the area covered by these plans.

3.3 National Policy and Planning

3.3.1 The Kyoto Protocol, 1997

South Africa's electricity is mainly generated from coal-based technologies. South Africa accounts for ~38 % of Africa's CO_2 (a greenhouse gas contributing to climate change) from burning of fossil fuels and industrial processes. The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change. South Africa ratified the Kyoto Protocol in 2002. The Kyoto Protocol requires developing countries to reduce its greenhouse gas emissions through actively cutting down on using fossil fuels, or by utilising more renewable resources. Therefore certain guidelines and policies (discussed further in the sections below) were put in place for the Government's plans to reduce greenhouse gas emissions. The development of renewable energy projects (such as the proposed CSP Project) is therefore in line with South Africa's international obligations in terms of the Kyoto Protocol. A second commitment period commenced from 1 January 2013, and extends to 31 December 2020.

3.3.3. United Nations Framework Convention on Climate Change and COP21 – Paris Agreement

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

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

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

COP 21 was held in Paris from 30 November to 12 December 2015. From this conference, an agreement to tackle global warming was reached between 195 countries. This Agreement shall be open for signature and subject to ratification, acceptance or approval by States and regional economic integration organizations that are Parties to the Convention from 22 April 2016 to 21 April 2017. Thereafter, this Agreement shall be open for accession from the day following the date on which it is closed for signature. The agreement can only enter into force once it has been ratified by 55 countries, representing at least 55% of emissions. South Africa signed this agreement in April 2016.

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

(a) Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5

°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;

(b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production;

(c) Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.

In order to achieve the long-term temperature goal set out in Article 2 of the Agreement, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties, and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty.

In working towards this goal, advanced economies have already included renewables in their energy mix and have planned to increase their use in order to meet their mitigation goals: Japan aims to derive 22-24% of its electricity production from renewable sources by 2030 and the European Union plans for them to reach 27% of its final energy consumption. Developing countries are also playing their part, including South Africa which has included a goal of 17,8GW of renewables by 2030 within the IRP.

South Africa supports the adoption of the Paris Agreement and will be required to communicate a nationally determined contribution to the global response to climate change every five years from 2020.

3.3.3 White Paper on the Renewable Energy Policy of the Republic of South Africa (2003)

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

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

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

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

- » ensuring that equitable resources are invested in renewable technologies;
- » directing public resources for implementation of renewable energy technologies;
- » introducing suitable fiscal incentives for renewable energy and;
- » creating an investment climate for the development of renewable energy sector.

The objectives of the White Paper are considered in six focal areas, namely: financial instruments, legal instruments, technology development, awareness raising, capacity building and education, and market based instruments and regulatory instruments. The policy supports the investment in renewable energy facilities as they contribute towards ensuring energy security through the diversification of energy supply, reducing GHG emissions and the promotion of renewable energy sources.

The White Paper set a target of 10 000GWh to be generated from renewable energy by 2013. The target was reviewed during the renewable energy summit of 2009 held in Pretoria. The summit raised the issue over the slow implementation of renewable energy projects and the risks to the South African economy of committing national investments in the energy infrastructure to coal technologies. Other matters that were raised include potential large scale roll out of solar water heaters and enlistment of Independent Power Producers to contribute to the diversification of the energy mix.

Further to the South African government's commitment in August 2011 to support the development of 3,725MW of renewable energy capacity, the Department of Energy ("DoE") initiated the Renewable Energy Independent Power Producer Procurement Program ("REIPPPP") to procure renewable energy from the private sector in a series of rounds. To date, the DoE has procured more than 6 000MW of renewable energy capacity from 92 independent producers, with 37 having started commercial operation, adding 1,860MW to the grid.

3.3.4. The National Energy Act (2008)

The National Energy Act was promulgated in 2008 (Act No 34 of 2008). One of the objectives of the Act was to promote diversity of supply of energy and its sources. In this regard, the preamble makes direct reference to renewable resources, including solar thermal energy:

> *"To ensure that diverse energy resources are available, in sustainable quantities, and at affordable prices, to the South African economy, in support of economic growth and poverty alleviation, taking into account environmental management requirements; to provide for increased generation and consumption of renewable energies (Preamble)."*

The National Energy Act aims to ensure that diverse energy resources are available, in sustainable quantities and at affordable prices, to the South African economy in support of economic growth and poverty alleviation, taking into account environmental management requirements and interactions amongst economic sectors, as well as matters relating to renewable energy. The Act provides the legal framework which supports the development of renewable energy facilities for the greater environmental and social good.

3.3.5. The Electricity Regulation Act, 2006 (Act No. 4 of 2006), as amended

The Electricity Regulation Act, 2006, replaced the Electricity Act, 1987 (Act No. 41 of 1987), as amended, with the exception of Section 5B, which provides for the funds for the energy regulator for the purpose of regulating the electricity industry. The Act establishes a national regulatory framework for the electricity supply industry & introduces the National Energy Regulator as the custodian and enforcer of the National Electricity Regulatory Framework. The Act also provides for licences & registration as the manner in which generation, transmission, distribution, trading & the import & export of electricity are regulated.

3.3.6. Renewable Energy Policy in South Africa

Internationally there is increasing development of the use of renewable technologies for the generation of electricity due to concerns such as climate change and exploitation of resources. In response, the South African government ratified the United Nations Framework Convention on Climate Change (UNFCCC) in August 1997 and acceded to the Kyoto Protocol, the enabling mechanism for the convention, in August 2002. In addition, national response strategies have been developed for both climate change and renewable energy.

Investment in renewable energy initiatives, such as the proposed Ilanga CSP 7 Project, is supported by the National Energy Policy (DME, 1998). This policy recognises that renewable energy applications have specific characteristics which need to be considered. The Energy Policy is "*based on the understanding that renewables are*

energy sources in their own right, and are not limited to small-scale and remote applications, and have significant medium- and long-term commercial potential." In addition, the National Energy Policy states that "*Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future*".

The support for the Renewable Energy Policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind, and that renewable applications are, in fact, the least cost energy service in many cases from a fuel resource perspective (i.e. the cost of fuel in generating electricity from such technology); more so when social and environmental costs are taken into account. In spite of this range of resources, the National Energy Policy acknowledges that the development and implementation of renewable energy applications has been neglected in South Africa.

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

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

3.3.7. National Development Plan

The National Development Plan (NDP) contains a plan aimed at eliminating poverty and reducing inequality by 2030. The NDP identifies 9 key challenges and associated remedial plans. Managing the transition towards a low carbon national economy is identified as one of the 9 key national challenges. Expansion and acceleration of commercial renewable energy is identified as a key intervention strategy.

The proposed project will support many of the objectives of the National Development Plan (NDP). Some of these objectives are listed below:

» Create 11 million jobs by 2030; and
» Procuring about 20 000MW of renewable electricity by 2030.

Infrastructure is a key priority of the NDP, which identifies the need for South Africa to invest in a strong network of economic infrastructure to support the country's medium- and long-term economic and social objectives. The NDP has been approved and adopted by government and has received strong endorsement from broader society. The plan sets out steps that aim to ensure that, in 20 years, South Africa's energy system looks very different to the current situation: coal will contribute proportionately

less to primary-energy needs, while gas and renewable energy resources – especially wind, solar and imported hydroelectricity – will play a much larger role.

3.3.8. Integrated Energy Plan

The development of a national Integrated Energy Plan (IEP) was envisaged in the White Paper on Energy Policy of 1998 and the Minister of Energy, as entrenched in the National Energy Act of 2008, is mandated to develop and publish the IEP on an annual basis. The IEP takes existing policy into consideration and provides a roadmap of the future energy landscape for South Africa which guides future energy infrastructure investments and policy development.

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

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

Eight key objectives for energy planning were identified:

» Objective 1: Ensure the security of supply
» Objective 2: Minimise the cost of energy
» Objective 3: Increase access to energy
» Objective 4: Diversify supply sources and primary sources of energy
» Objective 5: Minimise emissions from the energy sector
» Objective 6: Promote energy efficiency in the economy
» Objective 7: Promote localisation and technology transfer and the creation of jobs
» Objective 8: Promote the conservation of water

The IEP recognises the potential of renewable energy for power generation.

3.3.9. Final Integrated Resource Plan 2010 - 2030

The Integrated Resource Plan (IRP) 2010-30 was promulgated in March 2011. The primary objective of the IRP 2010 is to determine the long term electricity demand and detail how this demand should be met in terms of generating capacity, type, timing and cost. However, the IRP 2010 also serves as input to other planning functions, *inter alia* economic development, and funding, environmental and social policy formulation. The accuracy of the IRP 2010 is to be improved by regular reviews and updates, and a draft revised Plan is currently available for public comment. The IRP 2010 projected that an additional capacity of up to 56 539MW of generation capacity will be required to support the country's economic development and ensure adequate reserves over the next twenty years. The required expansion is more than two times the size of the existing capacity of the system.

The current iteration of the Integrated Resource Plan (IRP) for South Africa, initiated by the Department of Energy (DoE) after a first round of public participation in June 2010, led to the Revised Balanced Scenario (RBS) that was published in October 2010. The document outlines the proposed generation new build fleet for South Africa for the period 2010 to 2030. This scenario was derived based on the cost-optimal solution for new build options (considering the direct costs of new build power plants), which was then "balanced" in accordance with qualitative measures such as local job creation. In addition to all existing and committed power plants, the RBS included a nuclear fleet of 9.6 GW; 6.3 GW of coal; 17.8 GW of renewables (including wind and solar); and 8.9 GW of other generation sources. This means that 75% of new generation capacity by 2030 will be derived from energy sources other than coal.

3.3.10. Strategic Integrated Projects

The Presidential Infrastructure Coordinating Committee (PICC) are integrating and phasing investment plans across 18 Strategic Infrastructure Projects (SIPs) which have five core functions: to unlock opportunity, transform the economic landscape, create new jobs, strengthen the delivery of basic services, and support the integration of African economies. A balanced approach is being fostered through greening of the economy, boosting energy security, promoting integrated municipal infrastructure investment, facilitating integrated urban development, accelerating skills development, investing in rural development, and enabling regional integration.

SIP 8 of the energy SIPs supports the development of the solar energy facility which is as follows:

» SIP 8: Green energy in support of the South African economy: Support sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the Integrated Resource Plan (IRP 2010) and supports bio-fuel production facilities.

3.3.11. Renewable Energy Development Zones (REDZs)

The DEA has been mandated to undertake a Strategic Environmental Assessment (SEA) process. The wind and solar photovoltaic SEAs are being undertaken in order to identify geographical areas most suitable for the rollout of wind and solar photovoltaic energy projects and the supporting electricity grid network. The DEA and CSIR have released a map with focus areas best suited for the roll-out of wind and solar photovoltaic energy projects in South Africa. The aim of the assessment is to designate renewable energy development zones (REDZs) within which such development will be incentivised and streamlined. The proposed Ilanga CSP 7 falls within the identified geographical areas / focus area most suitable for the rollout of the development of solar energy projects (called "Upington Solar priority area") within the Northern Cape Province, as shown in **Figure 3.2**.

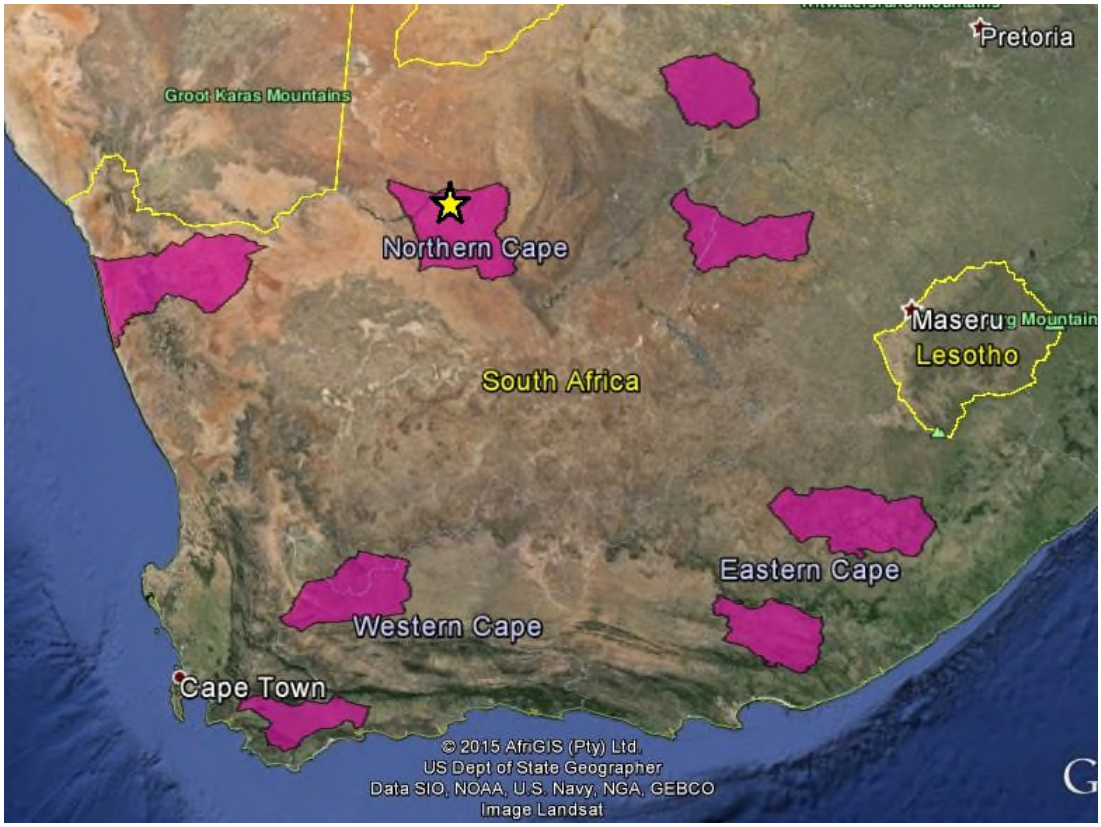

Figure 3.2: Renewable Energy Development Zones (REDZ) (CSIR 2014), Ilanga CSP 7 Project (shown by the yellow star) falls within REDZ 7

3.4. Provincial and Local Level Developmental Policy

3.4.1 Northern Cape Province Provincial Growth and Development Strategy

The Northern Cape Provincial Growth and Development Strategy (PGDS) sets the tone for development planning and outlines the strategic planning direction in the province. Planning for the promotion of economic growth and social development lies at the core

of the Government's responsibility to provide a better life for the nation. It is essential to ensure that planning is integrated across disciplines, coordinated within and between different planning jurisdictions and aligned with the budgeting processes of national, provincial and local government. The core purpose of the Northern Cape PGDS is to enable stakeholders from public and private sectors, together with labour and civil society, to determine a plan for sustainable growth and development of the Northern Cape. The main objectives set by the Northern Cape PGDS for development planning in the province are as follows:

» Promoting growth, diversification and transformation of the provincial economy
» Poverty reduction through social development
» Developing requisite levels of human and social capital
» Improving the efficiency and effectiveness of governance and other development institutions
» Enhancing infrastructure for economic growth and social development

The Northern Cape PGDS aims at building a prosperous, sustainable, growing provincial economy to eradicate poverty and improve social development. The proposed solar energy facility will contribute to growth and development of the province by expanding the economic base, diversifying the economy and creating employment opportunities, which will contribute towards reducing poverty.

3.4.2 Northern Cape Provincial Local Economic Development (LED) Strategy (2009)

The Northern Cape Local Economic Development (LED) strategy is intended to build a shared understanding of LED in the province and put into context the role of local economies in the provincial economy. It seeks to mobilise local people and local resources in an effort to fight poverty. The Northern Cape LED strategy investigated the options and opportunities available to broaden the local economic base of the province in order to promote the creation of employment opportunities and the resultant spin-off effects throughout the local economy. Areas of opportunity include:

» Livestock products
» Game farming
» Horticulture
» Agriculture
» Ago-related industries
» Tourism
» Manganese and iron Ore
» Beneficiation of minerals
» Renewable energy

The purpose of the LED is to build up the economic capacity of a local area to improve its economic future and quality of life for all. The LED provides local municipalities with

leadership and direction in policy making, in order to administer policy, programmes and projects, and to be the main initiator of economic development programmes through public spending. It is noted in the LED that renewable energy is an area of opportunity to broaden the local economic base and promote the creation of employment opportunities as well as local economy spin-off effects.

3.3.3. Northern Cape Provincial Development and Resource Management Plan / Provincial Spatial Development Framework (PSDF) (2012)

As part of the development planning process underlies the formulation of the Northern Cape Provincial Spatial Development Framework (PSDF). The PSDF not only gives effect to national spatial development priorities but it also sets out a series of provincial, district and local development priorities for the space economy of the Northern Cape.

The Northern Cape PSDF is premised upon and gives effect to the following five strategic objectives of the National Strategy for Sustainable Development (NSSD 2011-2014):

» Enhancing systems for integrated planning and implementation
» Sustaining our ecosystems and using natural resources efficiently
» Towards green economy
» Building sustainable communities
» Responding effectively to climate change

The PSDF makes reference to the need to ensure the availability of energy. Under the economic development profile of the Northern Cape PSDF, the White Paper on Renewable Energy Policy (2003) discussed a target of 10 000GWh of energy to be produced from renewable energy sources. It was also stated that the total area of high radiation in South Africa amounts to approximately 194 000km^2, of which the majority falls within the Northern Cape. It is estimated that, if the electricity production per km^2 of mirror surface in solar thermal power stations were 30.2MW and only 1% of the area of high radiation were available for solar generation, then generation potential would equate to approximately 64GW. A mere 1.25% of the area of high radiation could thus meet projected South African electricity demand in 2025 (80GW). It was also stated in the Northern Cape PSDF that the implementation of large Concentrating Solar Power (CSP) plants has been proposed as one of the main contributors to reducing greenhouse gas emission in South Africa. The Northern Cape PSDF also discusses economic development and that it typically responds to the availability of environmental capital (e.g. water, suitable agricultural soil, mining resources etc.) and infrastructural capital (e.g. roads, electricity, bulk engineering services etc.); over time this has resulted in the distinct development regions and corridors. The development corridors of the Northern Cape are demonstrated in **Figure 3.3**, with the Solar Corridor situated in the Northern Cape represented in

yellow. One of the policies in the NC PSDF is for renewable energy sources (e.g. Wind, solar, biomass, and domestic hydro-electricity generation) to comprise 25% of the province's energy capacity by 2020; thereby the proposed development will assist in contributing to the province's renewable energy capacity.

3.5. District and Local Authority Level Developmental Policy

These strategic policies at the district and local level have similar objectives for the respective areas, namely to accelerate economic growth, create jobs, uplift communities and alleviate poverty. The proposed development is considered to align with the aims of these policies, even if contributions to achieving the goals therein are only minor. The ZF Mgcawu District Municipality (ZFMDM) was previously known as Siyanda District Municipality (the name was changed on 1 July 2013, however the latest policies still refer to the ZFMDM as Siyanda District Municipality).

3.5.1 Siyanda (ZF Mgcawu) District Municipality Growth and Development Strategy (2007)

The Siyanda District Growth and Development Strategy (Siyanda DGDS) has a longer range planning horizon, and thus focusses on the short, medium and long term. The Siyanda DGDS emphasises development partnerships with other stakeholders, such as national, provincial government, the private sector, labour and the civil society, and it acts as a platform for targeted strategic interventions in terms of the following overarching strategic priorities/objectives/focus areas;

» To encourage economic growth and development, thereby making the economy of Siyanda nationally and globally competitive and more focused;
» To establish local government structures that will ensure democratic, responsible and equitable governance, as well as effective service delivery;
» To manage the physical integration of the constituent municipalities and their comprising towns;
» To ensure the communities well-being by addressing poverty and making essential services available, accessible and affordable;
» To ensure a safe and secure environment by making community safety services both available and accessible;
» To enhance Siyanda's provincial and national status as the destination of choice for investment and access to Africa;
» To care for the natural and cultural resources by preserving, utilising and enhancing them.

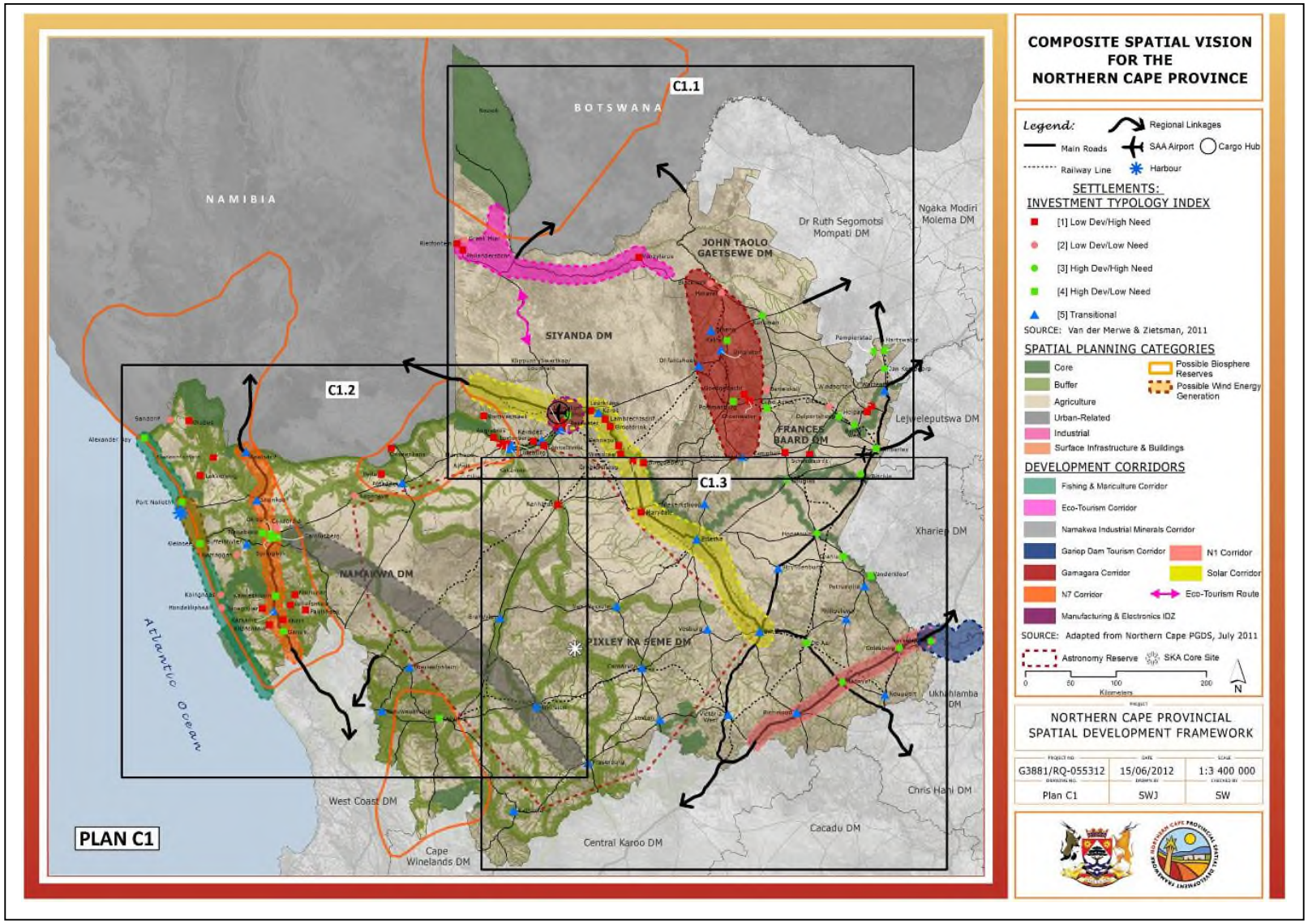

Figure 3.3: Development regions and corridors of the Northern Cape (Source: Northern Cape PSDF 2012)

The overarching direction of the Siyanda DGDS articulates a vision for economic growth and development, social and human development, justice and crime prevention as well as good governance. The proposed development will contribute to economic growth and development, which will in turn help eradicate poverty through job creations in the region, which is in line with the Siyanda DGDS.

3.4.2 Siyanda (ZF Mgcawu) District Municipality Integrated Development Plan (IDP) (2012-2017)

The Siyanda (now called ZF Mgcawu) District Municipality IDP has a vision to provide basic services to all in the municipality. The main mission of the IDP is to enhance economic development for the benefit of the community of the district area. The strategic and development objectives of the IDP include:

» To monitor and determine the housing backlogs in the district as well as to inform the public on housing information;
» To assess and provide targeted support improving institutional capacity and service delivery capabilities of local municipalities;
» To promote environmental health and safety of communities in the district through the proactive prevention, mitigation, identification and management of environmental health services, fire and disaster risks;
» To promote safety of communities in the district through the proactive prevention, mitigation, identification and management of fire and disaster risks;
» To facilitate the development of sustainable regional land use, economic, spatial and environmental planning frameworks that will support and guide the development of a diversified, resilient and sustainable district economy.

The proposed development will contribute to employment creation and economic growth, which in turn will have a positive multiplier effect on the local area through income expenditure, therefore supporting the Siyanda IDP.

3.5.3 //Khara Hais Local Municipality Integrated Development Plan (IDP) (2012-2017)

Ten Key Priority Issues (KPIs) were identified based on the challenges faced by the municipality. These KPIs were linked to the municipality's eight Key Performance Areas (KPAs) that is in line with the six National Key Focal Areas and the development objectives of the municipality.

KPA 1: Economic Growth and Development (Focal Area 4: LED)
Development objective(s):

- » Graduate people out of poverty by facilitating development and empowerment initiatives in order to create sustainable job opportunities
- » Market, develop and co-ordinate tourism in //Khara Hais
- » Create an environment for business establishment and support initiatives (i.e. increase in the number of businesses; entrepreneurial support)
- » Promote external investment opportunities in sectoral development (i.e. investment activities; entrepreneurial business support program)

KPA 2: Social and Community Development (Focal Area 5: Good Governance: Public Participation, labour, IGR etc.)

Development objective(s):

- » Facilitate and ensure the development and empowerment of the poor and most vulnerable people through the implementation of special programmes (i.e. gender, elderly, youth and disabled)
- » Facilitate the development of sustainable land use, economic, spatial and environmental planning frameworks that will support and guide the development of a diversified, resilient and sustainable economy
- » Provision of sustainable human settlement (housing).
- » Provide equal access to sport, park, recreational facilities and other public amenities to all residents.

KPA 3: Physical Infrastructure and Energy Efficiency (Focal Area 3: Service Delivery and Infrastructure Planning)

Development objective(s):

- » Invest in new and existing infrastructure in order to extend the lifespan of municipal infrastructure (incl. roads; storm water, electricity; water; sanitation; public places, etc.)

KPA 4: Health, Safety and Environment (Focal Area 6: Institutional Arrangements)

Development objective(s):

- » Pro-active prevention, mitigation, identification and management of environmental health, fire and disaster risks.
- » Provide safety to communities through law enforcement services and through legislative requirements

KPA 5: Governance and Stakeholder Participation (Focal Area 5: Good Governance: Public Participation, labour, IGR etc. and Focal Area 6: Institutional Arrangements)

Development objective(s):

- » Promote stakeholder participation through regular interaction with Stakeholders (i.e. IDP/Budget/PM Representative Forum; Ward Committees; LED Forum; IGR Forum and other spheres of governance)

» Facilitate the establishment of good governance practices (i.e. Audit Committee; Performance Audit Committee; Policies and By-laws; Oversight Committees – Internal and external)

KPA 6: Services and Customer Care (Focal Area 2: Financial Planning and Budgets; Focal Area 3: Service Delivery and Infrastructure Planning; Focal 5: Good Governance: Public Participation, labour, IGR etc. and Focal Area 6: Institutional Arrangements)

Development objective(s):

» Promote and improve public relations through servicing customers with dignity and care.
» Provide quality basic services to all communities within the municipality (i.e. electricity; water; sanitation; refuse)
» Facilitate and ensure the development and empowerment of the poor and most vulnerable people through the implementation of special programmes (Gender, elderly, youth and disabled)

KPA 7: Institutional Transformation (Focal Area 6: Institutional Arrangement)

Development objective(s):

» Aligning institutional arrangements in order to provide an effective and efficient support service in order to deliver on organisational objectives

KPA 8: Financial Sustainability (Focal Area 2: Financial Planning and Budgets)

Development objective(s):

» Enable and improve financial viability and management through well-structured budget processes, financial systems, and MFMA compliance (i.e. promote good budget and fiscal management; unqualified audits, etc.)

Key constraints/problems/issues in terms of the development of //Khara Hais Municipality include a shortage of job opportunities and job creation in the area. The natural resource base and economy does not have the capacity to support the total population, forcing the labour force to seek employment opportunities outside of the Municipality (e.g. Kimberley), etc. Furthermore low levels of income obtained in the area imply low levels of buying power and, therefore, few opportunities for related activities such as trade. The proposed project will have minor benefits to the local area through economic benefits such as short term employment opportunities.

3.5.4 //Khara Hais Spatial Development Framework (SDF) 2009

The main access routes to //Khara Hais Local Municipality (KHLM) are the national roads (N14) via Pofadder/Kakamas in the west, the N10 via Prieska in the south and the N14 via Kuruman. Regional roads include the R27 via Kenhardt in the

south and the R360 from the north via the Kgalagadi Transfrontier Park. One of the six primary spatial planning categories adopted for KHLM that relates to the proposed project is Category F (Surface infrastructure and buildings) - All surface infrastructure and building including roads, railway lines, power lines, communication structures etc. Activity corridors are important structural elements focused on the:

(i) Promotion of social integration,
(ii) Increasing residential and business densities,
(iii) Enhancing accessibility of economic and social opportunities; and
(iv) Creating high-quality urban environments through urban renewal and intensive landscaping.

Policy guidelines for land use outside of the urban edge are described within Volume 2, pages 27-29 of the SDF, 2009:

Policy and standard application guidelines exist in respect of the rezoning of agricultural land. The key objective of these guidelines and policy is to prevent fragmentation of high potential agricultural land. This is also a fundamental objective of bioregional planning, which recognises that the protection and appropriate management of high potential agricultural land are imperative for sustainable development.

The SDF states that for KHLM to consider non-agricultural development to be undertaken on Spatial Planning Category (SPC) C areas (Agricultural land), applicants have to provide assurance that such development would not fragment high potential agricultural land and that it would significantly support the over-arching objective of environmental sustainability. The proposed development must, therefore, imply a direct, or indirect, positive impact on, for example, regional tourism, agriculture, environmental conservation and the interests of previously disadvantaged people.

The proposed development will have positive economic contributions in the form of employment opportunities that can be created for previously disadvantaged people within the local area during construction phase if the social environmental management programme (EMPr) is followed by EPC contractors and the proponent.

3.5.5 !Kheis Local Municipality Integrated Development Plan (IDP) (2012-2017)

The mission of the !Kheis Local Municipality (KLM) is as follows 'To promote economic development to the advantage of the communities within the boundaries of the KLM this will be done by the establishment and maintenance of an effective administration and a safe environment in order to attract tourists and

investors to the area'. The KLM has developed new objectives that have been created from a list of key issues in the KLM which are as follows:

No.	Priority Issues	Objectives
1	Lack of a well-organized and effective systems and implemented policies and plans to manage and serve the whole Municipal Area	Improve the capacity within the Municipality as well as to establish effective systems for management and rendering of sustainable services to the Community of !Kheis Municipality
2	Lack of proper and sufficient water provision	To provide access for all the resident of !Kheis Municipality, to clean drinking water, according to RDP standards.
3	Lack of proper and sufficient accommodation/ housing	To provide 500 plots to communities within the whole !Kheis Municipal Area. Provide 76 houses to communities like Grootdrink, Topline, Wegdraai, Boegoeberg and Sternham.
4	Lack of good quality roads infrastructure, including storm water systems as well as efficient transport system	To improve road infrastructure in the whole municipal area on an annual basis, in order to make communities more accessible to all residents, as well as to make public transport more efficient.
5	Lack of proper and sufficient sanitation and sewerage systems to all residents	To provide access for all the residents of the !Kheis Municipality, in terms of sanitation and sewerage systems
6	Low levels of skilled people as well as high levels of poverty and unemployment	To create an environment in which to empower the Community through capacity building and skills development, as well as for economic growth
7	Lack of quality health and emergency services and facilities	To provide access to good quality health and emergency services for all the residents of !Kheis Municipality
8	Lack of sufficient cemeteries.	To provide proper cemetery facilities in all wards of !Kheis Municipality
9	Proper planning and development of Opwag	The township establishment of Opwag by June 2015, in order to plan and develop the towns to their full potential.
10	Lack of sport and recreation facilities	To provide access to good quality Sport and Recreation facilities for all the youth and the rest of the community of !Kheis Municipality
11	Lack of sufficient and effective telecommunication systems	To Provide sufficient and effective access to communication systems to all residents of the !Kheis Municipality
12	Lack of electricity provision to all residents	To provide access to electricity for all residents of !Kheis Municipality

The renewable energy sector is also recognized as a key sector. The IDP notes that a number of new opportunities have opened up for the KLM area since the need to facilitate the generation of sustainable energy was introduced in South Africa by Eskom and the South African government. The IDP notes that there are a number of solar projects proposed in the area and that the economic benefits from these projects are eagerly anticipated (increased job opportunities and improved standard of living). The KLM focus is on economic and social development and service delivery. The proposed development will contribute to economic and social development through employment opportunities and business opportunities in the local area.

3.6. Relevant legislative permitting requirements

Table 3.1 overleaf provides an outline of the legislative permitting requirements and Standards applicable to the Ilanga CSP 7 Project as identified at this stage in the project process.

Table 3.1: Relevant legislative permitting requirements applicable to the proposed Ilanga CSP 7 project

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
National Legislation			
National Environmental Management Act (Act No 107 of 1998)	» EIA Regulations have been promulgated in terms of Chapter 5. Activities which may not commence without an environmental authorisation are identified within these Regulations. » In terms of S24(1) of NEMA, the potential impact on the environment associated with these listed activities must be considered, investigated, assessed and reported on to the competent authority (the decision-maker) charged by NEMA with granting of the relevant environmental authorisation. » In terms of GNR 982 - 985 of 4 December 2014, a scoping and EIA process is required to be undertaken for the proposed project	» National Department of Environmental Affairs – lead authority » NC DENC - commenting authority	The listed activities triggered by the proposed solar energy facility have been identified and assessed in the EIA process being undertaken (i.e. Scoping and EIA). This EIA Report will be submitted to the competent and commenting authority in support of the application for authorisation.
National Environmental Management Act (Act No 107 of 1998)	» In terms of the Duty of Care provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, stopped or minimised. » In terms of NEMA, it has become the legal duty of a project proponent to consider a	Department of Environmental Affairs (as regulator of NEMA)	While no permitting or licensing requirements arise directly by virtue of the proposed project, this section has found application during the EIA Phase through the consideration of potential impacts (cumulative, direct, and indirect). It will continue to apply throughout the life cycle of the project.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	project holistically, and to consider the cumulative effect of a variety of impacts.		
Environment Conservation Act (Act No 73 of 1989)	» National Noise Control Regulations (GN R154 dated 10 January 1992)	» National Department of Environmental Affairs » NC DENC » Local Authorities	There is no requirement for a noise permit in terms of the legislation. Noise impacts may result from specific activities carried out during the construction phase of the project and could present an intrusion impact to the local community.
National Water Act (Act No 36 of 1998)	» Water uses must be licensed unless such water use falls into one of the categories listed in S22 of the Act or falls under the general authorisation.	Department of Water and Sanitation	» The abstraction of water and storage of water are regarded as a water uses (as defined in terms of S21 of the NWA). » A water use license (WUL) is required to be obtained if wetlands/pans or drainage lines are impacted on, or if infrastructure lies within 500m of wetland features or the regulated area of a watercourse (being the riparian zone or the 1:100yr floodline whichever is greatest). » A water use license (WUL) is required to be obtained for the handling and storage of wastewater associated with the project. » A water use license application

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
			will be submitted in line with the DWS requirements, once the project has obtained preferred bidder status.
National Water Act (Act No 36 of 1998)	» In terms of S19, the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to prevent and remedy the effects of pollution to water resources from occurring, continuing, or recurring.	Department of Water and Sanitation (as regulator of NWA)	This section will apply throughout the life cycle of the project.
Minerals and Petroleum Resources Development Act (Act No 28 of 2002)	» A mining permit or mining right may be required where a mineral in question is to be mined (e.g. materials from a borrow pit) in accordance with the provisions of the Act.	Department of Mineral Resources	As no borrow pits are expected to be required for the construction of the facility, no mining permit or right is required to be obtained.
National Environmental Management: Air Quality Act (Act No 39 of 2004)	» S21 – Listed activities requiring an Air Emissions License. » Minimum emission standards are set for Listed Activities. » Measures in respect of dust control (S32) and National Dust Control Regulations of November 2013. » Measures to control noise (S34) - no regulations promulgated yet. » The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has	» National Department of Environmental Affairs » District Municipality	» While no permitting or licensing requirements arise from this legislation, this act will find application during the operational phase of the project. » The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	failed to comply with the Act.		
National Heritage Resources Act (Act No 25 of 1999)	» Stipulates assessment criteria and categories of heritage resources according to their significance (S7). » Provides for the protection of all archaeological and palaeontological sites, and meteorites (S35). » Provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority (S36). » Lists activities which require developers any person who intends to undertake to notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development (S38). » Requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction (S44).	South African Heritage Resources Agency and the Provincial Heritage Resources Agency	An HIA has been undertaken as part of the EIA Process to identify heritage sites (refer to Appendix G). Should a heritage resource be impacted upon, a permit may be required from SAHRA.
National Environmental Management: Biodiversity Act (Act No 10 of 2004)	» Provides for the MEC/Minister to identify any process or activity in such a listed ecosystem as a threatening process (S53) » A list of threatened and protected species has been published in terms of S 56(1) - Government Gazette 29657.	» Department of Environmental Affairs » DENC	Under this Act, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed protected species.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	» Three government notices have been published, i.e. GN R 150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R 151 (Lists of critically endangered, vulnerable and protected species) and GN R 152 (Threatened or Protected Species Regulations). » Provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GN 1002), 9 December 2011). » This Act also regulates alien and invader species.		An ecological study has been undertaken as part of the EIA Phase. As such the potential occurrence of critically endangered, endangered, vulnerable, and protected species and the potential for them to be affected has been considered. This report is contained in Appendix D.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
Conservation of Agricultural Resources Act (Act No 43 of 1983)	» Prohibition of the spreading of weeds (S5) » Classification of categories of weeds & invader plants (Regulation 15 of GN R1048) & restrictions in terms of where these species may occur. » Requirement & methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048).	Department of Agriculture, Forestry and Fisheries (DAFF)	While no permitting or licensing requirements arise from this legislation, this Act will find application during the EIA phase and will continue to apply throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies must be developed and implemented. In addition, a weed control and management plan must be implemented.
Sub-division of Agricultural Land Act 70 of 1970 (SALA).	» Change in the zoning of demarcated agricultural land to any other zoning.	Department of Agriculture, Forestry and Fisheries (DAFF)	The site is currently zoned as Agricultural land. An application to change the zoning will be submitted to DAFF, Registrar of SALA, once the project has been awarded a preferred bidder status.
National Forests Act (Act No. 84 of 1998)	According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'.	Department of Agriculture, Forestry and Fisheries (DAFF)	A licence is required for any removal of protected trees such as the *Boscia albitrunca (*Listed species that are known to occur in the area.)

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
National Veld and Forest Fire Act (Act 101 of 1998)	In terms of S12 the landowner must ensure that the firebreak is wide and long enough to have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material. In terms of S17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires.	Department of Agriculture, Forestry and Fisheries (DAFF)	While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction and operational phase of the project.
Hazardous Substances Act (Act No 15 of 1973)	» This Act regulates the control of substances that may cause injury, or ill health, or death by reason of their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. » Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc, nature or because it generates pressure through decomposition, heat or other means,	Department of Health	It is necessary to identify and list all the Group I, II, III and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled. If applicable, a license is required to be obtained from the Department of Health.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	cause extreme risk of injury etc., can be declared to be Group I or Group II hazardous substance; » Group IV: any electronic product; » Group V: any radioactive material. The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.		
National Road Traffic Act (Act No 93 of 1996)	» The Technical Recommendations for Highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. » Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts. » The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also	» Provincial Department of Transport (provincial roads) » South African National Roads Agency Limited (national roads)	» An abnormal load/vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. » Transport vehicles exceeding the dimensional limitations (length) of 22m. » Depending on the trailer configuration and height when loaded, some of the power station components may not meet specified dimensional limitations (height and width).

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.		
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)	» The Minister may by notice in the *Gazette* publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. » The Minister may amend the list by— *(a)* adding other waste management activities to the list; *(b)* removing waste management activities from the list; or *(c)* making other changes to the particulars on the list. » A Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities. » Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that *(a)* the containers in which any waste is stored, are intact and not corroded or in	» National Department of Water and Environmental Affairs (hazardous waste and effluent) » Provincial Department of Environmental Affairs (general waste)	» As no waste disposal site is to be associated with the proposed project, no permit is required in this regard. » Waste handling, storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of this Act, as detailed in the EMPr.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	any other way rendered unlit for the safe storage of waste; *(b)* adequate measures are taken to prevent accidental spillage or leaking; *(c)* the waste cannot be blown away; *(d)* nuisances such as odour, visual impacts and breeding of vectors do not arise; and *(e)* pollution of the environment and harm to health are prevented		
Astronomy Geographic Advantage Act (Act No. 21 of 2007)	» In terms of section 7(1) and 7(2) of this Act, the Minister declared core astronomy advantage areas on 20 August 2010 under Regulation No. 723 of Government Notice No. 33462. In this regard, all land within a 3 kilometres radius of the centre of the Southern African large Telescope dome falls under the Sutherland Core Astronomy Advantage Area. The declaration also applies to the core astronomy advantage area containing the MeerKAT radio telescope and the core of the planned Square Kilometre Array (SKA) radio telescope.	Department of Science and Technology	Approval from SKA required.
Provincial Legislation			
Northern Cape Nature Conservation Act, Act No. 9 of 2009	This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the	Northern Cape Department of Environment and Nature Conservation	A collection/destruction permit must be obtained from Northern Cape Nature Conservation for the removal

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project: » Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property; » Aquatic habitats may not be destroyed or damaged; » The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species. » The Act provides lists of protected species for the Province.		of any protected plant and animals species found on site.

Table 3.2: Standards applicable to the Ilanga CSP 7 project

Theme	Standard	Summary
Air	South African National Standard (SANS) 69	Framework for setting and implementing national ambient air quality standards
	SANS 1929: Ambient Air Quality	Sets limits for common pollutants
Noise	SANS 10328:2003: Methods for Environmental Noise Impact Assessments	General procedure used to determine the noise impact
	SANS 10103:2008: The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and Speech Communication	Provides noise impact criteria
	National Noise Control Regulations	Provides noise impact criteria
	SANS 10210: Calculating and Predicting Road Traffic Noise	Provides guidelines for traffic noise levels
Waste	DWAF (1998) Waste Management Series. Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste	DWAF Minimum Requirements
	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) – National norms and standard for the storage of waste.	» Provides uniform national approach relating the management of waste facilities » Ensure best practice in management of waste storage » Provides minimum standards for the design and operation of new and existing waste storage
Water	Best Practise Guideline (G1) Stormwater Management DWS2006	Provides guidelines to the management of stormwater
	South African Water Quality Guidelines	Provides water quality guidelines

APPROACH TO UNDERTAKING THE SCOPING PHASE CHAPTER 4

An Environmental Impact Assessment (EIA) process refers to that process (in line with the EIA Regulations) which involves the identification of and assessment of direct, indirect, and cumulative environmental impacts associated with a proposed project/ activity. The EIA process comprises two main phases: i.e. **Scoping Phase** and **EIA Phase**. The EIA process culminates in the submission of an EIA Report (including an Environmental Management Programme (EMPr)) to the competent authority for decision-making. The EIA process is illustrated below:

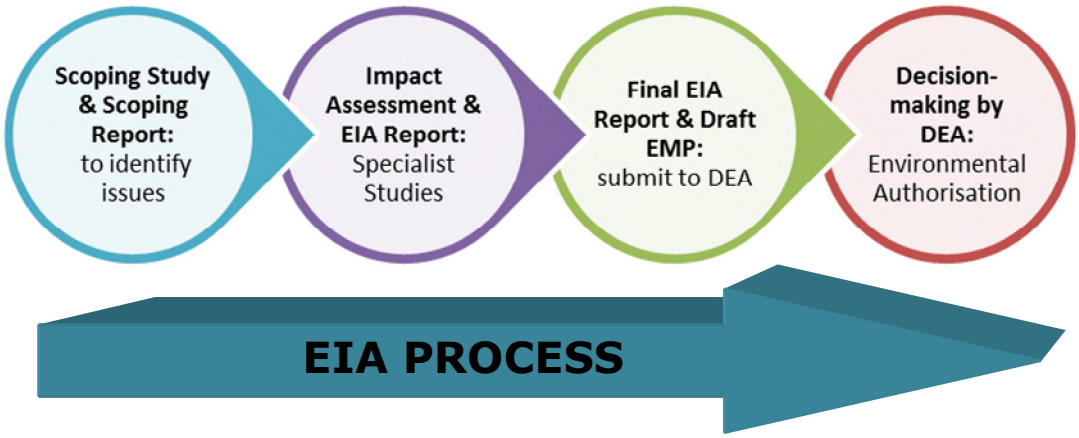

Figure 4.1: The Phases of an EIA Process

The EIA process for the proposed Ilanga CSP 7 Project is being undertaken in accordance with Section 24(5) of NEMA (No 107 of 1998). In terms of the EIA Regulations (2014) of GN R982 as well as GN R983, GN R984 and GN R985, a Scoping and EIA Study are required to be undertaken for this proposed project.
This chapter of the EIA report includes the following information required in terms of GNR982 Appendix 3: Content of Environmental Impact Assessment Reports:

Requirement	Relevant Section
3(d)(i) a description of the scope of the proposed activity, including all listed and specified activities triggered and being applied for.	All listed activities triggered and applied for are included in section 4.1.
3(h)(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs.	The public participation process followed throughout the EIA process of the Ilanga CSP 9 is included in section 4.3 and copies of the supporting documents and inputs are included in Appendix C.
3(h)(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the	The main issues raised through the undertaking of the public participation process within the EIA Phase including

Requirement	Relevant Section
issues were incorporated, or the reasons for not including them.	consultation with I&APs will be included in section 4.3.4 of the final EIA report (including all comments raised during the review period) and the Comments and Responses Report included in Appendix C.
3(h)(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks.	The methodology used to determine and rank the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks is included in section 4.3.5.
3(p) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed.	A description of the assumptions and limitations is included in section 4.3.6.

4.1 Relevant Listed Activities

In terms of the EIA Regulations, 2014 published within GN R983, GN R984 and GN R985; the following 'listed activities' are triggered by the proposed facility as shown in **Table 4.1**.

Table 4.1: Listed activities triggered by the proposed Ilanga CSP 7 Project

Number and date of the relevant notice:	Activity No(s) (in terms of the relevant notice):	Description of each listed activity as per project description
GN 983, 08 December 2014	11 (i)	The development of facilities or infrastructure for the transmission and distribution of electricity- (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts. ***A 132kV onsite substation will be constructed on site in order to connect the CSP 7 Facility to the National grid.***
GN 983, 08 December 2014	12 (xii)(a)(c)	The development of – (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse. ***infrastructure with a physical footprint of more than***

Number and date of the relevant notice:	**Activity No(s) (in terms of the relevant notice):**	**Description of each listed activity as per project description**
		100 square metres associated with the CSP facility will be constituted within or within 32 m of a non-perennial drainage line
GN 983, 08 December 2014	14	The development of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous goods, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres. ***The facilities or infrastructure for the storage or for the storage and handling, of a dangerous good will be required. The storage containers will have a combined capacity of 80 but not exceeding 500 cubic metres.***
GN 983, 08 December 2014	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. ***The facility and/or associated infrastructure will require the infilling or depositing of any material of more than 5 cubic metres into, or the excavation or moving of soil or rock of more than 5 cubic metres from a watercourse (ephemeral drainage lines).***
GN 983, 08 December 2014	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 meters. ***The construction on the CSP 7 Facility will require an access road that is potentially wider than 8m where no reserve exists.***
GN 983, 08 December 2014	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 ***The development footprint for the proposed solar energy facility (infrastructure and associated areas) will cover an area greater than 1 hectare on land currently zoned for agriculture.***
GN 983, 08	56 (ii)	The widening of a road by more than 6 metres, or the

Number and date of the relevant notice:	**Activity No(s) (in terms of the relevant notice):**	**Description of each listed activity as per project description**
December 2014		lengthening of a road by more than 1 kilometre— (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where the widening or lengthening occur inside urban areas. ***Existing roads will be used as far as possible. Construction of the CSP 7 Facility will require the widening of an access road by potentially more than 6m where no reserve exists. The upgrading of the road might also exceed 1km.***
GN 984, 08 December 2014	1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more. ***The development footprint for the proposed solar energy facility (infrastructure and associated areas) will cover an area greater than 1 hectare on land currently zoned for agriculture. This facility is considered to be an industrial development.***
GN 984, 08 December 2014	6	The development of facilities or infrastructure for any process or activity which requires a permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. ***A water use license will be required for the discharge of wastewater to the evaporation dams as well as for impacts on drainage lines and the abstraction of water from the Gariep River.***
GN 984, 08 December 2014	15	The clearance of an area of 20 hectares or more of indigenous vegetation. ***The development footprint for the proposed CSP facility (infrastructure and associated areas) will require clearance of indigenous vegetation of an area greater than 20 hectares.***

On the basis of the above listed activities, a Scoping and an EIA Process is required to be undertaken for the proposed project. This process is to be undertaken in two phases as follows:

» The Scoping Phase includes the identification of potential issues associated with the proposed project through a desktop study and consultation with interested and

affected parties and key stakeholders. Areas of sensitivity within the broader site were identified and delineated in order to identify any environmental fatal flaws, and sensitive or no go areas. Following a public review period of the report, this phase culminated in the submission of a final Scoping Report and Plan of Study for EIA to the DEA.

» The EIA Phase involved a detailed assessment of potentially significant positive and negative impacts (direct, indirect, and cumulative) identified in the Scoping Phase. This phase included consideration of a proposed facility layout through detailed specialist investigations and public consultation. Following public review of the report, this phase will culminate in the submission of a Final EIA Report and an Environmental Management Programme (EMPr), including recommendations of practical and achievable mitigation and management measures, to DEA for decision-making.

4.2 Scoping Phase

A Scoping Report was released for public review from 22 January 2016 to 22 February 2016 for a 30-day comment period. Following the review period, a final scoping report was submitted to DEA in March 2016. This together with the Plan of Study for the EIA was accepted by the DEA, as the competent authority, in April 2016. In terms of this acceptance, and in line with Regulation 23 of GNR982, an EIA phase was required to be undertaken for the proposed project.

The Scoping Study provided interested and affected parties (I&APs) with the opportunity to receive information regarding the proposed project, participate in the EIA process, and raise issues of concern. The Scoping Report aimed at detailing the nature and extent of the proposed CSP facility, identifying potential issues associated with the proposed project, delineating areas of environmental sensitivity, and defining the extent of studies required within the EIA. This was achieved through an evaluation of the proposed project, involving the project proponent, specialist consultants, and a consultation process with key stakeholders that included both relevant government authorities and I&APs.

4.3. Environmental Impact Assessment Phase

The EIA Phase aims to achieve the following:

» Provide a comprehensive assessment of the social and biophysical environments affected by the proposed phases put forward as part of the project.
» Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed facility.
» Comparatively assess any alternatives put forward as part of the project.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.

» Undertake a fully inclusive public participation process to ensure that I&APs are afforded the opportunity to participate, and that their issues and concerns are recorded.

The EIA Report addresses potential direct, indirect, and cumulative[14] impacts (both positive and negative) associated with all phases of the project including design, construction, operation and decommissioning. In this regard the EIA Report aims to provide the relevant authorities with sufficient information to make an informed decision regarding the proposed project.

4.3.1. Tasks completed during the EIA Phase

As this is an energy generation project the National Department of Environmental Affairs (DEA) is the competent authority for this application. As the project falls within the Northern Cape, the Department of Environmental and Nature Conservation (DENC) acts as a commenting authority for the project. Consultation with these authorities has been undertaken throughout the Scoping process. This consultation has included the following:

» Submission of the application for authorisation to DEA;
» Submission of the Scoping Report for review by I&APs, the Organs of State and the competent authority.

A record of all authority consultation undertaken prior to and within the Scoping Phase is included within **Appendix C**.

The EIA Phase for the proposed CSP Project has been undertaken in accordance with the EIA Regulations published in GN 38282 in December 2014, in terms of NEMA. Key tasks undertaken within the EIA phase included:

» Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
» Undertaking a public participation process throughout the EIA process in accordance with Chapter 6 of Government Notice R982 of 2014 in order to identify any additional issues and concerns associated with the proposed project.
» Preparation of a Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process.
» Undertaking of independent specialist studies in accordance with Appendix 6 of Government Notice R982 of 2014.

[14] "Cumulative environmental change or cumulative effects may result from the additive effect of individual actions of the same nature or the interactive effect of multiple actions of a different nature" (Spaling and Smit, 1993).

» Preparation of an EIA Report in accordance with Appendix 3 of Government Notice R982 of 2014.

These tasks are discussed in detail below.

4.3.2 Authority Consultation

In terms of the Energy Response Plan, the DEA is the competent authority for all energy related projects. As the project falls within the Northern Cape, the Department of Environment and Nature Conservation (DENC) is the commenting authority for the project. A record of all authority consultation undertaken is included within this EIA report. Consultation with the regulating authorities (i.e. DEA and Northern Cape DENC) has continued throughout the EIA process. On-going consultation included the following:

» Submission of the application for authorisation to DEA;
» Submission of the Scoping Report for review by the competent authority and commenting authority from 22 January 2016 to 22 February 2016.
» The Final Scoping Report for the proposed project was submitted in March 2016. The Scoping Report was accepted by DEA in April 2016.
» The EIA Report will be made available for a 30-day public review period.

The following will also be undertaken as part of this EIA process:

» Submission of a final EIA Report to DEA following the 30-day public review period for the draft EIA and the receipt of the comments from the DEA on the draft EIA report.
» If required, an opportunity for DEA and DENC representatives to visit and inspect the proposed project site.
» Notification and consultation with Organs of State (refer to Table 4.1) that may have jurisdiction over the project, including:
  * Provincial departments
  * Parastatals and Non-Governmental Organisations
  * Local Municipality and District Municipality

A record of the authority consultation in the EIA process is included within **Appendix B**.

4.3.3. Public Involvement and Consultation

The aim of the public participation process is primarily to ensure that:

» Information containing all relevant facts in respect of the proposed project is made available to potential stakeholders and I&APs.

» Participation by potential I&APs is facilitated in such a manner that all potential stakeholders and I&APs are provided with a reasonable opportunity to comment on the proposed project.
» Comments received from stakeholders and I&APs are recorded and incorporated into the EIA process.

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

» Open day (pre-arranged and stakeholders invited to attend - for example with directly affected and surrounding landowners).
» Telephonic consultation sessions (consultation with various parties from the EIA project team, including the project participation consultant, lead EIA consultant as well as specialist consultants).
» Written, faxed or e-mail correspondence.
» The Draft EIA Report has been released for a 30-day public review period from 08 July – 08 August 2016. The comments received from I&APs during this period will be captured within a Comments and Response Report, and will be included within the EIA Report, for submission to the authorities for decision-making.

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

» Fixing a notice board at a place conspicuous to the public at the boundary or on the fence of—
    (i) the site where the activity to which the application relates is or is to be undertaken; and
    (ii) any alternative site mentioned in the application;
» Giving written notice to:
    (i) the owner or person in control of that land if the applicant is not the owner or person in control of the land;
    (ii) the occupiers of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
    (iii) owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
    (iv) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;
    (v) the municipality which has jurisdiction in the area;
    (vi) any organ of state having jurisdiction in respect of any aspect of the activity; and

(vii) any other party as required by the competent authority.

» Placing an advertisement in:
  (i) two local newspaper;

» Open and maintain a register/ database of interested and affected parties and organs of state.
» Release of a Draft EIA Report for Public Review
» Preparation of a Comments and Responses Report which documents all of the comments received and responses from the project team.

In compliance with the requirements of Chapter 6 of the EIA Regulations, 2014, the following summarises the key public participation activities conducted to date.

» **Placement of Site Notices**
Site notices (in English and Afrikaans) were placed at visible points along the N10 and at the boundary of Portion 4 of the Farm Trooilaps Pan 53 on 20 January 2016, in accordance with the requirements of the EIA Regulations. Other notices were placed at the Khara Hais (Upington) Public Library and the !Kheis Local Municipal offices. In addition to the advertisements and site notices, key stakeholders and registered I&APs were notified in writing of the commencement of the EIA process and the availability of the draft Scoping Report. .Copies of all the site notices are included within **Appendix C**.

» **Identification of I&APs and establishment of a database**
Identification of I&APs was undertaken by Savannah Environmental through existing contacts and databases, recording responses to site notices and the newspaper advertisement, as well as through the process of networking. The key stakeholder groups identified include authorities, local and district municipalities, public stakeholders, Parastatals and Non-Governmental Organisations (refer to Table 4.2 below).

Table 4.2: List of Stakeholders identified and consulted during the EIA process

Organs of State
National Government Departments
Department of Agriculture, Forestry and Fisheries (DAFF)
Department of Communications
Department of Energy (DoE)
Department of Mineral Resources (DMR)
Department of Public Works (DPW)
Department of Rural Development and Land Reform (DRDLR)
Department of Water and Sanitation (DWS)
Department of Science and Technology (DST)
Government Bodies and State Owned Companies

Eskom SOC Limited
National Energy Regulator of South Africa (NERSA)
Sentech
South African Civil Aviation Authority (SACAA)
South African Heritage Resources Agency (SAHRA)
South African National Roads Agency Limited (SANRAL)
Square Kilometre Array: Southern Africa
Telkom SA Ltd
Provincial Government Departments
Ngwao-Boswa Ya Kapa Bokone (Northern Cape Provincial Heritage Resources Authority)
Northern Cape Department of Agriculture, Land Reform and Rural Development
Northern Cape Department of Environment and Nature Conservation (DENC)
Northern Cape Department of Roads and Public Works
Local Government Departments
Khara Hais Local Municipality (KHLM)
ZF Mgcawu (previously Siyanda) District Municipality (ZF MDM)
Conservation Authorities
BirdLife South Africa
Wildlife and Environment Society of South Africa (WESSA)
Landowners
Affected landowners and tenants
Neighbouring landowners and tenants

All relevant stakeholder and I&AP information has been recorded within a database of affected parties (refer to **Appendix C**). While I&APs were encouraged to register their interest in the project from the onset of the process undertaken by Savannah Environmental, the identification and registration of I&APs has been on-going for the duration of the EIA phase of the process.

» **Newspaper Advertisements**
During the scoping phase, newspaper adverts was placed to notify and inform the public of the proposed project and the availability of the Scoping report for public review. These adverts were placed in the following newspapers:

* Gemsbok on the 29 January 2016; and
* The Volksblad on the 21 January 2016.

During the EIA phase, a second round of newspaper adverts has been placed to inform the public of the availability of the Draft EIA report in the following newspapers:
* Gemsbok on the 11 July 2016; and
* The Volksblad on the 11 July 2016.

» **Consultation**

In order to accommodate the varying needs of stakeholders and I&APs, the following opportunities have been provided for I&AP issues to be recorded and verified through the EIA process as outlined in Table 4.3 below:

Table 4.3: Consultation undertaken with I&APs for the Ilanga CSP 5 Facility

Scoping Phase	Activity	Date
	Placement of site notices on-site.	20 January 2016
	Distribution of letters announcing the EIA process and the availability of the Scoping Report for review for a 30-day comment period. These letters were distributed to organs of state departments, ward councillors, landowners within the study area, neighbouring landowners and key stakeholder groups.	22 January 2016
	30-day review period for the Scoping Report for public comment.	22 January 2016 to 22 February 2016
	The EIA process and the availability of the Scoping Report for review was advertised in the Gemsbok and the Volksblad newspapers.	21 January 2016 29 January 2016
EIA Phase	Meetings with adjacent and affected landowners.	15 – 19 March 2016
	Distribution of letters announcing the availability of the EIA Report for review for a 30-day comment period. These letters will be distributed to organs of state departments, ward councillors, landowners within the study area, neighbouring landowners and key stakeholder groups.	8 July 2016
	The availability of the EIA Report and the date of the Public will be advertised in the Gemsbok and the Volksblad newspapers.	11 July 2016
	30-day review period of the EIA Report for public comment at the following locations: » Khara Hais (Upington) Public Library (Market Street) » !Kheis Local Municipal Offices (Oranje Street) » www.savannahSA.com	08 July 2016 – 08 August 2016
	Open Day meeting.	5 May 2016 2016

Records of all consultation undertaken are included in **Appendix C**.

4.4.4. Evaluation of Issues Identified through the Scoping Process

Issues which require investigation within the EIA Phase, as well as the specialists involved in the assessment of these impacts are indicated in Table 4.4 below

Table 4.4: Specialist consultants appointed to evaluate the potential impacts associated with the CSP Facility

Specialist	Area of Expertise	Refer Appendix
Simon Todd of Simon Todd Consulting[15]	Ecology	Appendix D
Dr Rob Simmons of Bird and Bat Unlimited Environmental Consultants	Avifauna	Appendix E
Werner Marais of the Animalia Zoological & Ecological Consultation CC	Bat	Appendix F
Peter Kimberg of the Biodiversity company	Aquatic Ecology	Appendix G
Jaco van der Walt of Heritage Contracts	Heritage	Appendix H
Garry Paterson of Agricultural Research Council (ARC)	Agricultural Potential & Soils	Appendix I
Candice Hunter of Savannah Environmental	Social	Appendix J
Dr Neville Bews of Dr Neville Bews & Associates	Social Peer Review	Appendix J-1
Jon Marshall of Afzelia Environmental Consultants & Environmental Planning and Design	Visual	Appendix K
Morné de Jager of Enviro Acoustic Research cc	Noise	Appendix L

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

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

[15] It must be noted that the ecological specialist was replaced on the project as a result of Gerhard Botha being unavailable to complete the work.

- 4 is low and will cause a slight impact on processes
- 6 is moderate and will result in processes continuing but in a modified way
- 8 is high (processes are altered to the extent that they temporarily cease)
- 10 is very high and results in complete destruction of patterns and permanent cessation of processes

» The **probability of occurrence**, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:
- Assigned a score of 1–5, where 1 is very improbable (probably will not happen)
- Assigned a score of 2 is improbable (some possibility, but low likelihood)
- Assigned a score of 3 is probable (distinct possibility)
- Assigned a score of 4 is highly probable (most likely)
- Assigned a score of 5 is definite (impact will occur regardless of any prevention measures)

» The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high

» The **status**, which is described as either positive, negative or neutral

» The degree to which the impact can be reversed

» The degree to which the impact may cause irreplaceable loss of resources

» The degree to which the impact can be mitigated

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

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

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

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

» **< 30 points:** Low (i.e. where this impact would not have a direct influence on the decision to develop in the area)

» **30-60 points:** Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated)

» **> 60 points:** High (i.e. where the impact must have an influence on the decision process to develop in the area)

As the developer has the responsibility to avoid or minimise impacts and plan for their management (in terms of the EIA Regulations), the mitigation of significant impacts is discussed. Assessment of impacts with mitigation is made in order to demonstrate the

effectiveness of the proposed mitigation measures. An EMPr is included as **Appendix K**.

4.3 Assumptions and Limitations of the EIA Process

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

» All information provided by the developer to the environmental team was correct and valid at the time it was provided.
» It is assumed that the development site identified by the developer represents a technically suitable site for the establishment of the proposed solar facility.
» It is assumed that the proposed connection to the National Grid is correct in terms of viability and need.
» Studies assume that any potential impacts on the environment associated with the proposed development will be avoided, mitigated, or offset.
» This report and its investigations are project-specific, and consequently the environmental team did not evaluate any other power generation alternatives.

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

DESCRIPTION OF THE RECEIVING ENVIRONMENT CHAPTER 5

This section of the EIA Report provides a description of the environment that may be affected by the proposed project against which the potential impacts of the proposed facility can be assessed and future changes monitored. This information is provided in order to assist the reader and the competent authority in understanding the possible effects of the proposed project on the environment. Aspects of the regional, local, and site-specific biophysical, social, and economic environment that could directly or indirectly be affected by, or could affect, the proposed development have been described. This information has been sourced from both existing information available for the area as well as collected field data, and aims to provide the context within which this EIA is being conducted. A comprehensive description of each aspect of the affected environment is included within the specialist reports contained within **Appendices D - L**.

5.1. Legal Requirements as per the EIA Regulations, 2014

This chapter of the EIA report includes the following information required in terms of Appendix 3: Content of Environmental Impact Assessment Reports:

Requirement	Relevant Section
3(h)(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	The environmental attributes associated with the surrounding areas and the project development footprint is included in this chapter as a whole.

5.2 Regional Setting: Location of the Study Area

The proposed development site is located approximately 30 km east of Upington in the Northern Cape Province of South Africa. The Northern Cape is the largest province in South Africa and covers an area of approximately 360 000 km^2 which constitutes approximately 30% of South Africa. The study area falls in the //Khara Hais Local Municipality (KHLM) and !Kheis Local Municipality (KLM) which fall within the ZF Mgcawu District Municipality (ZFMDM), of which the latter has Upington as its main town which serves as both the agricultural hub of the region and a portal to Namibia, the Kalahari, and the Kgalagadi Transfrontier Park.

This region of the Northern Cape is sparsely populated with small concentrations in and around small towns along the Orange River (Gariep River). This key natural feature has to a large degree dictated the settlement pattern by providing a source of irrigation water for the cultivation of grapes and other crops (i.e. lucerne, wheat, vegetables, deciduous fruits, and maize). The Orange River supplies irrigation water to

the urban and agricultural areas of Upington, Kakamas, and Keimoes and to the Upington Irrigation Scheme. Various canal schemes within the region have been established to supply water to those areas requiring irrigation.

The main access routes to the area include the N14 and the N10. Regional roads include the R360 and the R27 from Keimoes. These roads, as well as the local roads are generally in a good condition even though large volumes of heavy vehicle traffic are experienced on the main routes. Industrial infrastructure includes the Upington Airport[16], transmission, and distribution power lines (e.g. the Garona-Gordonia No 1 132kV line to the north east of the proposed development site, and the Garona-Kleinbegin No 1 132kV line to the west of the proposed development site), as well as several substations and solar energy facilities. The railway line through Upington connects the area to Karasburg in Namibia, Keimoes, and Kakamas to the west of Upington and De Aar in the south, which again links with Johannesburg, Kimberley and Cape Town.

Three major areas within the vicinity of the study area receive water directly from the Orange River, namely Upington (urban and surrounds), Upington Irrigation Scheme controlled by the Upington Irrigation Board, and Kakamas /Keimoes (urban & irrigation). Various canal schemes within the region are used to supply the irrigated areas.

5.3 Climatic Conditions

The Northern Cape is characterised by an arid climate with summer rainfall. Rainfall events are erratic, both locally and seasonally and therefore cannot be relied on for agricultural practices. The average evaporation is 2 375 mm per year, peaking at 11.2 mm per day in December.

The climate for the Upington area has the following characteristics (refer to **Figure 5.1**): i) rainfall occurs mainly in late summer and early autumn with very dry winters; ii) the mean annual rainfall is about 180 mm with March being the wettest month averaging at about 39 mm and July being the driest with an average of only 2 mm; iii) the average annual temperature in Upington is 19.3 °C with January being the warmest (Ave. 26.2 °C) and July being the coldest (Ave 11.5 °C). The extreme high temperature that has been recorded is 43ºC and the extreme low –7.9ºC. Frost incidence may range up to 10 frost days per year. Whirl winds (dust devils) are common on hot summer days.

[16] Upington airport caters for daily passenger flights from the main centres in South Africa, as well as various national and international cargo carrier flights. The establishment of an International Development Zone (IDZ) at the airport has been proposed to further enhance its strategic importance for the local, regional and provincial economy.

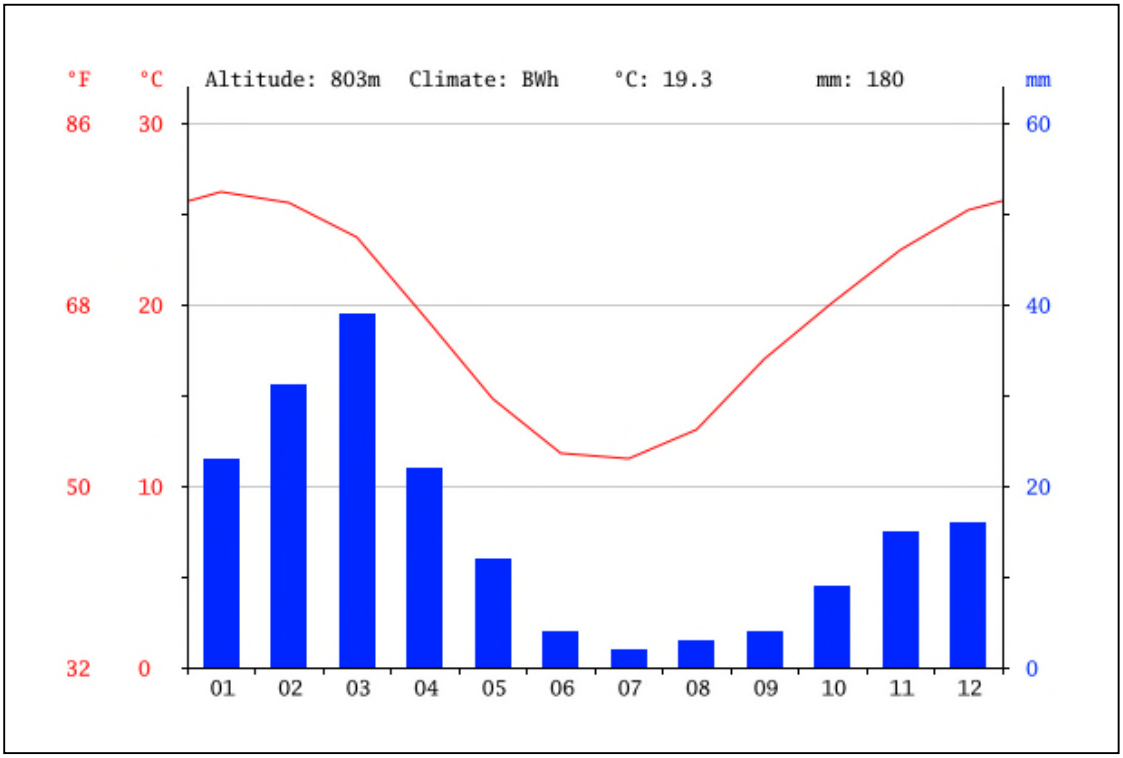

Figure 5.1: Climate graph for the town of Upington, Northern Cape Province

5.4 Topographical Characteristics

The study area occurs on land that ranges in elevation from 800 m a.s.l. (at the Orange River) to 1180 m a.s.l. (at the top of the nearby koppies/ ridgelines). The terrain surrounding the study area is predominantly flat with an even slope down towards the Orange River valley that forms the most distinct hydrological feature in the region. Due to this flat topography, the area, particularly south of the river, is characterised by the occurrence of many non-perennial drainage lines and pans.

The dominant topographical unit or terrain type of the region is relatively homogenous and is described pre-dominantly as *lowlands with hills, dune hills* and *irregular or slightly irregular plains*.

Relatively prominent low hills and koppies occur in the south-east of the study area. A few isolated koppies also occur randomly in the north-west of the study area. The Orange River meanders from the south east, and then curves toward the west.

5.5 Biophysical Characteristics of the Study Area

5.5.1 Water Resources

The proposed development is situated to the south of the Orange River (Gariep River) with a proposed abstraction point that is situated on the Orange River approximately 25km upstream of Upington. The project area is situated in the Lower Orange Water Management Area (WMA) (refer to **Figure 5.2**).

The site proposed for the CSP facility overlaps 4 1:50000 topographical grid squares namely 2821AD, 2821BC, 2821CB and 2821DA. The proposed water abstraction point is situated in grid square 2821AD.

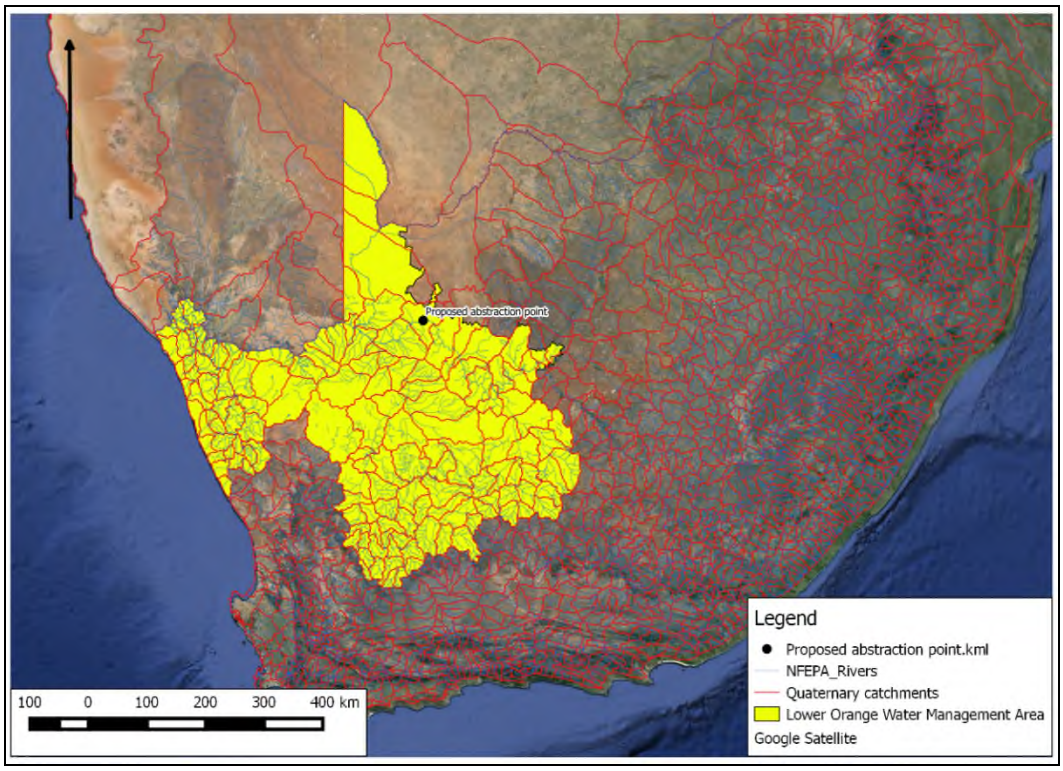

Figure 5.2: Map showing the regional location of the Ilanga CSP 7 facility within the Karoshoek Solar in the Northern Cape and the Lower Orange Water Management Area

The main drainage line associated with the Karoshoek CSP facility is the Orange River which is situated to the north of the project area. A proposed water abstraction point is situated in the Orange River (refer to **Figure 5.3**). The Matjies River, a 1st order tributary of the Orange River flows in a northerly direction down the centre of the proposed site whilst an unnamed tributary of the Orange River flows through the south western portion of the site (refer to **Figure 5.4**). The Donkerhoekspruit, another 1st order tributary of the Orange River, is situated to the west of the project area and is unlikely to be impacted upon by the project. Of all these rivers only the Orange River is perennial and the smaller tributaries are likely only to flow for brief periods after rainfall events.

Hydrology

The Orange River is the largest catchment in South Africa (refer to **Figure 5.5**) and at the site the catchment area is approximately 365 000 km^2, although the effective area is around 275 000 km^2 after the deduction of endorheic areas.

Normal flows in the Lower Orange River are regulated by a number of major dams upstream. The main dams are the Vaal and Bloemhof Dams on the Vaal River and the Gariep and Vanderkloof Dams on the Orange River above the confluence with the Vaal River (**Figure 5.5**). These have the effect of reducing normal flow variability, and particularly damping small floods. As a result the 2-year flood event at Upington (600 cumec) is less than half its natural value which would have been above 1500 cumec.

5.5.2 Geological Profile

The study area is located within the Namaqualand Metamorphic Belt which comprises very old and very highly deformed sedimentary and igneous rocks of the Mokolian and Namibian Erathem that form part of the Southern African Basement Complex. The rocks have undergone both regional and contact metamorphism and the culminating deformation phase has been dated at about 1000Ma. These basement rocks are covered by Quaternary sands of the Gordonia Formation and sporadic Tertiary Calcrete deposits. The details of the geological formations that occur within the study area are tabulated within the geological specialist report.

There are several geological faults traversing the study area which are indicated to occur in the area. The activity of these faults is considered dormant and the seismic activity of the area is considered low. The anticipated seismic activity is rated as V[17] on the Modified Mercalli Scale and peak horizontal ground accelerations are typically less than 50cm/s with a 10% chance of being exceeded at least once in a 50 year period.

Analysis of the aerial photography indicates that rock outcrops are likely to be concentrated in the northern and eastern portions of the study area. The sand cover is likely to be thickest in the southern lowland areas.

[17] Movement felt by all, some damage to plaster, chimneys

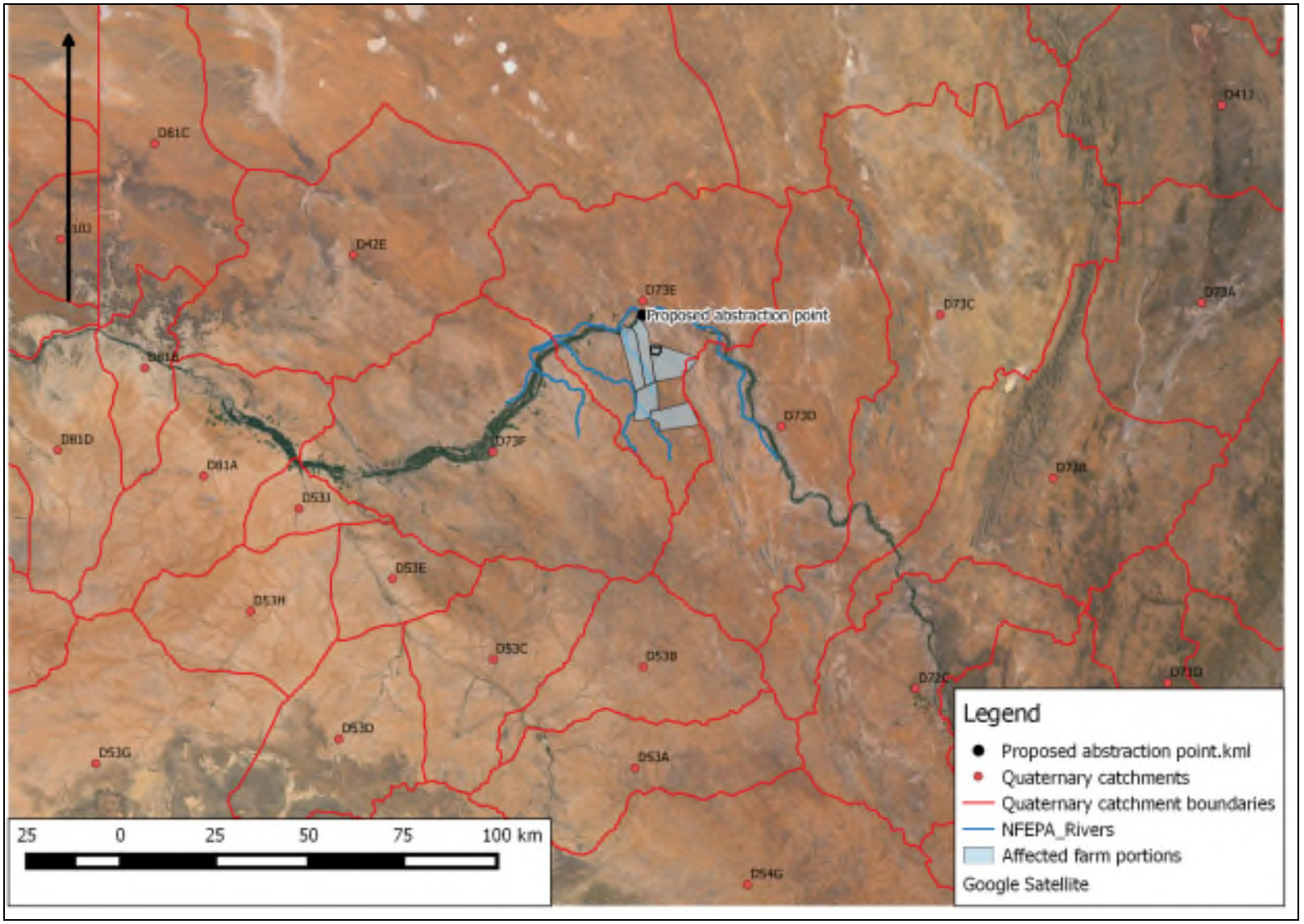

Figure 5.3: Proposed project area showing the location of the proposed abstraction point on the Orange River

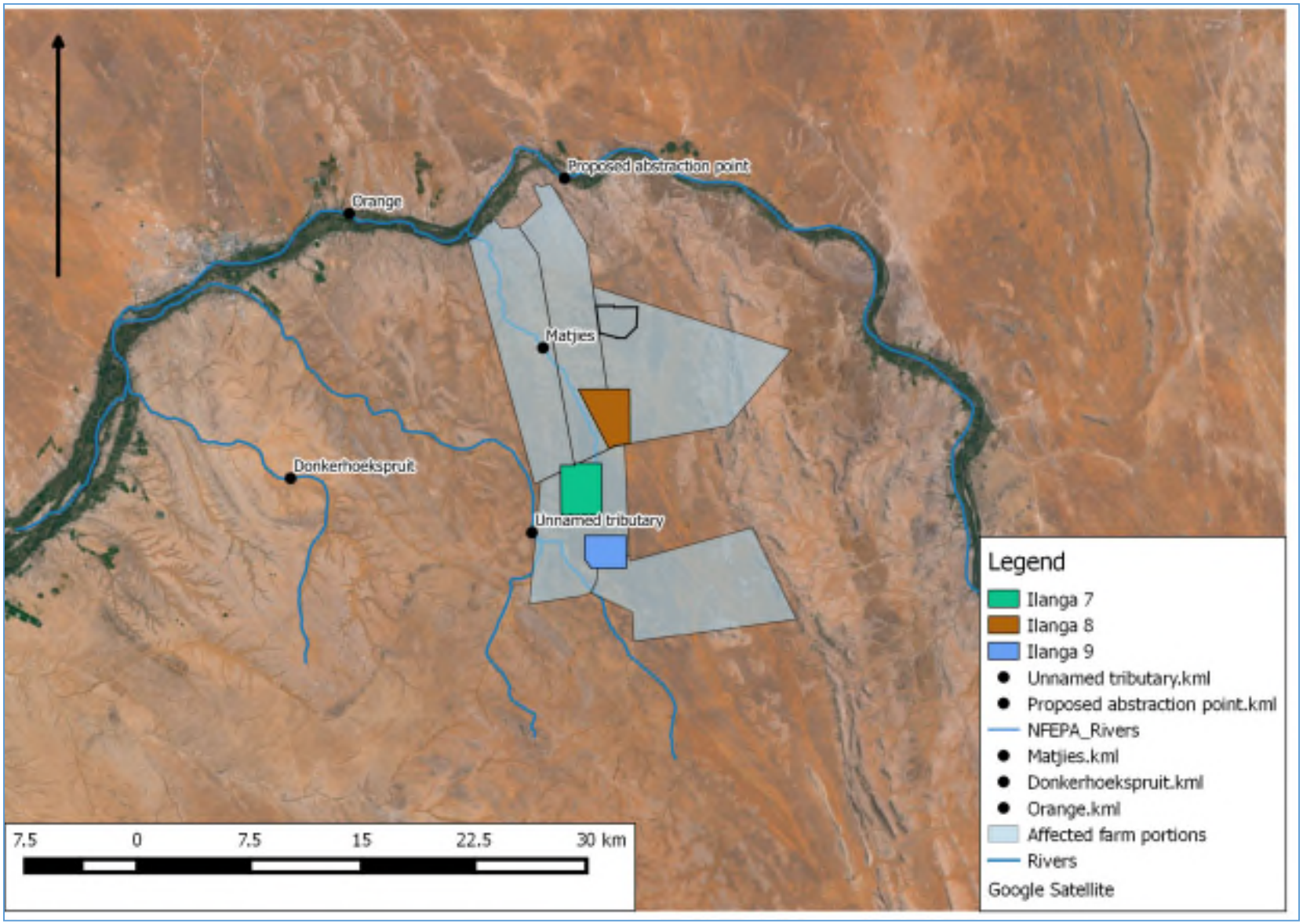

Figure 5.4: Map of the drainage line and rivers associated with the Ilanga CSP project

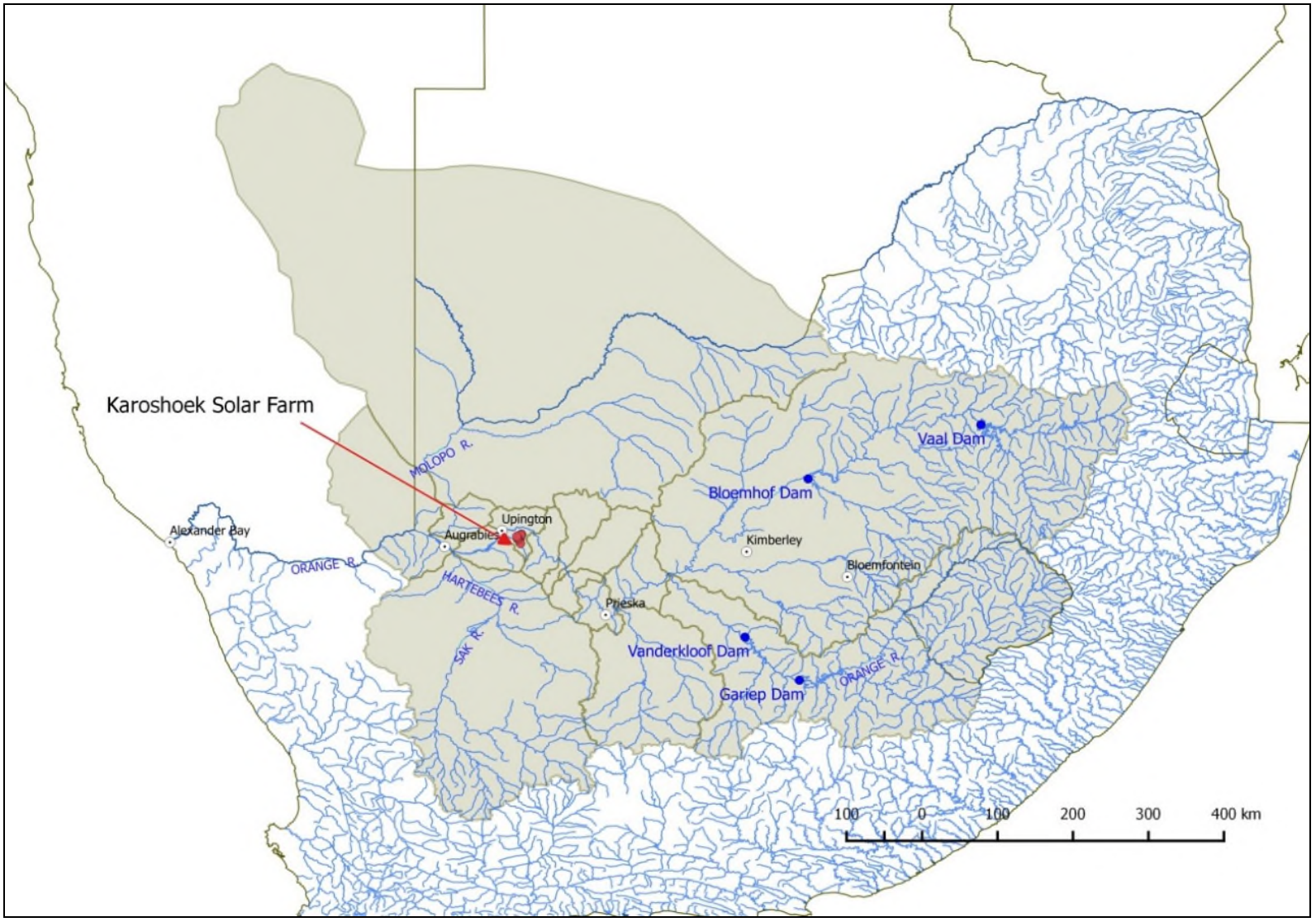

Figure 5.5: Catchment of the Lower Orange River

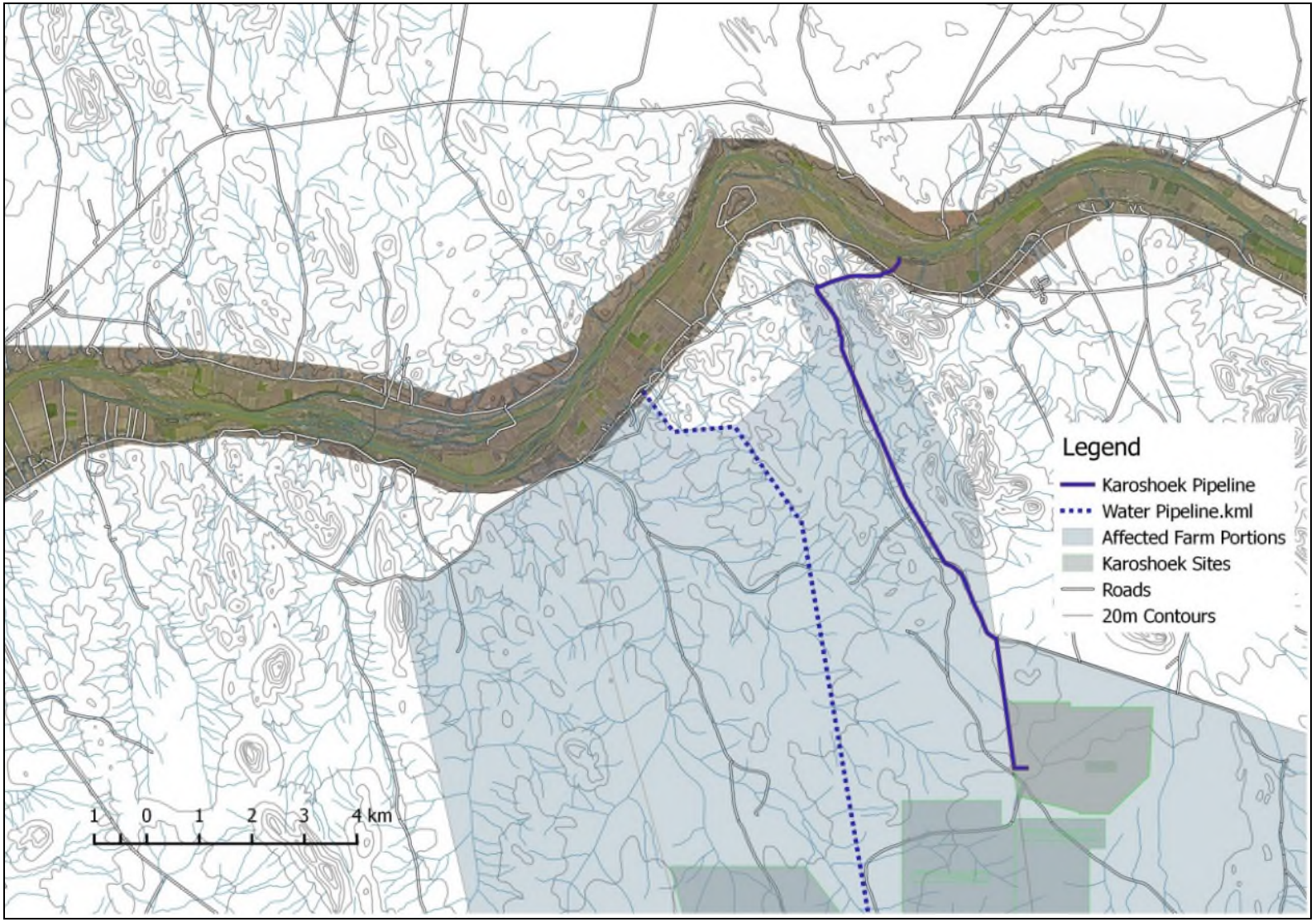

Figure 5.6: Overview of the river system at the site of the Karoshoek Solar Valley Development Park

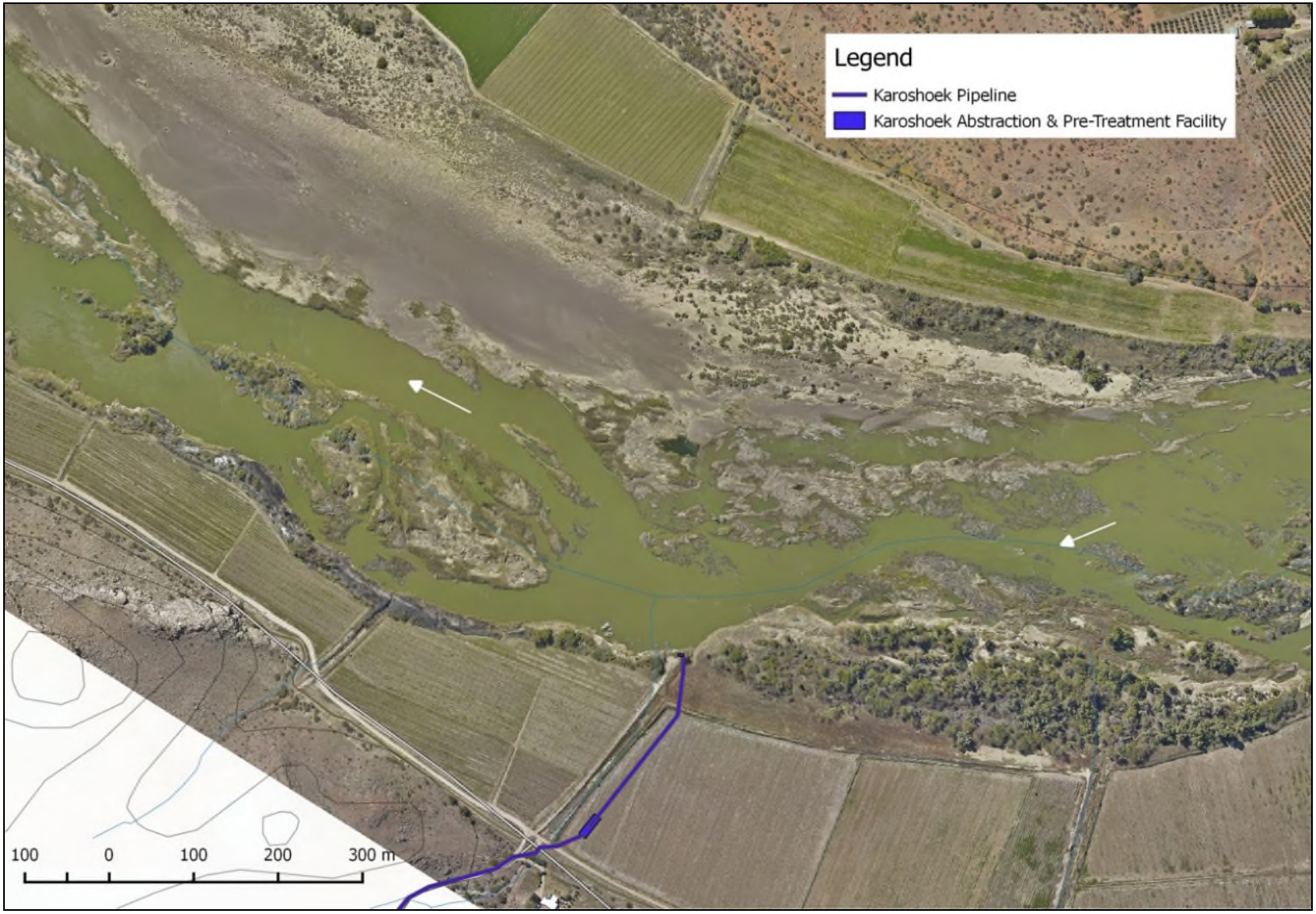
Legend
Karoshoek Pipeline
Karoshoek Abstraction & Pre-Treatment Facility
100
0
100
200
300 m

Figure 5.7: Location of the abstraction point on the Lower Orange River

5.5.3 Soils and Agricultural Potential

The broad study area is covered by the following seven land types, as Figure 5.8, namely:

- **Ae11, Ae111** (Red, freely-drained, structureless soils, high base status);
- **Af25** (Red, freely-drained, structureless soils, high base status, ***with dunes***);
- **Ag4, Ag5** (Shallow, red, freely-drained, structureless soils, high base status);
- **Ia2** (Alluvial soils); and
- **Ic156** (Very rocky areas with shallow soils).

A summary of the dominant soil characteristics of each land type is given in Table 5.2 (the colours correspond to those used in the Figure 5.8). The distribution of soils with high, medium and low agricultural potential within each land type is also given, with the dominant class shown in **bold type.**

Much of the area comprises red, sandy soils, many of which are shallow to moderately deep and only a limited portion of deep soils (as can be seen from the information contained in Table 5.2). In addition, the very low rainfall in the area means that the only means of cultivation would be by irrigation and based on the google images of the study area, there is absolutely no signs of any agricultural infrastructure and certainly none of irrigation, as is clearly evident along the Orange River.

The climatic restrictions mean that this part of the Northern Cape is suited at best for grazing and here the grazing capacity is very low, around 40-50 ha/large stock unit (ARC-ISCW, 2004).

The dominant class of agricultural potential within the study area is **low**. The study area falls within a portion of land type **Ag5** (shallow red soils) and land type **Af25** (mixed depth red soils plus dunes), although the dune areas seem to occur to the south-east of the site.

Table 5.1: Land types occurring (with soils in order of dominance)

Land Type	Depth (mm)	Dominant soils	Percent of land type	Characteristics	Agric. Potential (%)
Ae11	450-1000 100-250	Hutton 30/33 Mispah 10/22 + Rock	49% 45%	Red, sandy soils, occasionally on hardpan calcrete Red-brown, sandy topsoils plus hard rock and calcrete	High: 0.0 Mod: 48.8 **Low: 51.2**

Ae111	450-1200 75-300	Hutton 34/35/44/45 Hutton 34/35/44/45	45% 36%	Red, sandy soils, occasionally on hardpan calcrete Red, sandy topsoils on hard rock and calcrete	High: 0.0 Mod: 45.0 **Low: 55.0**
Af25	>1200 450-1200	Hutton 30/31 Hutton 34/35/44/45	44% 25%	Deep red, sandy ***dune*** soils on hard rock and calcrete Red, sandy soils, occasionally on hardpan calcrete	High: 0.0 Mod: 25.0 **Low: 75.0**
Ag4	100-400 100-400	Hutton 30/33/34 Mispah 10/12/20/22	35% 23%	Red, sandy soils on hard rock and calcrete Red-brown, sandy topsoils plus hard rock and calcrete	High: 0.0 Mod: 11.0 **Low: 89.0**
Ag5	100-400 100-400	Hutton 34/35/44/45 Mispah 10/12/20/22	43% 26%	Red, sandy soils on hard rock and calcrete Red-brown, sandy topsoils plus hard rock and calcrete	High: 0.0 Mod: 12.9 **Low: 87.1**
Ia2	>1200 >1200	Dundee 10 Oakleaf 36/46/47	50% 29%	Deep, brown, stratified alluvial sandy loam soils Deep, brown, alluvial sandy clay loam soils	**High: 79.0** Mod: 0.0 Low: 21.0
Ic156	- 30-250	Rock Mispah 10	85% 6%	Exposed rock outcrops Red, sandy soils, occasionally on hardpan calcrete	High: 0.0 Mod: 8.1 **Low: 91.4**

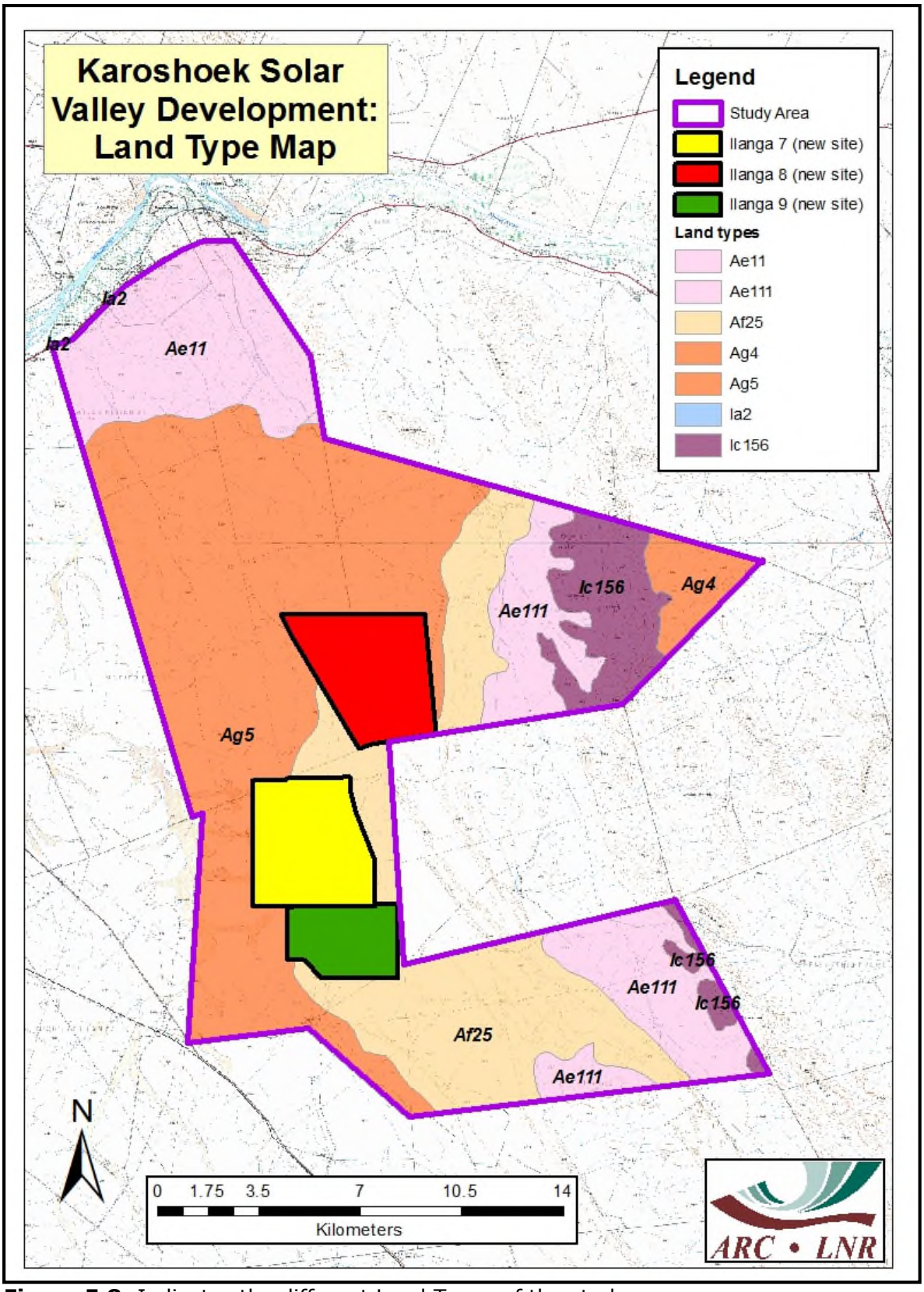

Figure 5.8: Indicates the different Land Types of the study area

5.5.4 Ecological Profile

Vegetation

According to the national vegetation map (Mucina & Rutherford 2006), there are six vegetation types within the broader area around the site, but only four of these are likely to be potentially impacted by the development (refer to **Figure 5.9**). The basic statistics for these vegetation types are listed below in Table 5.1. The only vegetation type of conservation concern in the area is Lower Gariep Alluvial Vegetation which is Endangered on account of the fact that only 50% of this vegetation unit remains intact. This vegetation unit is associated with the alluvium along the Orange River and would not be impacted by the current development which is some distance from the river itself[18]. The other vegetation types are of similar sensitivity at a broad scale and all are overwhelmingly intact and have been little impacted by intensive agriculture or mining across their distribution. Gordonia Duneveld is well protected in comparison to the other vegetation units which are all poorly conserved, with virtually no extent within formal conservation areas. No endemic species are known from Kalahari Karroid Shrubland, while both Gordonia Duneveld and Bushmanland Arid Grassland are known to contain some endemic species, but given that these are some of the most extensive vegetation types within South Africa, the endemic species tend to be widespread within the vegetation type itself and local-level impacts are not likely to be of significance for any of these species.

Table 5.1: Vegetation types which occur in the broad vicinity of the Karoshoek Solar Valley development, with their basic conservation statics and status according to Mucina & Rutherford (2006) as well as the National List of Threatened Ecosystems (2009).

Name	Extent km²	Remaining	Conservation Target	Protected	Status
Kalahari Karroid Shrubland	8284	99.2%	21%	0.1%	Least threatened
Gordonia Duneveld	36772	99.8%	16%	14.2%	Least threatened
Lower Gariep Alluvial Vegetation	752	50.3%	31%	5.8%	Endangered
Lower Gariep Broken Veld	4538	99.5%	21%	3.9%	Least threatened
Bushmanland Arid Grassland	45479	99.4%	21%	0.4%	Least threatened

According to the vegetation map of Mucina & Rutherford (2006), study areas is covered almost equally by Bushmanland Arid Grassland and Gordonia Duneveld (refer to **Figure 5.9**).

[18] Note that the abstraction point is in an area where this vegetation type is disturbed.

» **Bushmanland Arid Grassland** - According to the vegetation map of Mucina & Rutherford (2006), all the proposed development areas fall within Bushmanland Arid Grassland. Within the site, the areas of Bushmanland Arid Grassland are generally extensive open plains with greater or lesser amounts of scattered taller woody species and trees present. Typically, this vegetation unit is dominated by grasses such as *Stipagrostis ciliata, S.uniplumis, S.amabilis* and *Schmidtia kalahariensis*. Trees and shrubs of the open plains included *Boscia foetida, Boscia albitrunca, Parkinsonia africana, Phaeoptilum spinosum, Rhigozum trichotomum* and *Aptosimum albomarginatum*.

There are also rocky and stony outcrops within this vegetation unit that contain a greater number of woody shrubs and grass species not common in other areas. These areas are dominated by species such as *Aptosimum spinescens, Barleria rigida, Leucosphaera bainesii, Zygophyllum dregeanum* and grasses such as *Enneapogon scaber, Stipagrostis obtusa* and *Oropetium capense*. These areas also contain some protected species not observed elsewhere on the site, such as *Adenium oleifolium, Aloe claviflora* and *Hoodia gordonii*. The drainage lines within this vegetation unit are generally broad and flat, often without a distinct drainage channel. These areas generally contain similar grass species to the surrounding plains but contain a greater proportion of woody trees and shrubs, particularly *Acacia erioloba, A.mellifera, Boscia albitrunca, B.foetida, Rhigozum trichotomum* and *Lycium oxycarpum*.

» **Gordonia Duneveld** - is characterized by parallel dunes about 3-8 m above the plains covered by open shrubland with ridges of grassland (dominated by Stipagrostis amabilis) on the dune crests and Acacia haematoxylon on the dune slopes, also with Acacia mellifera on the lower slopes and Rhigozum trichotomum in the interdune straaten.

Important taxa within this vegetation type include small trees and tall shrubs such as *Acacia mellifera* subsp. *detinens, Grewia flavam Rhigozum trichotomum*. The lower shub layer is mostly made up of *Aptosimum albomarginatum* and *Monechma incanum* as well as the succulent shrubs, *Lycium bosciifolium* and *L. pumilum*. *Schmidtia kalahariensis, Eragrostis lehmanniana. V*arious *Stipagrostis* species (primarily *S. ciliata, S. obtusa* and *S. amabilis*) make up the grassy component of these dune fields.

Biogeographically important and endemic taxa include:

» Tall shrubs: *Acacia haematoxylon*
» Graminoids: *Stipagrostis amabilis, Anthephora argentea* and *Megaloprotachne albescens*
» Herbs: *Helichrysum arenicola, Kohautia ramosissima* and *Neuradopsis austro-africana.*

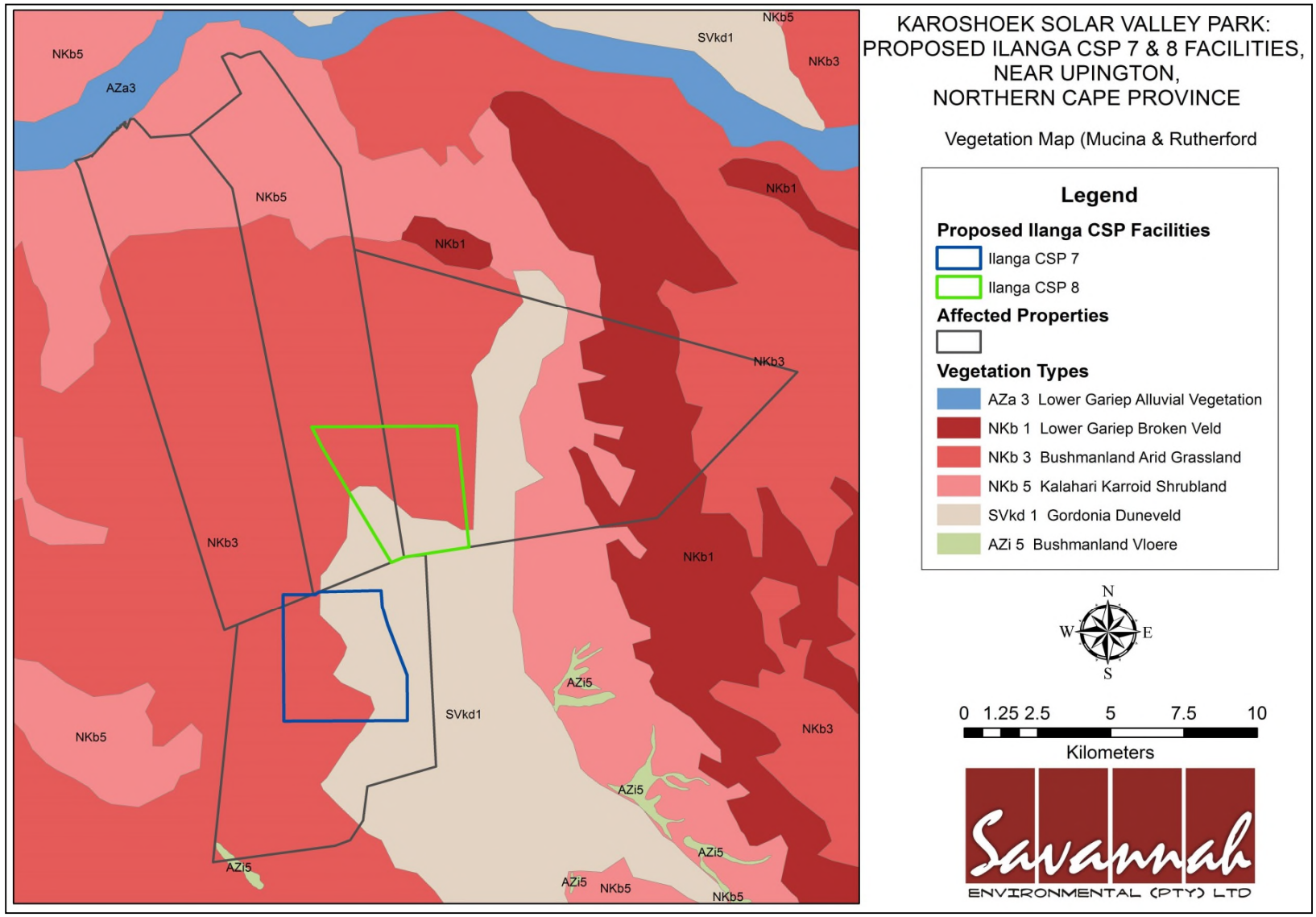

Figure 5.9: Vegetation types as classified by Mucina and Rutherford (2006) as well as NFEPA wetlands locate within the proposed footprint area as well as surroundings.

Protected and Listed Plant Species

A number of protected species were identified on site, which included the *Acacia erioloba*, which are common within some of the larger drainage lines, *Boscia albitrunca* are also widespread at the site and are also particularly common in drainage lines and in areas of red Kalahari sand. *Aloe clavifora* was identified to be common in areas of stony ground, calcrete and on gravel plains*. Adenium oleifolium* was observed to be common on some of the gravel and quartz outcrops. *Hoodia gordonii* was not common. Listed species that are known to occur in the area, but which were not observed include *Brachystelma huttonii* (Rare) and *Pelargonium reniforme* subsp. *reniforme* (Data Deficient Data).

Critical Biodiversity Areas & Broad-Scale Processes

No fine-scale conservation planning has been done for this area of the Northern Cape Province and as a result, no Critical Biodiversity Areas have been defined for the province. However, the ZF Mgcawu District Municipality (formerly Siyanda District Municipality) has compiled an Environmental Management Framework (EMF), in which environmental concerns and conservation priorities for all landscapes within the municipality are listed and mapped. This EMF has however not yet been adopted by the DENC or municipality and is therefore not yet implemented. Although not yet implemented, it is still important to take note that according to the EMF, the proposed project area does not fall within areas earmarked for conservation. According to the EMF there are no specific restrictions on the development area.

Fauna

Mammals

The site falls within the distribution range of 46 terrestrial mammals, indicating that the mammalian diversity at the site is likely to be moderate to low. At a broad scale, it is likely that a large proportion of these species occur at the area. However, within the affected development areas, mammalian diversity is likely to be quite low on account of the limited range of habitats available. No species associated with rocky outcrops are likely to occur within the proposed development areas, which would significantly reduce the number of the species that would be directly affected. The affected habitats are widely available in the area, as well as at a broader scale.

Three listed terrestrial mammals may occur at the site, the Honey Badger *Mellivora capensis* (Endangered), Brown Hyaena *Hyaena brunnea* (Near Threatened) and Black-footed cat *Felis nigripes* (Vulnerable). Although the area is used for livestock production, human activity in the area is low and it is possible that all three listed species occur in the area.

The development footprint areas lies within the distribution range of 6 bat species, indicating that the richness of bats at the site is probably quite low. Bat activity is probably focused along the Orange River, where there is ample food as well as an abundance of natural and artificial shelter. The absence of wetlands and large drainage lines away from the Orange River suggests that bat activity patterns within the site are likely to be low. Areas of higher activity are likely to be near the larger ridges of the area and the wooded drainage lines.

Reptiles

The site lies within the distribution range of 34 reptile species, suggesting that the reptile diversity in the area is likely to be quite low. Within the affected plains habitat of the site, the reptile composition is likely to be dominated by species which inhabit open areas, such as Horned Adders, Sand Lizards, Ground and Barking Geckos. As there are no large rocky outcrops within the proposed development areas, species associated with rocky habitats are not likely to occur in these areas.

Amphibians

The site lies within the distribution range of 10 amphibian species. The only listed species which may occur at the site is the Giant Bullfrog *Pyxicephalus adspersus* which is listed as Near Threatened. Some of the depression wetlands within the proposed development areas represent potentially suitable breeding habitat for this species as well as any other species present which breed in temporary pools. Those amphibians which require perennial water are likely to be restricted to the vicinity of the Orange River and the plains of the site are likely to contain low amphibian diversity and are not likely to be highly significant from an amphibian perspective.

Avifauna Species

A total of 114 bird species were recorded on the 17 bird atlas cards from these and similar areas to the west submitted to the Animal Demography Unit from 2007 to 2015. Of these, 8 species were collision-prone as ranked by the BARESG (2011), and only 2 were red-listed (Kori Bustard and Lanner Falcon). However, three additional species were observed, the Black Harrier, the Booted Eagle, and a nesting Verreaux's Eagle. Therefore, a total of 11 collision-prone species potentially occur on the site.

Other species observed on site are the small and flocking Sociable Weavers. This species builds large grass nests (reputed to be the world's largest) in trees as well as on man-made structures (Spottiswoode 2005). While they are common, their propensity for building on man-made structures is well known and this includes pylons, power line poles, and telephone poles. The presence of heliostat mirrors offering support for their nests may entice flocks to build on structures associated with the mirrors or associated infrastructure.

Bat Species

Vegetation units and geology are of great importance as these may serve as suitable sites for the roosting of bats and support of their foraging habits (Monadjem et al. 2010). Houses and buildings may also serve as suitable roosting spaces (Taylor 2000; Monadjem et al. 2010). The importance of the vegetation units and associated geomorphology serving as potential roosting and foraging sites have been described in Table 5.2 below. There are no houses or buildings located within close proximity of the proposed development site.

Bat species with a geographical distribution that includes the current study area are listed in Table 5.3.

Table 5.2: Potential of the vegetation within the study area to serve as suitable roosting and foraging areas for bats.

Vegetation Unit	Roosting Potential	Foraging Potential	Comments
Bushmanland Arid Grassland	Low	Low	The flat relatively featureless terrain does not offer ample roosting or foraging habitat.
Gordonia Duneveld	Low	Low - Moderate	The undulating dunes can offer some shelter from wind and other elements, but roosting space is low and vegetation sparse.
Kalahari Karroid Shrubland	Low	Moderate	Roosting space is low but the denser vegetation and some floristic elements can offer habitat for insect prey.
Lower Gariep Alluvial Vegetation	Low	High	The availability of open surface water in combination with ample insect prey offers ample foraging opportunities for bats.

Table 5.3: Bat species with a geographical distribution that includes the current study area

Common name	Taxon	Habitat	National status	Likelihood of occurrence
Darling's horseshoe bat	*Rhinolophus darlingii*	Arid areas but require caves or rock crevices	NT	Low, on edge of distribution; suitable probably does not occur on site.
Dent's horseshoe bat	*Rhinolophus denti*	Savanna woodland species but requires caves	NT	Low, on edge of distribution; suitable habitat may occur on site or may be vagrant from Gariep River valley.
Cape Serotine Bat	*Pipistrellus capensis*	Wide habitat tolerances, but often found near open water	LC	Suitable habitat may occur along Gariep River.
Egyptian Free-tailed Bat	*Tadarida aegyptiaca*	In arid areas. often associated with water sources	LC	Suitable habitat may occur along Gariep River.
Egyptian Slit-faced Bat	*Nycteris thebaica*	Wide habitat tolerance	LC	Moderate-High
Straw-coloured fruit bat	*Eidolon helvum*	Occasional migratory visitors within southern Africa	LC	Low

5.6 Social Characteristics of the Study Area and Surrounds

The project site is located approximately 30 km east of Upington within the //Khara Hais Local Municipality (KHLM) and !Kheis Local Municipality (KLM) which falls within the ZF Mgcawu District Municipality (ZFMDM) in the Northern Cape. The socio-economic profile of the ZFMDM and the KHLM, in the Northern Cape Province was found to have the following general characteristics:

- The population of the ZFMDM in 2011 was approximately 236 783 people, of which 93 494 people reside in the KHLM and 16 637 people reside in the KLM.
- The majority of the local population belong to the Coloured group and the most spoken language is Afrikaans.
- 64.6% of the KHLM population and 60.3% of the KLM population comprise the Economically Active Population (EAP); this implies that there is a larger human resource base for development projects to involve the local population. The dependency ratio is high in the local municipalities which puts pressure on the EAP and local municipalities.
- The female population is slightly more prominent in the KHLM and KLM.
- More than half of the local population are semi- skilled or low skilled. This reflects the rural nature of the region and relatively poor level of education.

The skills profile of the area indicates that the availability of local labour for the proposed project is largely limited to low-skilled construction workers and a small number of skilled workers.

- » There is a high unemployment rate in the KHLM (22.1%) and KLM (28%) with a large economically active population seeking employment opportunities. Local workers should be utilised as much as possible for the proposed development in order to alleviate local unemployment.
- » Higher unemployment and lower income levels in the study area demonstrate the need for job creation.
- » The high demand for employment can be addressed (although marginally) through direct job creation during the construction and slightly for the operation phase of the proposed development
- » Access to basic services is generally greater in the KHLM than at a district and provincial level demonstrating that service delivery is generally more accessible. However access to basic services in the KLM is generally low.

According to the //Khara Hais IDP 2012-2017 with regards to the socio-economic characteristics of the local population, the employment rate for the Municipality is relatively high, with as much as 75% of people of working age who are actively seeking employment. The majority of the employed population is found in elementary occupations, which require little or no skills. This is also reflected in the low education levels of the local population, with as much as 12% of the population aged 20 years and older having no form of education whatsoever. This, to some extent, constrains the development potential of the Municipality in the development of more advanced industries. The level of employment and type of occupations taken up by the population of the Municipality also directly affects their income levels.

5.6.1 Tourism in the Study Area

Upington is seen as the "gateway to the Green Kalahari." The main attractions and destinations in the area are the Augrabies Falls National Park, as well as the Kgalagadi Transfrontier Park. A small game farm, Spitskop, is situated approximately 13km to the north of Upington (//Khara Hais SDF, 2008).

There is a growing tourism sector, primarily based on various national parks. Diamonds, iron, lime and salt are mined in the eastern parts of the district and are a major contributor to the district's economy. The ZFMDM has internationally known game parks within its boundaries, namely the Augrabies National Park and the Kgalagadi Transfrontier Park. Riemvasmaak is also being developed as a tourist destination. There is an international airport at Upington, mainly used for the export of agricultural products.

The most prominent economic activities in the ZFMDM include:

- » Agriculture, comprising of grape production which is mainly exported to Europe, as well as livestock and game farming;
- » Extensive livestock farming that occurs mainly on large farms
- » Irrigation farming, although the largest part of the ZFMDM area is taken up by extensive livestock farming;
- » Tourism is one of the most important economic sectors in the Northern Cape as well as within the ZFMDM.
- » The ZFMDM economy is largely dominated by mining and agriculture. Currently salt is being mined and mining activity that occurs in the local municipalities of Tsantsabane and Kgatelopele area are magnese, diamonds and raw ash for producing cement.

5.6.2 Land use characteristics of the broader study site

The Karoshoek Solar Valley Development and associated infrastructures (power line, access road & water pipeline) is located approximately 30 km east of Upington within the KHLM and KLM in the Northern Cape. Smaller settlements such as Dagbreek, Karos and Leerkrans are located near the study area. The 150MW CSP tower plant is proposed on Portion 2 of Matjiesrivier 41 and Portion 4 Trooilaps Pan 53.

The primary land use in the immediate local area is livestock farming which includes sheep farming, cattle farming and goat farming within the larger farms to the south of the N10, there is also intensive grape cultivation activities that take place along the banks of the Orange River. Livestock farming mainly takes place on the larger, privately owned farms. The majority of the area is sparsely populated and consists of wide-open landscapes. The study area has a rural character with little development outside of Upington. The population distribution is concentrated in and around small towns along the Orange River, other farming homesteads are scattered around the area. The authorised Ilanga CSP 1 Parabolic Trough plant is currently under construction adjacent to the proposed site on Karos Lot 994.

Adjacent properties surrounding the proposed site are mainly privately owned farmlands. Livestock farming is the primary land use and majority of the area has a low number of farmsteads that are sparsely populated. Farmsteads occur within the surrounding area and adjacent farms, there are no farmsteads located in the impacted farms. There will be a designated area for livestock grazing on Portion 2 of Matjiesrivier 41 and Portion 4 Trooilaps Pan 53.

5.7 Heritage and *Palaeontology*

Stone Age

South Africa has a long and complex Stone Age sequence of more than 2 million years. The broad sequence includes the Later Stone Age, the Middle Stone Age and the

Earlier Stone Age. Each of these phases contains sub-phases or industrial complexes, and within these we can expect regional variation regarding characteristics and time ranges. For Cultural Resources Management (CRM) purposes it is often only expected/ possible to identify the presence of the three main phases. Yet sometimes the recognition of cultural groups, affinities or trends in technology and/or subsistence practices, as represented by the sub-phases or industrial complexes, is achievable (Lombard 2011). The three main phases can be divided as follows:

- Later Stone Age; associated with Khoi and San societies and their immediate predecessors. Recently to ~30 thousand years ago.
- Middle Stone Age; associated with Homo sapiens and archaic modern humans. 30-300 thousand years ago.
- Earlier Stone Age; associated with early Homo groups such as Homo habilis and Homo erectus. 400 000-> 2 million years ago.

The Later Stone Age

Hunters-with-livestock/herders

The region is well-known as one that produced the largest sample (n = 56) of prehistoric skeletons in South Africa (Morris 1995). Excavated in 1936, known as the 'Kakamas Skeletons', and currently housed in the National Museum in Bloemfontein, they are considered the 'type' specimens of Khoi morphology (1992). Grave locations can be expected along the Gariep (perhaps up to 35 km from its shore), and on the Gariep Islands between Upington and the Augrabies Falls. They are often marked with stone burial cairns, dug into the alluvial soil or into degraded bedrock above the alluvial margin. Graves can be isolated or grouped in small clusters, sometimes containing up to eight graves (Morris 1995).

Burial cairns can be elaborately formed, some with upright stones in their centres, but they are often disturbed. Cairns from near the Gariep Islands are often characterised by their high conical shapes, and the grave shafts filled with stones. Those closer to Augrabies Falls, however, are low and rounded with ashes in the grave shaft (Dreyer & Meiring 1937). The placing of specularite or red ochre over the body was common, but other grave goods are rare (Morris 1995).

Where dating was possible, most of the skeletons were dated to the last 200 years-or-so, but association with archaeological material from up to about 1200 years old is possible. The grave sites show parallels to those of recent Khoi populations (Morris 1995).

Apart from the grave locations, archaeological sites of this period in the region have been further divided into Swartkop and Doornfontein sites. Doornfontein sites are mostly confined to permanent water sources. The assemblages contain a consistently large complement of thin-walled, grit-tempered, well-fired ceramics with thickened bases, lugs, bosses, spouts, and decorated necks or rims. Lithics are often produced on quartz, and dominated by coarse irregular flakes with a small or absent retouched

component (Beaumont et al. 1995; Lombard & Parsons 2008; Parsons 2008). Late occurrences contain coarser potsherds with some grass temper, a higher number of iron or copper objects, and large ostrich eggshell beads. These assemblages are mostly associated with the Khoi (Beaumont et al. 1995).

Post-Wilton

Swartkop sites can be almost contemporaneous with, or older than, the Doornfontein sites. They are usually characterised by many blades/bladelets and backed blades. Coarse undecorated potsherds, often with grass temper, and iron objects are rare. These sites are remarkably common throughout the region. They usually occur on pan or stream-bed margins, near springs, bedrock depressions containing seasonal water, hollows on dunes, and on the flanks or crests of koppies (Beaumont et al. 1995; Parsons 2008). Some of these sites are also associated with stone features, such as ovals or circles, which may represent the bases of huts, windbreaks or hunter's hides (Jacobson 2005; Lombard & Parsons 2008; Parsons 2004). These sites are linked to the historic /Xam communities of the area who usually followed a hunter-gatherer lifeway (Deacon 1986, 1988; Beaumont et al. 1995).

Wilton

These assemblages are distinguished by a significant incidence of cryptocrystalline silicates (mainly chalcedony) and contain many formal tools such as small scrapers, backed blades and bladelets. A regional variation of the Wilton in the area is often referred to as the Springbokoog Industry (Beaumont et al. 1995).

Oakhurst

A few heavily patinated Later Stone Age clusters, that include large scrapers, may represent Oakhurst-type aggregates (Beaumont et al. 1995).

The Middle Stone Age

Previous collections of stone tools in the region include artefacts with advanced prepared cores, blades and convergent flakes or points. Most of the scatters associated with the Middle Stone Age have a 'fresh' or un-abraded appearance. They appear to be mostly associated with the post-Howiesons Poort (MSA 3) or MSA 1 sub-phases (Beaumont et al. 1995). ubstantial Middle Stone Age sites seem uncommon. However, where archaeological sites were excavated, such as only two farms west of Geelkop 456, on Zoovoorbij 458, a Middle Stone Age assemblage was excavated beneath Later Stone Age deposits (Smith 1995). This shows that, although not always visible on the surface, the landscape was inhabited during this phase. The large flake component of the lower units of Zoovoorbij Cave has Levallois-type preparation on the striking platforms, reinforcing their Middle Stone Age context.

The Earlier Stone Age

Stone artefacts associated with this phase, based on their morphology, seem moderately to heavily weathered. Scatters may include long blades, cores (mainly on dolerite), and a low incidence of formal tools such as handaxes and cleavers. Clusters

with distinct Acheulean characteristics have been recorded in the area (Beaumont et al. 1995).

Palaeontological heritage

The Precambrian igneous and metamorphic **basement rocks** underlying the entire study area at depth are entirely unfossiliferous. The fossil record of the Pleistocene to Recent **Kalahari Group** is generally sparse and low in diversity. 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 the underlying bedrocks (including, for example, dolerite) 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*) and shells of land snails (*e.g. Trigonephrus*) (Almond 2008, Almond & Pether 2008). Other fossil groups such as freshwater bivalves and gastropods (*e.g. Corbula, Unio*) and snails, 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. 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 of the **Mokolanen Formation** might also contain trace fossils such as rhizoliths, termite and other insect burrows, or even mammalian trackways. It is noted that potentially fossiliferous alluvial gravels of Neogene or Quaternary age ("High Level Gravels") associated with the Orange River are *not* mapped within the present study area, including within the proposed water supply pipeline corridor.

The igneous and metamorphic basement rocks of Precambrian age underlying the entire Karoshoek Solar Valley Development study area are entirely unfossiliferous. The overlying aeolian sands, calcretes, surface gravels and stream deposits of the Kalahari Group mantling the ancient bedrocks are generally of low to very low palaeontological sensitivity. The three main CSP project areas lie too far from the river to affect any possible older (Tertiary - Quaternary) fossiliferous river gravels along the southern banks of the Gariep. No such gravels are mapped along the banks of the Orange where this is intersected by the proposed water supply pipeline.

ASSESSMENT OF IMPACTS: ILANGA CSP 7 PROJECT AND ASSOCIATED INFRASTRUCTURE CHAPTER 6

The Ilanga CSP 7 Facility is proposed to utilise the solar tower and heliostats technology, using superheated steam, with a generation capacity of up to 150MW and energy storage of up to 6 hours (using molten salts technology). The proposed project which is the subject of this assessment is planned to include several heliostats and a central receiver tower of up to 270m, internal access roads, cables and on-site substation.

The Ilanga CSP 7 Project will have a development footprint of up to approximately 1519ha and will be located within Portion 4 of the Farm Trooilaps Pan 53. The project is proposed to form part of the larger Karoshoek Solar Valley Development and will include the following infrastructure:

» Central tower up to 270m with a molten salt receiver on top of the tower.
» Waste management infrastructure including evaporation dams and a wastewater treatment facility.
» Access roads[19] to the site and internal access roads.
» On-site substation and associated 132kV power line linking the facility to the Karoshoek Solar Valley substation or to the national electricity grid.
» Karoshoek Solar Valley substation and associated power lines 132 – 400kV lines connecting to the National Grid.
» A water supply pipeline from the Orange River (including water treatment and storage reservoirs).
» Operational buildings, including offices and workshops.
» The solar collector field consisting of heliostats, all systems and infrastructure related to the control and operation of the heliostats.
» The power block/power island comprising of a conventional steam turbine generator with an ACC and associated feed water system.
» Molten Salt Circuit which includes the thermal storage tanks for storing low and high temperature liquid salt, a central solar thermal tower receiver, pipelines and molten salt to steam heat exchangers.
» Auxiliary facilities and infrastructure consisting of the switch yard, step up transformers, up to 132 kV power evacuation lines, access routes, water supplies and facility start up generators.

The following infrastructure will be **shared infrastructure** for all the proposed projects within the Karoshoek Solar Valley Development. This infrastructure is to be assessed within a separate Basic Assessment process:

[19] Note that the associated linear infrastructure, i.e. access road to the site, power line infrastructure and water supply pipeline will be assessed through a separate Basic Assessment process.

» On-site substation and associated 132kV power line linking the facility to the national electricity grid;
» Access roads (main and access roads within the property boundary); and
» A water pipeline from the Orange River (including abstraction point, water pre-treatment and storage reservoirs).

The establishment of a CSP facility is comprised of various phases, including pre-construction, construction, operation, and decommissioning[20]. The **construction activities** involved for the proposed CSP plant will include the following:

» Conduct pre-construction surveys.
» Establishment of access roads.
» Undertaking site preparation (i.e. including clearance of vegetation; and stripping and stockpiling of topsoil).
» Transportation of equipment to site and establishment of construction camps; laydown areas (i.e. including storage facilities, batching facilities and mirror assembly plant).
» Assemble and construct troughs.
» Construct power-island and substation.
» Establish and implement a stormwater management plan.
» Undertake site remediation.

The construction phase is expected to take approximately 24-36 months.

The **operational activities** will include the following:

» The operation of the CSP facility.
» The operation of the power island.
» The abstraction, treatment, pumping and storage of water for use in the facility and wastewater handling.
» Site operation and maintenance.

The operation phase is expected to be 20-25 years.

The **decommissioning activities** will include the following:

[20] The CSP 7 infrastructures which will be utilised for the proposed CSP facility are expected to have a lifespan of 20 - 25 years (with maintenance). Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. Although a high level assessment on the impacts associated with decommissioning phase of the facility have been included, it must be noted that decommissioning activities will need to be undertaken in accordance with the relevant legislation applicable at that time, which may require the amendment of the decommissioning mitigation measures proposed in this EIAr to be revisited and amended. It should therefore be noted that listed activities related to decommissioning have not been applied for.

» Removal and disposal of project infrastructure.
» Site rehabilitation.

Environmental impacts of the proposed Ilanga CSP 7 Facility and its infrastructure are expected to be associated with the construction, operation and decommissioning of the facility. The majority of the environmental impacts associated with the facility will occur during the construction phase. Environmental issues associated with **construction and decommissioning** activities of the CSP 7 Facility are similar and include, among others:

» Impact on ecology (flora, fauna and avifauna) and loss of protected species.
» Potential soil loss and change in land-use for the footprint of the facility.
» Impact on heritage resources.
» Social impacts (positive and negative).
» Visual impacts.

Environmental issues specific to the **operation** of the CSP 7 Facility include, among others:

» Visual impacts (intrusion, negative viewer perceptions and visibility of the facility).
» Avifaunal Impacts (fatalities due to the collision with the mirrors)
» Impacts on bats (fatalities due to interactions with solar infrastructure).
» Social impacts (positive and negative).

These and other environmental issues were originally identified through a scoping evaluation of the proposed CSP facility. Potentially significant impacts have now been assessed during this EIA Phase in line with the accepted Plan of Study for EIA. This EIA process has involved key input from specialist consultants, the project developer, and from key stakeholders and interested and affected parties.

This chapter provides a summary of the assessment of the identified potentially significant environmental impacts associated with the development of the proposed Ilanga CSP 7 Facility, as well as recommendations for the management of these impacts for inclusion in the draft Environmental Management Programme (refer to **Appendix N**). This assessment is based on the layout provided by the developer (refer to **Figure 6.1**). This chapter must be read together with the detailed assessments included within the specialist reports contained within Appendix D – L in order to obtain a detailed understanding of the potential impacts associated with the project. Cumulative impacts are assessed within Chapter 7.

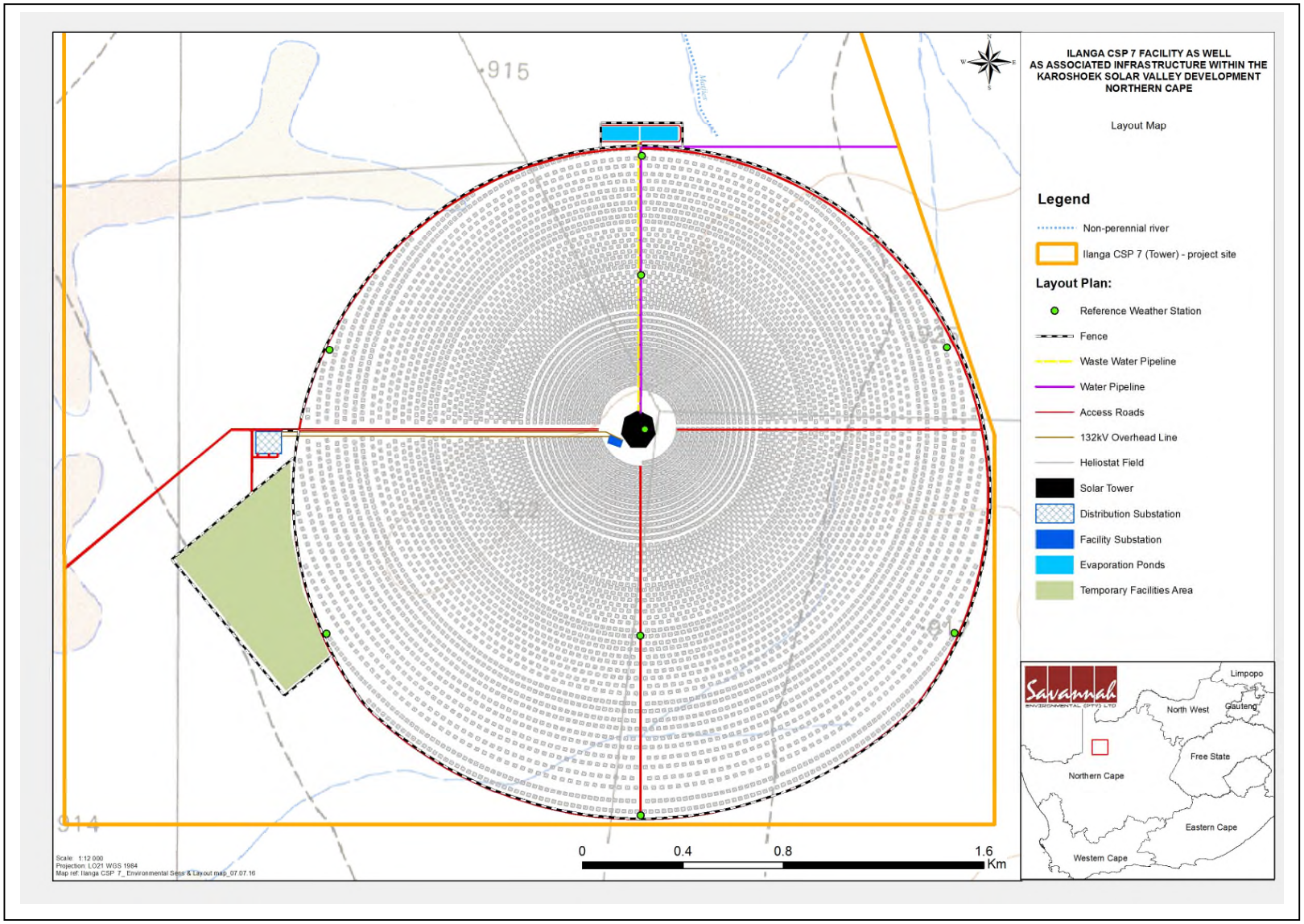

Figure 6.1: Map showing the preliminary layout of the 150MW Ilanga CSP 7 Facility and associated infrastructure

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

Requirement	Relevant Section
3(h)(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts (aa) can be reversed, (bb) may cause irreplaceable loss of resources, and (cc) can be avoided, managed or mitigated.	The impacts and risks identified to be associated with the construction and operation of the Ilanga CSP 9 Facility and the associated infrastructure is included within this chapter. This assessment of the impacts and risks include the nature, significance, magnitude, extent, duration and probability of the impacts as well as the degree to which the impacts can be reversed, may cause irreplaceable loss of resources and can be voided or mitigated. This is included in the Sections 6.2.3, 6.3.3, 6.4.3, 6.5.2, 6.6.3, 6.7.3, 6.8.3, 6.9.3.
3(h)(viii) the possible mitigation measures that could be applied and the level of residual risk.	Possible mitigation measures and the residual risks are included in Sections 6.2.3, 6.3.3, 6.4.3, 6.5.2, 6.6.3, 6.7.3, 6.8.3, 6.9.3.
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 the environmental issues and risks that were identified during the environmental impact assessment process and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures,.	A description of the environmental issues and risks that were identified during the environmental impact assessment process and 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 are included in Sections 6.2.2, 6.2.3, 6.3.2, 6.3.3, 6.4.2, 6.4.3, 6.5.1, 6.5.2, 6.6.2, 6.6.3, 6.7.2, 6.7.3, 6.8.2, 6.8.3, 6.9.2, 6.9.3.
3(m) based on the assessment, and where applicable, recommendations from the specialist reports, the recording of proposed impact management objective and, the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions for authorisation.	Recommendations from the specialists and mitigation measures from the specialist reports for inclusion in the EMPr is within sections 6.2.3, 6.3.3, 6.4.3, 6.5.2, 6.6.3, 6.7.3, 6.8.3, 6.9.3 and within the EMPr which is included as **Appendix M**. The EMPr also includes the recording of the management objective and the impact management outcomes.

6.2 Assessment of Potential Impacts on Flora and Fauna associated with the proposed 150MW Ilanga CSP Facility

The expected impact on flora and fauna as a result of the proposed development will be associated with the loss of habitat which may have direct or indirect impacts on individual species. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix D** - Ecology Report for more details).

6.2.1. Results of the Ecological Study

The Ilanga CSP Tower 7 site consists of open *Stipagrostis* grassland on flat open plains considered to be largely of low to moderate sensitivity. Within this habitat type there are few listed or protected plant species present and the significance of impacts on vegetation within these areas would be low. The density of protected species, largely *Boscia albitrunca* is fairly high and a relatively large number would be affected by the development. Due to the homogenous nature of the habitat for fauna, faunal diversity is likely to be low and faunal species of concern are not likely to be abundant at the site. There are no features at the site considered to be very high sensitivity or present a no go area.

Due to the large amount of development proposed in the area, the development of the site will contribute to cumulative impact. However, the affected Bushmanland Arid Grassland vegetation type is extensive and the extent of habitat loss (ca. 1500ha) resulting from the development would not significantly impact the remaining extent of this vegetation type at the national level, although some local impact on this vegetation type is likely given the large extent of development within this vegetation unit within the broader Karoshoek solar development area. Consequently the impact of the development on the future conservation potential of the area is considered moderate at a local level and low at the national level.

There are no highly sensitive features within the development footprint and the abundance of *Boscia albitrunca* is identified as the only significant feature of the site. As the development of the site would certainly lead to the loss of several hundred individuals of this species, an offset for the loss within the current as well as the other Karoshoek developments should be investigated. However, this should take place in an integrated manner for all the Karoshoek developments and not on a piecemeal basis for each development and should consider the broader connectivity and landscape level processes in the area. Although the development would result in the loss of fairly large numbers of *Boscia*, this is not a rare or threatened tree species and the development would not compromise the local populations of this species which remains widespread in the area.

Overall, and with the suggested mitigation measures implemented, the impacts of the development are likely to be of moderate to low significance and no impacts of high significance are likely. As a result, there are no ecological fatal flaws or impacts that cannot be mitigated that should prevent the development from being approved.

The ecological sensitivity map for the Ilanga CSP 7 facility (authorised site and proposed 150MW facility) is illustrated in **Figure 6.3**.

6.2.2. Description of Ecological Impacts

The development of the Ilanga Tower 7 project is likely to result in a variety of impacts, associated largely with the disturbance, loss and transformation of intact vegetation and faunal habitat due to hard infrastructure. The site is however adjacent to and would be part of the larger Karoshoek development and as such, the impacts associated with the development would be lower than if the development was a stand-alone development within an area of no existing development. The contribution of the development to cumulative impacts is however potentially higher as a result of the presence of other approved developments in the immediate area. The following impacts are identified as the major impacts associated with the development and which are assessed for the preconstruction, construction and operational phases of the development.

Impacts on vegetation and protected plant species

Some loss of vegetation is an inevitable consequence of the development. The vegetation types within the affected area are however widespread and the loss of even a few thousand hectares of these vegetation types would be of relatively minor significance when considered at a broad scale. However, the potential impacts on protected plant species especially *Boscia albitrunca* is one of the main concerns with the development of the site.

Soil erosion and associated degradation of ecosystems

The large amount of disturbance created during construction will leave the site vulnerable to soil erosion. The large amount of hardened surface created by the development will generate significant amounts of runoff during occasional storm events and this will pose a potential erosion hazard to those areas receiving the runoff. As a result, the receiving areas would be vulnerable to erosion and regular monitoring to ensure that erosion problems are addressed would be required.

Increased Alien Plant Invasion Risk

The disturbance created during the construction phase of the project would leave the site highly vulnerable to invasion by alien plant species, which would impact diversity and ecological processes within the area. Alien species that were observed on site and which are likely increase in response to the disturbance include *Prosopis glandulosa*, *Salsola kali* and *Flaveria bidentis*.

Direct Faunal impacts

Construction and operational phase noise, pollution, disturbance and human presence will be detrimental to fauna. Sensitive and shy fauna would move away from the area as a result of the noise and human activities present, while some slow-moving species might not be able to avoid the construction activities and might be killed. Some mammals or reptiles such as tortoises would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction

personnel that are likely to be present. The development areas would also amount to habitat loss for most fauna, although there are some species which would potentially increase in the developed areas. Depending on how the development areas were fenced off, the fencing would probably also restrict animal movement and disrupt the connectivity of the landscape for fauna.

Impacts on Broad-Scale Ecological Processes and Loss of Landscape Connectivity

As there are several preferred bidder projects under development in the area as well as a number of approved renewable energy developments in the area, the development of the current site will contribute towards cumulative impacts, particularly the loss of landscape connectivity. The site is likely to be fenced and the cleared parts of the site are also likely to be hostile to many smaller fauna which will prevent or impede their movement across the landscape.

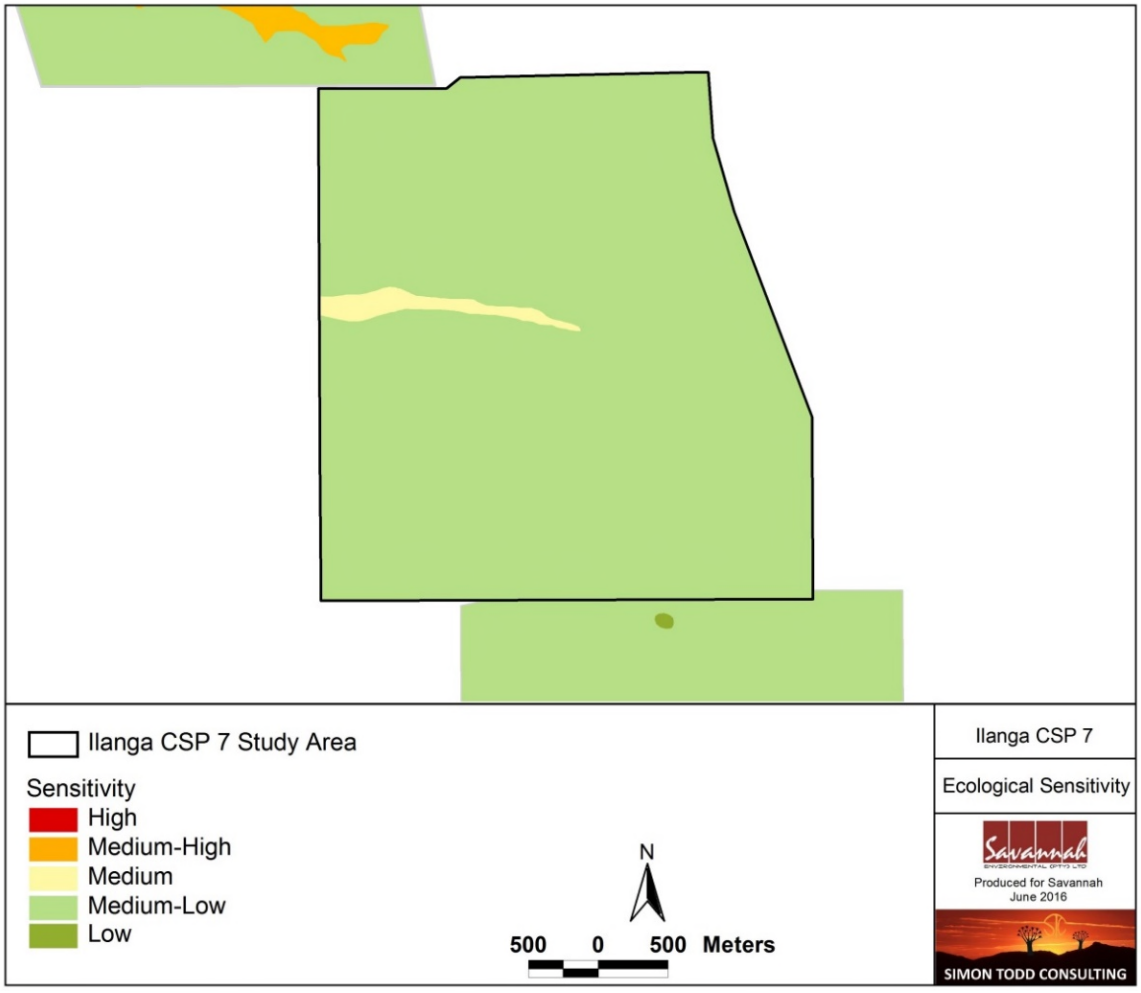

Figure 6.3: Ecological sensitivity map of the Tower 7 site, illustrating that the majority of the site is considered relatively low sensitivity.

6.2.3. Impact tables summarising the significance of the ecological impacts (with and without mitigation)

Planning & Construction Phase Impacts

Impact Nature: Impacts on vegetation and protected plant species will occur due to vegetation clearing and disturbance associated with the construction of the facility.
There relatively large numbers of *Boscia albitrunca* within the development footprint that would be impacted. There are no highly sensitive habitat features present within the site and overall post-mitigation impacts are likely to be **Medium**.

Relevant Listed activities:
GNR 983 Activity: 12 (xii)(a)(c), 28 (ii)
GNR 984 Activity: 1, 15

	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium (5)	Medium (4)
Probability	Certain (5)	Probable (4)
Significance	**Medium (50)**	**Medium (36)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Impacts on protected plant species can to some extent be mitigated through avoidance and translocation, but some impact on vegetation and habitat is inevitable and cannot be avoided.	

Mitigation

» Preconstruction walk-through of the facility in order to locate species of conservation concern that can be translocated prior to construction.
» Vegetation clearing to commence only after walk through has been conducted and necessary permits obtained.
» Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within demarcated construction areas etc.
» ECO to provide supervision and oversight of vegetation clearing activities near sensitive areas.
» Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared.
» Construction activities are to be restricted to the development footprint. No disturbance of vegetation may occur outside of the demarcated development area.
» All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed.
» Temporary lay-down areas should be located within the development footprint or within areas that have been identified as being of low sensitivity. These areas should be

rehabilitated after use.

Residual Impacts
Some residual habitat loss will result from the development, equivalent to the operational footprint of the facility (1519ha).

Impact Nature: Disturbance, transformation and loss of habitat will have a negative effect on resident fauna during construction.

There are fauna resident within the site and these will be impacted during construction of the facility. However, faunal diversity and density within the site is low and post mitigation impacts are likely to be **Low** and of **Local** significance only.

Relevant Listed activities:
GNR 983 Activity: 12 (xii)(a)(c), 28 (ii)
GNR 984 Activity: 1, 15

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Medium (6)	Medium (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (36)**	**Low (28)**
Status	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Large amounts of noise and disturbance at the site during construction is largely unavoidable.	

Mitigation

» All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises, and owls which are often persecuted out of superstition.
» Any fauna threatened by the construction activities should be removed to safety by the ECO or appropriately qualified environmental officer. An appropriate permit must be obtained for the relocation of fauna.
» Regular dust suppression during construction, especially along access roads which are used frequently.
» All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.
» All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.

Residual Impacts
There will be some residual impact as the facility will persist past the construction phase.

Operation Phase Impacts

Impact Nature: Alien plants are likely to invade the site as a result of the large amounts of disturbance created during operation.

Current levels of plant invasion at the site are moderate. Alien species such as *Prosopis* are already present and would potentially invade the site along with other typical weedy species such as *Salsola kali* and *Flaveria bidentis.*

Relevant Listed activities:
GNR 984 Activity: 1

	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Medium (5)	Low (3)
Probability	Probable (4)	Improbable (3)
Significance	**Medium (40)**	**Low (21)**
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes	

Mitigation

» Due to the disturbance at the site as well as the increased runoff generated at the site, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented.
» Rehabilitation of cleared areas with indigenous species after construction to reduce alien invasion potential.
» Regular monitoring for alien plants within the development footprint.
» Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible and should only be used for woody species which re-sprout following manual control.

Residual Impacts
If alien species at the site are controlled, then there will be very little residual impact.

Impact Nature: The operation and presence of the facility may lead to disturbance or persecution of fauna.
It is likely that some fauna including Ground Squirrels, Yellow Mongoose and Gerbils are likely to increase or settle within the Tower 7 development area. These should be tolerated and allowed to move about the facility. In addition if the facility is to be fenced with electrical fencing, this should be on the inside and not the outside of the facility.

Relevant Listed activities:
GNR 984 Activity: 1

	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)

Magnitude	Medium (5)	Low (3)
Probability	Probable (3)	Probable (2)
Significance	**Medium (30)**	**Low (16)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	To some extent, but not that part related to the presence and operation of the facility.	

Mitigation

» No unauthorised persons should be allowed onto the site.
» Undesirable and problem fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. An appropriate permit must be obtained for the relocation of fauna.
» The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden.
» If parts of the site must be lit at night for security purposes, this should be done with low-UV type lights (such as most LEDs), which do not attract insects.
» All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
» All vehicles accessing or on the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises.

Residual Impacts

The facility will be operational for at least 20 years and impact sources such as disturbance will persist for the operational lifetime of the facility and cannot be mitigated, although many fauna would become habituated to these disturbance sources and this would operate only at a local level. The impact will be largely removed after decommissioning although some habitat degradation is likely to persist for some decades as it is not likely that the affected areas can be rehabilitated to their preconstruction state.

Impact Nature: As there are several other preferred bidders as well as authorised renewable energy developments in the area, the operation of the site will contribute towards the loss of landscape connectivity.

The facility will prevent fauna from moving through the area and decrease landscape connectivity at the site level. However, the surrounding landscape is still largely intact and the magnitude of impact would be moderate as a result although additional development will increasingly impact connectivity.

Relevant Listed activities:

GNR 984 Activity: 1

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium (4)	Low (3)
Probability	Highly Probable (4)	Highly Probable (4)

Significance	**Medium (40)**	**Medium (36)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Only partly as much of the impact stems from the presence and operation of the facility.	

Mitigation

» The development footprint should be kept to a minimum and natural vegetation should be encouraged to return to disturbed areas where possible.
» An open space management plan should be developed for the site, which should include management of biodiversity within the fenced area, as well as that in the adjacent rangeland.
» No fauna should be persecuted within the facility area and any problem animals should be humanely captured and released outside the facility area.

Residual Impacts

There will be some residual impact as it is the presence of the facility that generates the impact and this cannot be mitigated. However, after decommissioning the impact will be removed provided that the area is rehabilitated.

Impact Nature: The loss of unprotected vegetation types on a cumulative basis from the broad area may impact the country's future ability to meet its conservation targets.
The Bushmanland Arid Grassland and Gordonia Duneveld vegetation types are extensive and the extent of habitat loss from the development would not significantly impact the remaining extent of this vegetation type. Even at a local scale, there are no features within or near the site that would be affected and which would be considered a conservation priority. Consequently the impact of the development on the future conservation potential of the area is considered **low**.

Relevant Listed activities:
GNR 984 Activity: 1

	Without Mitigation	**With Mitigation**
Extent	Regional (2)	Regional (2)
Duration	Long-term (2)	Long-term (2)
Magnitude	Medium (5)	Medium-Low (4)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium (36)**	**Low (27)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Partly as the development will impact the site on a long-term basis and it is not likely that it can be fully rehabilitated.	

Mitigation

» The development footprint should be kept to a minimum and natural vegetation should be encouraged to return to disturbed areas as far as possible.
» An open space management plan should be developed for the site, which should include

management of biodiversity within the fenced area, as well as that in the adjacent rangeland.

Residual Impacts
The impact will last for as long as the facility is present and well after that as well because it is not likely that the full biodiversity value of the affected area can be fully restored after decommissioning.

Decommissioning & Closure

Impact Nature: Disturbance or persecution of fauna during the decommissioning phase may occur.
The operation of heavy machinery and human presence at the site during decommissioning would impact fauna.

	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Medium (4)	Low (2)
Probability	Probable (3)	Improbable (3)
Significance	**Low (21)**	**Low (15)**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes.	

Mitigation

» Site access to be controlled and no unauthorised persons should be allowed onto the site.
» The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden.
» Undesirable and problem fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. An appropriate permit must be obtained for the relocation of fauna.
» Any accidental chemical, fuel, and oil spills that occur at the site during decommissioning should be cleaned up in the appropriate manner as related to the nature of the spill.
» No open excavations, holes or pits should be left at the site as fauna can fall in and become trapped.
» All disturbed areas should be rehabilitated with a cover of indigenous grass.

Residual Impacts
With avoidance measures there should be no residual impact on fauna.

Impact Nature: Alien plants are likely to invade the site as a result of disturbance created during decommissioning. This impact would be likely to persist from several years after decommissioning until such time as a cover of indigenous species has recovered. The area is however very arid and this limits which species would potentially invade the site.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Medium-term (3)
Magnitude	Medium (5)	Low (3)
Probability	Probable (3)	Improbable (3)
Significance	**Medium (30)**	**Low (21)**
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes	
Mitigation » Due to the disturbance at the site during decommissioning, alien plant species are likely to invade the site and a long-term control plan will need to be implemented for several years after decommissioning » Regular monitoring (bi-annual) for alien plants within the development footprint for 2-3 years after decommissioning. » Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible. » Cleared and disturbed areas should be revegetated with a cover of indigenous grass or shrubs.		
Residual Impacts If alien species at the site are controlled, then there will be very little residual impact		

6.2.4 Implications for Project Implementation

The ecological impacts can be managed by taking the following implications for project implementation into consideration:

» The Ilanga CSP 7 site consists of shallow gravelly soils dominated by shrubs interspersed with areas of *Stipagrostis* grassland on deeper soils and lower-lying areas with taller shrubs and trees with a dense ground layer of grasses and forbs. There are few listed and protected species across most of the site although the lower lying areas have a relatively high density of *Boscia albitrunca*. As relatively large numbers of protected trees would be affected by the development, permitting conditions from DAFF may have some implications for the wider development and include a requirement for more formal protection of similar habitats in the area.

» Due to the relatively homogenous nature of the habitat for fauna, faunal diversity is likely to be low and faunal species of concern are not likely to be abundant at the site. There are no features at the site considered to be very high sensitivity or represent a no go area.
» Due to the large amount of development proposed in the area, the development of the site will contribute to cumulative impact. However, the affected Bushmanland Arid Grassland vegetation type is extensive and the extent of habitat loss resulting from the development would not significantly impact the remaining extent of this vegetation type, or the availability of this habitat in the broader area. Consequently the impact of the development on habitat loss, fragmentation and the future conservation potential of the area is considered of moderate overall magnitude and of local significance.
» There are no highly sensitive features within the development footprint and the abundance of species of concern within the development area is also low. While there are some protected species present, there are no species of high conservation concern present and no significant impacts can be expected on the local populations of the protected species present.

Overall, and with the suggested mitigation measures implemented, the impacts of the development are likely to be of moderate to low significance and no impacts of high significance are likely.

6.3 Assessment of Potential Impacts on Avifauna associated with the proposed 150MW Ilanga CSP 7 Facility

The expected impacts on avifauna associated with the proposed development will potentially result in loss of habitat during construction and fatalities due to the collision with infrastructure during the operation phase, which may have direct or indirect impacts on individual species. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix E** - Avifaunal Report for more details).

6.3.1. Results of the Avifaunal Study

Two site visits were undertaken to the CSP 7 to coincide with different environmental conditions:

» a dry season visit from 31 October - 7 November 2015;
» a wet-season visit following on-going rains from 29 February – 9 March 2016;

This approach is considered to be the most appropriate time for surveying bird species within the area such that the most representative information on bird species is obtained.

A total of 114 bird species were recorded on the 17 bird atlas cards from the Karoshoek Solar Valley Development area and similar areas to the west (following the proposed Ilanga power line) submitted to the Animal Demography Unit from 2007 to 2014 (Appendix 1). Of these, 8 were collision-prone as ranked by the BARESG (2014), and only 2 were red-listed (Kori Bustard and Lanner Falcon).

This may over-estimate the numbers on site because the SABAP data includes some Orange River pentads. Therefore, the only species tallied are the species recorded in transects, VPs and incidental observations during the survey, to determine overall species richness in the dry and wet seasons over the development area alone. A total of 72 species were recorded which will be added to the SABAP2 data base.

In summary, a total of 14 collision-prone species were recorded in the greater Karoshoek Solar Development area, of which six are red-listed (refer to Table 6.1).

Table 6.1: Threatened (**in red**) and collision-prone bird species (**in bold**) likely to occur over the proposed Ilanga CSP 7 facility drawn from SABAP2 atlas cards for 4 pentads. These are based on 17 cards, submitted to the SABAP2 project from 2007 to 2015. Those shaded were observed during the November 2015 and March 2016 site visits, but not previously recorded.

Common name	Scientific name	Threat status	Reporting Rate*	Collision Rank**	Susceptible to: Disturbance
Verreaux's Eagle	*Aquila verreauxii*	**Vulnerable**		**2**	Moderate
Black Harrier	*Circus maurus*	**Endangered**		**6**	High
Ludwig's Bustard	*Neotis ludwigii*	**Endangered**		**10**	Moderate
Secretarybird	*Saggitarius serpentarius*	**Vulnerable**		**12**	Moderate
Lanner Falcon	*Falco biarmicus*	**Near-threatened**	6%	**22**	
African Fish Eagle	*Haliaetus vocifer*	-	35%	**27**	
Kori Bustard	*Ardeotis kori*	**Vulnerable**	6%	**37**	Moderate
Karoo Korhaan	*Eupodotis vigorii*		6%	**49**	
Booted Eagle	*Aquila pennatus*	-		**55**	
Black-chested Snake Eagle	*Circaetus pectoralis*			**56**	
Pale Chanting Goshawk	*Melierax canorus*	-	6%	**73**	Moderate
N Black Korhaan	*Afrotis afroides*		12%	**91**	
Black-shouldered Kite	*Elanus caeruleus*	-	24%	**96**	
Spotted Eagle Owl	*Bubo africanus*	-	6%	**100**	

*Reporting rate is a measure of the likelihood of occurrence, as recorded in the atlas period.

**Collision rank derived from the BAWESG 2014 guidelines. Smaller numbers denote more collision-prone.

A total of 30 arid-adapted species on CSP Tower site 7 in the two site visits. The density of birds recorded was higher in the wet season than in the dry season. This

was due to flocks of Grey-backed Sparrow-Lark that were feeding in the area in March 2016.

Three collision prone species in the top 100 (BARESG 2014) were present in the CSP Tower 7 site, of which two were red data species. Of the collision-prone birds recorded on site, two species were bustards (Ludwig's and Kori Bustard), and one was a korhaan. Two small raptors were observed but could not be identified. The rate at which they flew through the site differed between the seasons, averaging 0.42 birds h^{-1}, which is considered to be medium-low.

Other aerial species that may be influenced by the solar flux or mirrored surfaces included Namaqua Sandgrouse that were active in both seasons (averaging 2.7 birds h^{-1}), and the larks that undertake aerial displays.

Sociable Weavers were recorded on site and a large nest site occurred in the south-eastern corner of CSP Tower site 7. Other non-collision-prone species attracted to water were recorded on site in relatively large numbers, and these included Namaqua Sandgrouse (138 birds in 24 hours: 5.75 birds h^{-1}) flying randomly in the north-west section of the site. These birds were numerous in both seasons

A sensitivity map was compiled based on all records of collision-prone red data species recorded within the CSP 7 site (refer to Figure 6.4). Two areas of high avian sensitivity were identified:

» The first in the north encompassed an area where two red-data species were present in March 2016 (Ludwig's Bustard, Kori Bustard). Both were probably breeding. Numerous flights of displaying Northern Black Korhaans were also recorded in this area.
» A second high sensitivity area in the south end of site 7 encompassed an area where 2 red data Kori Bustards were located. Given that they were recorded in both seasons the chances are high that they breed here too.

Thus, CSP Tower 7 site is of relatively high sensitivity due to the threatened bustards that were recorded and probably breed there.

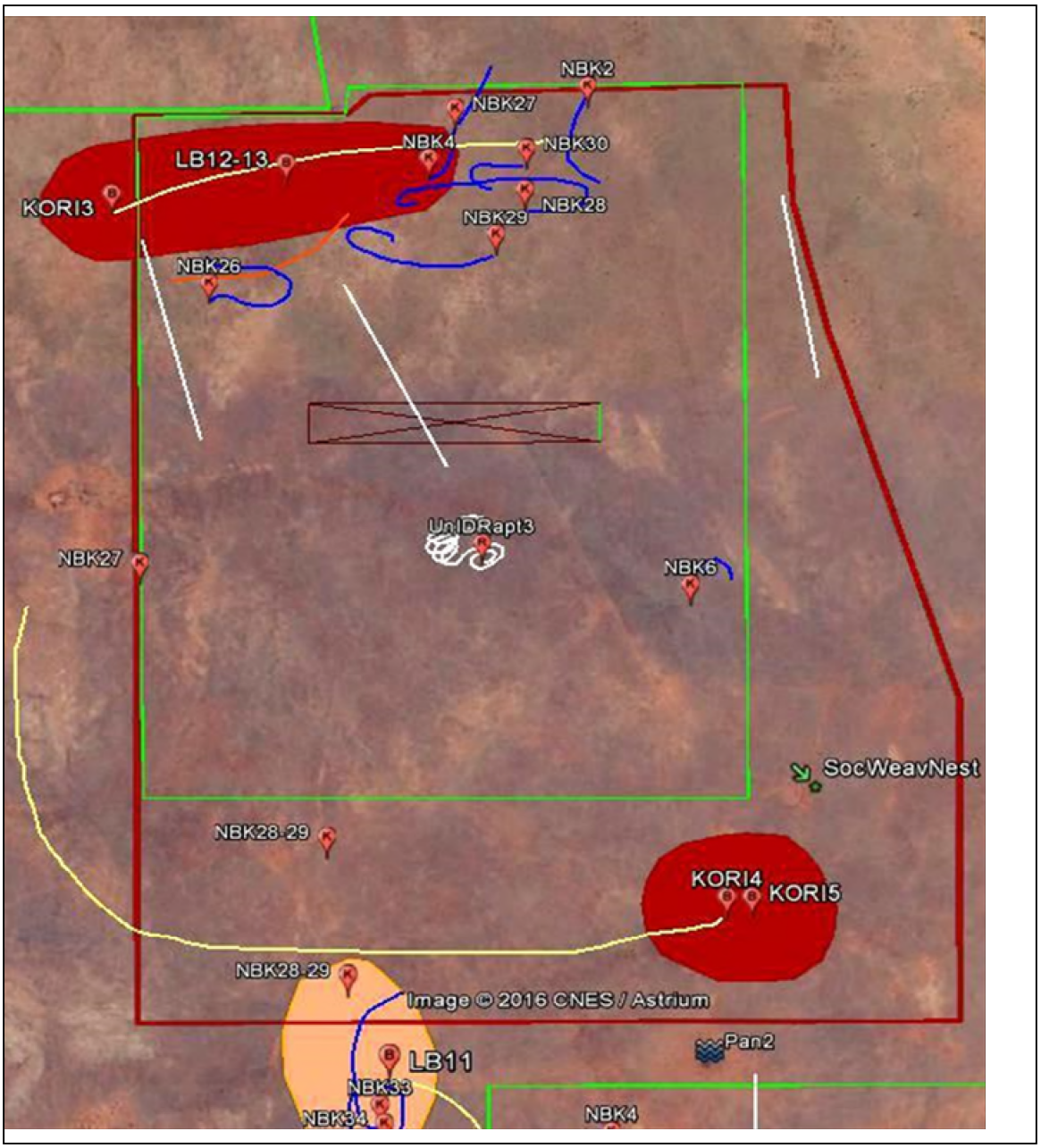

Figure 6.4: Sensitivity map of the collision-prone species on Karoshoek solar development CSP Tower 7. Two areas of high sensitivity were identified. The upper red polygon indicates where two red-data species were recorded in March 2016 (Ludwig's Bustard = LB, Kori Bustard = Kori1). The lower red polygon encloses an area where 2 Kori Bustards were recorded in November 2015 and March 2016 (NBK = Northern Black Korhaan).

6.3.2. Description of Impacts on Avifauna

CSP facilities typically have three key impacts on birds – habitat destruction, population displacement, and, in particular, mortality through collisions. The following impacts are identified as the major impacts associated with the development and which are assessed, for the pre-construction, construction and operational phases of the development area.

Habitat Loss – Destruction, Disturbance and Displacement

The construction and maintenance of CSP technology causes mainly permanent habitat destruction under the parabolic mirrors. Operation and maintenance activities are likely to cause some disturbance to birds in the general surrounds, and especially the shy or ground-nesting species resident in the area. Mitigation of such effects requires that best-practice principles be rigorously applied – i.e. sites are selected to avoid the destruction of key habitats for red data species, and the disturbance final footprint size should all be kept to a minimum. Construction time for each facility is expected to take 2-3 years. From the habitat removal point of view, it is a simple exercise to calculate the numbers of birds potentially lost from density estimates of important species/birds per unit area of habitat. These are likely to be minimal considerations, given that smaller birds are generally more common than larger birds, breed faster, and are less likely to suffer high population reduction. However, where range-restricted species occur on sites ear-marked for development this can have a larger impact.

As only two CSP facilities are currently operational in South Africa (and no post-construction avian reports are available), and there are relatively few published studies of avian mortalities at such sites in other parts of the world, limited information on actual impacts in this regard is available.

Collision – with Reticulation Lines and CSP Tower Heliostats

Several South African bird species are well known to collide with overhead power lines, fences, towers and other aerial objects (Jenkins et al. 2010). These have been tabulated and the reasons for their propensity for collision investigated (Martin and Shaw 2010). The extenuating factors were then extrapolated to all South African species based on wing loading, aerial flights, nocturnal activity, red-data status (Taylor et al. 2015) and several other contributing factors (BARESG 2014).

The most collision-prone species are generally the larger species such as bustards and cranes, but also raptors. It is somewhat surprising that birds also collide with ground-based structures and, as detailed in the avifauna specialist report (**Appendix E**), these include passerines, and wetland birds in collision with CSP helisostats in the USA. While it is unknown which species will be similarly prone in South Africa, they are likely

to be a similar suite of birds (i.e. wetland and aerial species), and those known to collide with aerial structures (bustards and raptors).

Feather Singeing and Incineration in the Solar Flux

Air temperatures close to the receiving area at the top of the CSP tower often exceed 500°C. This temperature is only reached when the heliostats are focused on the area, and it declines as one gets closer to the mirrors, further from the focus. Modelling of the temperature at different heights indicates that only above ~175m on a 200m tower will temperatures exceed 400°C. This is critical because it is at this point that feathers start to curl and melt (Kagen et al. 2014), and birds can no longer stay airborne.

Avian fatalities arising from birds passing through the solar flux have been recorded at the Mojave Desert CSP plants at Ivanpah in the USA with clear signs that the victims' feathers have been singed[21]. It is thought that insects are attracted to the intense light at the plants, this attracts migrants, and predatory raptors are attracted to both insects and other birds as potential prey. Direct deaths are reported at both Ivanpah and Crescent Dunes in the USA by birds being incinerated as they pass through the highest solar flux, to create "streamers": plumes of smoke and steam as the bird evaporates[22].

There are no data for avian deaths at CSP tower sites in Africa, thus, it is not known if southern African birds will be susceptible to incineration or singeing. There are, however, a number of highly aerial species including the Hirundines (swifts and swallows), soaring raptors (eagles, falcons, buzzards) and sandgrouse that sometimes forage, soar, or commute at high levels and may be susceptible to solar flux burning.

6.3.3. Impact tables summarising the significance of impacts on avifauna (with and without mitigation)

Nature of Impact: Direct impact during construction as a result of displacement /avoidance of area around the Ilanga CSP 7 development site for the Red-listed bird groups identified as at risk. (**Bust** = Bustards, **Rapt** = Raptors, **Korh** = Korhaans, **WetB** = Wetland birds):		
Relevant Listed activities: GNR 983 Activity: 12 (xii)(a)(c), 19 (i), 28 (ii) GNR 984 Activity: 1, 15		
	Without mitigation	**With mitigation**
Extent	Site (2)	Site (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	High (8) (Bust)	Medium-high (6) (Bust)

[21] http://www.livescience.com/43458-bird-deaths-ivanpah-solar-energy-plant.html

[22] http://www.basinandrangewatch. org/Crescent-Dunes-Solar-Flux.html

	High (8) (Rapt) Low (1) (WetB) Low (2) (Korh)	Medium-high (6) (Rapt) Low (1) (WetB) Low (1) (Korh)
Probability	High (5) (Bust) High (5) (Rapt) Low (1) (WetB) Medium-low (3) (Korh)	Medium-high (4) (Bust) Medium-high (4) (Rapt) Low (1) (WetB) Low (2) (Korh)
Significance (E+D+M)P	High (70) (Bust) High (70) (Rapt) Low (7) (WetB) Medium-low (24) (Korh)	Medium (44) (Bust) Medium (44) (Rapt) Low (6) (WetB) Low (12) (Korh)
Status (+ve or –ve)	Negative	Negativ
Reversibility	Medium	medium
Irreplaceable loss of species?	Yes, two red-data species (2 bustards) will lose foraging and breeding habitat with up to 8 birds being impacted.	
Can impacts be mitigated?	Probably yes: but only if the constructions avoids the areas of high sensitivity.	
Mitigation: There are only two mitigations for displacement or avoidance of the CSP troughs by red data birds: » move the site away from highly sensitive bird area (especially feeding/nesting areas or roosts), or » reduce disturbance post-construction to allow birds to re-settle.		
Residual impacts: After mitigation, displacement or avoidance by the species identified above may still occur. A post-construction monitoring programme will assess the efficacy of the mitigations to reduce avoidance by the red data birds. Further research and mitigation can then be suggested and tested as the need arises.		

Nature of impact: Direct impact during operation as a result of mortality from impacting the mirrored surfaces within the Ilanga CSP 7 development site for the Red-listed bird groups identified as at risk. (**Bust** = Bustards, **Rapt** = Raptors, **Korh** = Korhaans, **WetB** = Wetland birds):		
Relevant Listed activities: GNR 983 Activity: 12 (xii)(a)(c), 19 (i), 28 (ii) GNR 984 Activity: 1, 15		
	Without mitigation	**With mitigation**
Extent	Site (1)	Site (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3) (Bust) Low (3) (Rapt) Medium (4) (WetB) Low (2) (Korh)	Low (2) (Bust) Low (2) (Rapt) Low (3) (WetB) Low (1) (Korh)

Probability	Improbable (2) (Bust) Improbable (2) (Rapt) Very improbable (1) (WetB) Improbable (2) (Korh)	Very improbable (1) (Bust) Very improbable (1) (Rapt) Very improbable (1) (WetB) Very improbable (1) (Korh)
Significance (E+D+M)P	**Low (16) (Bust)** **Low (16 (Rapt)** **Low (9) (WetB)** **Low (14) (Korh)**	**Low (7) (Bust)** **Low (7) (Rapt)** **Low (8) (WetB)** **Low (6) (Korh)**
Status (+ve or –ve)	Negative	Neutral
Reversibility	Medium	(Mitigations untested)
Irreplaceable loss of species?	No, few red data species occur within the development area. It depends entirely whether wetland species (or other African species) are attracted to and collide with the CSP mirrors.	
Can impacts be mitigated?	Probably yes, the use of bird scaring strategies in the development area will probably deter species from interacting negatively.	
Mitigation: » There are two classes of mitigation for the CSP troughs: (i) move them away from highly sensitive bird areas (especially pans or other nests or roosts), or (ii) employ bird-diverters to deter birds mistaking the troughs for open water. » It is recommended that the developer install video cameras above some troughs for post-construction monitoring of any mortality of birds in the vicinity, through direct observation and carcass searches in a systematic and regular fashion.		
Residual impacts: After mitigation, direct mortality through collision by the species identified above may still occur. An on-going monitoring programme will assess the efficacy of the mitigations to reduce direct impacts or any problems with sandgrouse, or the aerial swallows/swifts impacting trough infrastructure. Further research and mitigation can then be suggested and tested as the need arises.		

Nature of impact: Direct impact during operation as a result of mortality from flying through the solar flux around or above the CSP tower for the Red-listed bird groups and highly aerial species. (**Bust** = Bustards, **Rapt** = Raptors, **Korh** = Korhaans, **Sandgrouse+ Hirundines** = Sand/Hiru):		
Relevant Listed activities: GNR 983 Activity: 12 (xii)(a)(c), 19 (i), 28 (ii) GNR 984 Activity: 1, 15		
	Without mitigation	**With mitigation**
Extent	Site (2)	Site (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3) (Bust) High (7) (Rapt)	Low (2) (Bust) Medium-high (6) (Rapt)

	High (7) (Sand/Hiru) Low (2) (Korh)	Medium -high (6) (WetB) Low (1) (Korh)
Probability	Improbable (2) (Bust) Probably (4) (Rapt) Probable (4) (Sand/Hiru) Improbable (2) (Korh)	Very improbable (1) (Bust) Improbable (3) (Rapt) Improbable (3) (Sand/Hiru) Very improbable (1) (Korh)
Significance (E+D+M)P	**Low (16) (Bust)** **High (53) (Rapt)** **High (53) (Sand/Hiru)** **Low (16) (Korh)**	**Low (7) (Bust)** **Medium (33) (Rapt)** **Medium (33) (Sand/ Hiru)** **Low (6) (Korh)**
Status (+ve or –ve)	Negative	Negative-neutral
Reversibility	Medium	(mitigations untested)
Irreplaceable loss of species?	Yes, red data species and large numbers of sandgrouse and swifts and swallows have the potential to be incinerated or suffer feather singeing. The risk depends entirely whether aerial species such as sandgrouse and raptors are attracted to or fly through the solar flux.	
Can impacts be mitigated?	Probably yes: moving the site away from the high sensitivity areas and avoiding all flyways to pans (or closing them down) may deter species from flying through the solar flux.	

Mitigation:

» There are three classes of mitigation to avoid deaths from incineration and singeing: (i) move the site away from highly sensitive bird area (especially fly-ways to flooded pans or other nests or roosts), or (ii) shutting down and covering all sources of water within 1 km of the solar site (this includes settling ponds) or (iii) employ bird-diverters to deter birds from flying through the high energy end of the solar flux.

» Evaporation ponds located on the boundary edge of the heliostat mirrors will act as a magnet for both wetland birds and arid-adapted species seeking water on hot or dry days. Such ponds should be completely covered so birds do not perceive them from above or they should be constructed more than 1 km from the edge of the heliostat field. Positioning them so that birds do not fly through the solar flux from a known roost or already existing water source will further reduce any possible impacts.

» It is recommended that the developer install video cameras above some mirrors or on the tower itself for post-construction monitoring of any mortality of birds in the vicinity, through direct observation and carcass searches in a systematic and regular fashion.

» Standby mode for the heliostats often involves the mirrors focusing light above the 270 m tower. This can also kill birds flying through the intense flux. Thus mirrors vertically orientated in standby (to produce no focussed flux) or a series of 10 or more focal points at tower height, none of which are intense enough to kill birds flying through them, will reduce this form of mortality to close to zero.

» Vertically orientated mirrors are the best solution given that they also will not form a reflective surface that birds may attempt to land on.

Residual impacts:

After mitigation, direct mortality through singeing or incineration collision by the species identified above may still occur. An ongoing monitoring programme will assess the efficacy

of the mitigations to reduce direct impacts or any problems with sandgrouse, or the aerial swallows/swifts being killed in any numbers. Further research and mitigation can then be suggested and tested as the need arises.

6.3.4. Implications for Project Implementation

With the implementation of mitigation measures by the developer, contractors, and operational staff, the severity of avifaunal impacts of the Ilanga CSP 7 Facility can be reduced to low, or avoided. The CSP 7 Facility can be developed and impacts on avifauna managed by taking the following into consideration:

» Impacts associated with the project are expected to be of medium-high levels of significance for the threatened collision-prone species present on CSP tower site 7 that requires mitigation.
» Bird scaring techniques are used on the mirrors and the tower, including rotating prisms, avian distress calls and experimental use of Torri lines (ribbons used on trawlers to deter albatrosses from taking baited hooks and drowning), if birds are found to impact the CSP infrastructure.
» A structured but *ad hoc* construction and post-construction assessment, as laid out in the Environmental Management Programme by trained ornithologists will determine the impacts and provide appropriate mitigations.
» Little research is presently available to determine the impact of CSP trough and tower technology on the South African avian community. Therefore, a minimum of 12 months' post-construction monitoring at this site by trained ornithologists is recommended.
» It is recommend that all available precautions are taken to avoid threatened species and wetland birds being attracted to the faclity. Evaporation ponds must be completely covered (using a mesh), or located at least 1km from the heliostat field. Positioning them so that birds do not fly through the solar flux from a known roost or already existing water source will further reduce any possible impacts

6.4 Assessment of Potential Impacts on Bats associated with the proposed 150MW Ilanga CSP 7 Facility

6.4.1. Results of the Bat Study

Potential impacts on bats as a result of the proposed CSP 7 Facility could include:

» Reductions in the extent of bat foraging and roosting habitat
» Mortality as a result of the interaction with the proposed infrastructure

Reductions in the extent of bat foraging and roosting habitat
Tthe development site is located completely within the Bushmanland Arid Grassland. The flat relatively featureless terrain of this vegetation type within the study area does not offer ample roosting or foraging habitat and therefore, there is a low likelihood that this impact will occur.

Mortality as a result of the interaction with the proposed infrastructure
Results of international and local monitoring indicate that bat interactions with thermal solar facility infrastructure are associated with the air-cooled condenser, with bat mortalities being recorded within or in close proximity to this infrastructure. The mechanism of cooling the steam at the local facility allows for the hot steam to be openly blown onto the condenser, inside the steam condenser building. This mechanism in combination with the condenser building being accessible to bats, is what allowed for the bats to get in contact with hot steam, which was the cause of the mortalities. The mortalities recorded at this site are most likely to be almost exclusively of the species *Tadarida aegyptiaca* (Egyptian Free-tailed bat) with very few that may have been *Neoromicia capensis* (Cape Serotine bat), both of which could potentially occur within the larger study area (i.e. along the Gariep River). It must be noted that bat fatalities at this site were recorded on only one occasion, prior to full operation of the facility.

6.4.2. Impact table summarising the significance of impacts on bats during the construction and operation phases (with and without mitigation)

Impact Nature: Some roosting and foraging habitat will be lost by means of the construction the facility.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Minor (2)
Probability	Highly Probable (4)	Highly Probable (4)

Significance	Medium (36)	Low (28)
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes	
Mitigation: The development is proposed within a habitat with low foraging and roosting potential, it should remain within this habitat as the preferred location.		
Residual Impacts: The impacted habitat cannot be rehabilitated to a state that is completely similar to preconstruction, however the roosting and foraging potential of the impacted habitat is low and therefore the residual impacts reduction of foraging and roosting habitat is also considered to be low.		

Impact Nature: Bat mortalities may occur due to interaction with potentially harmful infrastructure (e.g. contact with hot steam), if such infrastructure is not adequately closed up.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Minor (2)
Probability	Highly Probable (4)	Very Improbable (1)
Significance	**Medium (52)**	**Low (5)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes	
Mitigation: Buildings housing steam condensers and other hot surfaces/liquids should be closed up thoroughly and have no overhanging roofs or overlapping sheets with holes of 1.5cm or more in diameter.		
Residual Impacts: Local bat populations, if impacted in significantly, have a slow recovery rate due to bats having a low level of annual reproduction.		

6.4.3. Implications for Project Implementation

With the implementation of mitigation measures by the developer, contractors, and operational staff, the severity of bat impacts of the Ilanga CSP 7 Project can be reduced to low, or avoided. The Ilanga CSP 7 Project can be developed and impacts on bats managed by taking the following into consideration:

» The cooling system used must be based on an Air Cooled Condenser, which is a widely used technology for all kind of power plants. The steam is a completely closed system.
» Structures with high temperatures are to be appropriately thermally isolated. Any openings to the central tower and pipe extractions are to be closed with a grid to prevent bats entering these areas.
» The tower must be monitored with thermal cameras. There will be no significant heat loss at night at top of the solar flux tower. The tower will be completely drained on a daily basis before the sunset. The receiver will quickly cool.
» The risk of mortality as a result of interactions with the solar facility infrastructure (such as the ACC) is therefore considered to be low as there is little potential for bats to come into contact with heated surfaces and/or steam.

6.5 Assessment of Potential Impacts on Water Resources associated with the proposed 150MW Ilanga CSP 7 Facility

6.5.1. Results of the Water Resources Study

The proposed solar development is situated to the south of the Orange River with a proposed abstraction point that is situated on the Orange River approximately 25km upstream of Upington. The banks of the Orange River adjacent to the proposed abstraction point are utilised for irrigated agricultural activities with fruits such as grapes being the main crop grown due to the fertile floodplain soils. The activities in the area and local land uses have had impacts on the aquatic system and visible disturbances were moderate. Due to these activities the system is regarded as largely modified.

6.5.2. Description of the impacts on the Water Resources

The proposed water abstraction of water from the Orange River may alter flow quantities and inundation levels in the Orange River thereby impacting on habitat availability and migration corridors for fish.

Potential impacts on river ecosystems due to abstraction include the following:

» Changes in biotic communities due to changed habitat structure;
» Changes in aquatic habitats; and
» Loss of sensitive aquatic biota.

6.5.3. Impact table summarising the significance of impacts on water resources during the construction and operation phases (with and without mitigation)

The assessment of impacts on water resources has been undertaken in accordance with the DWS risk-based water use authorisation approach and delegation guidelines. The details of the scoring of the various aspects are provided in Tables 5 and 6 of the Water Resources Specialist Report contained in **Appendix F**. The tables below present the Risk Rating as determined from this assessment, as well as an indication of the significance of impacts expected, which is based on the risk rating provided.

Nature:		
Reduced flow levels due to abstraction of water may results in changes in aquatic habitats. Changes in aquatic habitats may result in changes in biotic communities including the loss of species of conservation concern.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Site (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance (E+D+M)P	**Medium (40)**	**Low (28)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes

Mitigation*:* Structures should be put in place to reuse process water thereby reducing the requirement for continual water abstraction. Monitoring should be conducted by DWS of the cumulative abstraction associated with the various CSP sites in the region.
Cumulative impacts: Although the impacts of abstraction of water from a single CSP facility will be low, the impact of abstraction from several CSP facilities in the same region will be compounded and may range from medium to high.
Residual Risks: As water is required for operation of the CSP facility, some abstraction of water will be required, with little opportunity for mitigation.

6.5.4. Implications for Project Implementation

The following conclusions were reached based on this assessment:

» Based on the fish community, biotic integrity in this section of the Orange River is in a good state with 9 of the 10 potential fish species recorded during the February 2016 survey.
» Four species of conservation concern were captured during this survey. This includes 2 indigenous species with high sensitivity and 2 alien invasive species that threaten biotic integrity in the Orange River and need to be removed.
» Potential impacts on aquatic ecosystems are primarily associated with the abstraction of water for the proposed Ilanga CSP 7 Facility from the Orange River. Abstraction of water may result in modification of instream habitats which may in turn result in changes to the aquatic fauna and flora communities which includes species and ecosystems of conservation importance.
» The significance of potential impacts was rated as low prior to implementation of mitigation measures based on the DWS risk-based water use authorisation approach and delegation guidelines.
» The project has the potential to contribute positively to South Africa's growing power demands;
» It is concluded by the specialist that the project be favourably considered.

6.6 Assessment of Potential Impacts related to the Storage and Handling of Dangerous Goods

During the construction and operation phase, the Ilanga CSP 7 Facility will require the storage of materials which may be considered to be dangerous goods.

"Dangerous goods" is defined under the Listing Notices that deal with the storage, or storage and handling, of dangerous goods:

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

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

6.6.1. Description of the Impacts associated with the storage and handling of hazardous substances

The construction and operation of the Ilanga CSP 7 Facility requires the storage of fuels and other chemicals for everyday construction, operation and maintenance. The facilities or infrastructure for storage and handling of a dangerous good will be located in containers with a combined capacity of 80 but not exceeding 500 cubic metres (m^3). The construction phase will require the handling and storage of materials including hydraulic oil, fuel, cement and fly ash (for use in concrete batching plant) with an estimated volume of 300-400 m^3 at any one time. The operation phase will require the storage and handling of fuels and hydraulic oil with a combined capacity of less than 500m^3.

These substances will be stored on-site in appropriate storage vessels within bunded areas/ on impervious surfaces. A designated storage and dangerous good handling area is considered as part of the facility design. The storage and handling of dangerous goods has the potential to result in soil and/or water contamination should any spillages/leakages occur. This is considered to be the most significant risk, other than a direct risk to personnel on site, which is an occupational health and safety issue and is considered in line with the OH&S Act. While not all materials to be stored on site are considered to be hazardous (or have a hazard rating), materials such as fuel and oils are flammable and also have the potential to cause fires, explosions, damage to infrastructure, as well as injuries of staff.

6.6.2. Impact tables summarising the significance of the storage and handling of hazardous substances (with and without mitigation)

Nature of impact: Soil and water contamination due to the handling and storage of dangerous goods during the construction and operational phases.		
Relevant Listed activities: GNR 983 Activity: 14		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short (2)	Short (1)
Magnitude	High (8)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (33)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation: » Any spillages of dangerous substances must be contained as soon as possible, and remedial and clean-up actions initiated immediately. » Regular inspections of the permanent bunded areas for storage of dangerous goods must be undertaken throughout the life cycle of the project. » Appropriate spill kits must be available on site. » Maintenance vehicles must have access to spill kits. » An emergency spill response plan must be developed for implementation during the construction and the operational phase. Personnel should be suitably trained to attend to any spills which may occur. » A fire management plan must be developed for implementation during the construction and the operational phase. Personnel must be suitably trained to manage any fires which may occur on site. » Flammable substances must be stored in enclosed containers away from heat, sparks, open flames, or oxidizing materials. » Develop a monitoring and leak detection procedure for monitoring of the chemical spillages.		
Residual Impacts: If spillages occur and are not cleaned up, contamination can result in impacts which remain after decommissioning of the project		

6.7 Assessment of Impacts on Agricultural Potential and Soils associated with the proposed 150MW Ilanga CSP 7 Facility

6.7.1. Results of the Soil and Agricultural Potential Assessment

The project site is currently used for livestock farming. However, the grazing capacity is very low (approximately 40-50 ha/large stock unit), which is due to the dominant climatic conditions and prevailing soil conditions. Rainfall is erratic, both locally and seasonally and therefore cannot be relied on for agricultural practices. Very low rainfall, along with other soil-related factors lead to low vegetative cover throughout the area. The area consists of shallow soil with rock outcrops and sandy soils and the whole site can be better utilised for development (such as power generation) in comparison to any other practise. This project site is not regarded as a viable commercial farming site and would be suited to house the facility.

6.7.2. Description of Impacts associated with Soil and Agricultural Potential

Potential Erosion:
The soils in the study area are susceptible to erosion, especially due to the predominance of very sandy soils, often with a fine grade of sand. The measure as to how easy soil may erode by means of wind transportation is given below:

» Fine silt and clay (<0.01 mm) offer strong resistance to movement.
» Coarse silt and very fine sand (0.01-0.1 mm) are lost in suspension.
» Very fine to medium sand (0.1-0.5 mm) is subjected to saltation.
» Coarse sand (0.5-1.0 mm) moves as surface creep.

The general assumption is that the erosion susceptibility increases with an increase in the slope angle and/if the slope length is constant. There is the potential for the loss of soil resources through erosion, particularly during the construction phase. This impact can be effectively minimised through the implementation of appropriate management and mitigation measures including implementation of an appropriate stormwater management plan and regular monitoring of the occurrence, spread and potential cumulative effects of erosion. Impacts post-mitigation are expected to be of low significance.

Loss of Agricultural Land:
The eight-class land capability system from Klingebiel & Montgomery which was drafted in 1961 (refer to Appendix H) provides a way in which agricultural potential data for the country can be measured on a macro scale, grouping similar areas together. The available data was adapted for use with GIS in South Africa and made available by the Land Type Survey Staff under the ISCW. The entire study area falls within Land **Class VII** – very severe limitations that make it unsuited to cultivation and which restrict its use mainly to grazing and habitat for wildlife. Restrictions are

more severe than those for Class VI because of one or more continuing limitations that cannot be corrected. The main restrictions present in this area are the low rainfall and high sun intensity.

The unfavourable climate of the environment greatly decreases agricultural potential. The area is known to be an agricultural-hub but the sites are too far from the Orange River and its fertile banks to realistically be considered for high intensity grazing and/or cultivation practices.

The overall impacts of the proposed facility on agriculture and soil conditions will be low, principally because of the local climatic conditions and the low agricultural and grazing potential of the soils on the site.

6.7.3. Impact table summarising the significance of impacts on Soil and Agricultural Potential during the construction phase (with and without mitigation)

Nature of impact: Loss of agricultural land Land that is no longer able to be utilized due to construction of infrastructure. The impact will be confined to areas within the site where infrastructure will be located and will cease once operation of the activity ceases. The significance of the impact is low due to low potential of area, as well as the nature of the infrastructure.		
Relevant Listed activities: GNR 983 Activity: 28 (ii), 56(ii) GNR 984 Activity: 1, 4		
	Without mitigation	**With mitigation**
Extent	Local (2)	N/A
Duration	Long-term (4)	N/A
Magnitude	Minor (2)	N/A
Probability	Highly Probable (4)	N/A
Significance	**Low (16)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	Irreversible	N/A
Irreplaceable loss of resources?	No	N/A
Can impacts be mitigated?	Yes	N/A
Mitigation: » None.		
Residual Impacts: None provided that the site is rehabilitated after decommissioning.		

Nature of impact: Wind erosion

Removal of topsoil by the action of wind due to removal of vegetation. The impact will possibly occur in areas surrounding the project site. The impact will cease when operation of activity ceases. The significance and severity of the impact is low, mainly due to low potential of the area and the nature of infrastructure. Especially if mitigation measures are put in place and applied.

Relevant Listed activities:

GNR 983 Activity: 28 (ii), 56(ii)

GNR 984 Activity: 1, 4

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Highly Probable (4)	Probable (3)
Significance	**Low (30)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes

Mitigation:

» Ensure that the footprint for vegetation removal is restricted to as small an extent as possible. In addition, appropriate soil conservation measures to combat wind erosion (windbreaks, geotextiles on the soil surface and immediate re-establishment of vegetation) should be implemented and monitored on at least a six-monthly basis.

Residual Impacts:

Loss of topsoil through erosion can occur unless appropriate mitigation is implemented. Loss of soil resource is irreversible.

6.7.4. Implications for Project Implementation

The overall impacts of the proposed facility on agricultural potential and soil conditions will be low, principally because of the climatic conditions and the low agricultural and grazing potential of the site. This site is considered suitable for the development as a result of the low agricultural potential of the site which renders it unsuitable for commercial agricultural activities. Appropriate soils erosion management measures must be implemented during construction to minimise loss of topsoil resources.

6.8 Assessment of Potential Visual Impacts associated with the proposed 150MW Ilanga CSP 7 Facility

The 150MW CSP Facility has a development area of ~1519.19 ha. Negative impacts on visual receptors are expected during construction activities and the operation of the facility. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix J** - Visual Report for more details).

6.8.1. Results of the Visual Assessment

Visibility of the proposed development

Figure 6.5 indicates the Zone of Theoretical Visibility (ZTV) of the proposed development area of the Ilanga CSP 7 Facility (considering a 275m high power tower as anticipated). This shows that the proposed tower is likely to be visible over an extensive area within the approximate limit of visibility. It also indicates that areas to the east of the proposed development are likely to be screened by the ridgelines that run in an approximate north to south direction to the west of the Orange River. It also indicates that areas immediately adjacent to the Orange River to the north are likely to be screened and that views of the development become less continuous the closer to the limit of visibility that the viewer is located.

Figure 6.6 indicates the ZTV of the proposed heliostat field and lower development surrounding the tower. The analysis indicates that the heliostats could be visible within a band centred on the site and extending for approximately 17km north to south and 9km east to west (approximately 153km^2). This is no doubt due to the orientation of the main landform features (non-perennial streams and minor ridgelines) that generally run in a south to north direction. Whilst undertaking the site visit it was difficult to gain a clear view of the site from public areas. It should be noted that Figure 6.6 confirms that limited views of the lower sections of the development will be possible from public areas.

Visual absorption capacity (VAC) of the landscape

The VAC for the area surrounding the site is dependent on the level of the viewer relative to the site. Close to the site, the VAC is largely provided by the vegetation cover and low ridgelines that bisect the valley floor.

From low levels the surrounding vegetation combines to provide screening ability for development up to an approximate height of approximately 2-3m. As the viewpoint is elevated above the plain on minor ridgelines and undulations, the screening effect of existing vegetation over short distances reduces drastically as the viewer sees over and between individual woody plants.

Given that the development will largely be viewed from a similar level as the site, the minor ridgelines combined with vegetation cover to provide significant VAC. This VAC

results in general screening of lower sections of the proposed development, including heliostats, from public roads.

from further away, the more major ridgelines and koppies particularly to the east and north of the Karoshoek Valley will help to at least part screen most views of the towers and in areas, they are likely to completely screen individual towers.

Key viewpoints

Views into the site from public roads are likely to be difficult to see due to the VAC provided by low ridgelines and vegetation. This means that the power tower will be the main element that will impact the surrounding landscape. A series of viewpoints have been selected to indicate:

- An overview from higher surrounding ridgelines and Koppies (VP1)
- Close views from local roads (VP2)
- Views from settlement areas and particularly from southern edges of Upington (VP3)
- Views from the northern side of the Orange River including FM Safaris and the N14 (VP4)

In order to provide a realistic comparison of the impacts of this structure within the wide landscape area that it will affect, views of an existing power tower at known distances are presented (refer to Appendix I).

Possible visual receptors that have been identified include:

- A small number of homesteads that occur within the approximate limit of visibility of the heliostat field;
- A large number of homesteads and urban areas that could be affected by the power tower;
- Local road to the west (Kleinbegin and Kenhardt Roads) that could be affected by the heliostat field and the power tower;
- The N10 and N14 National roads to the north that could be affected by the power tower; and
- The FM Safaris ecotourism operation on the northern side of the Orange River.

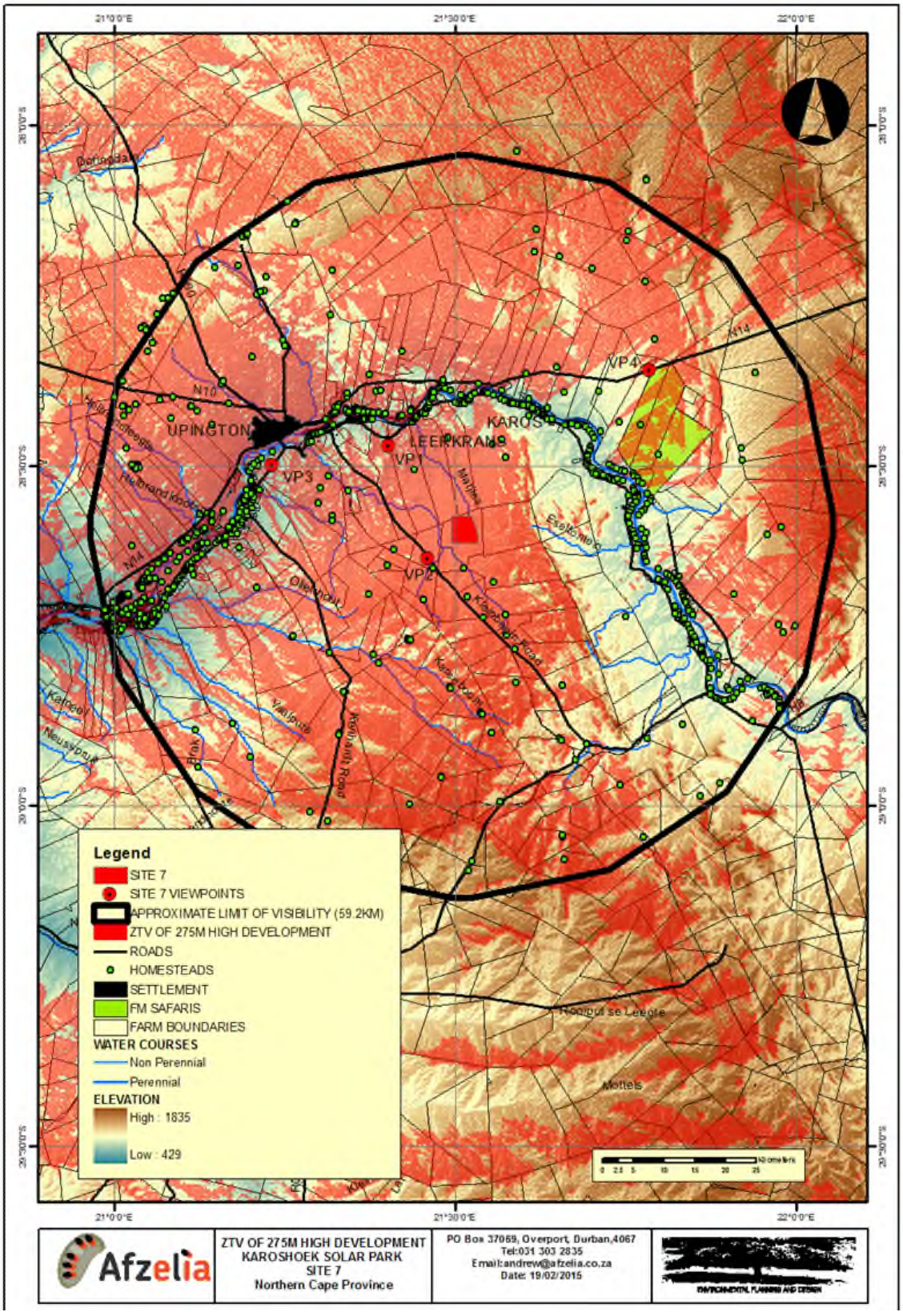

Figure 6.5: ZTV of 275m high development, Ilanga CSP 7

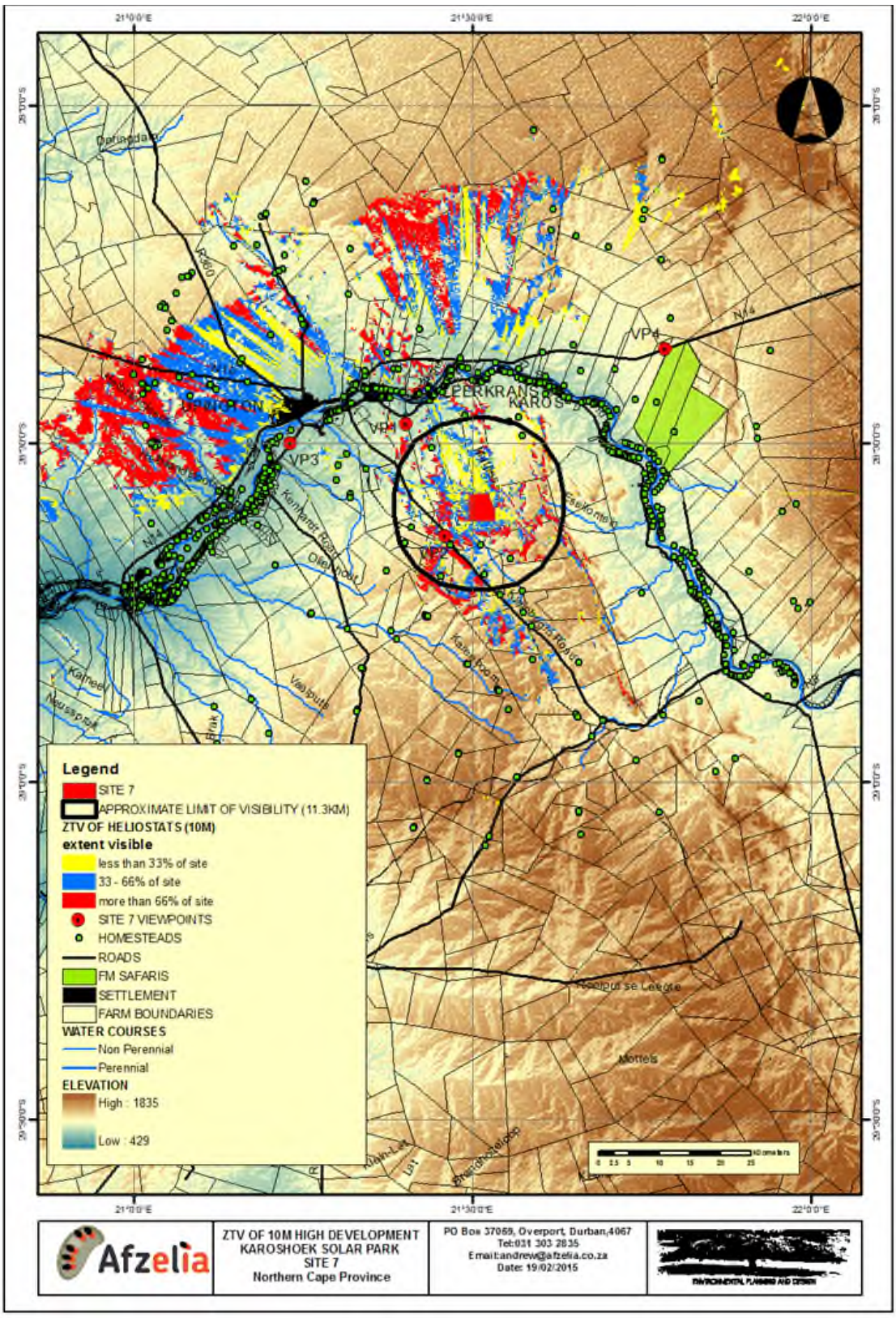

Figure 6.6 ZTV of 10m high development, Ilanga CSP 7

6.8.2. Description of Visual Impacts

Potential visual impacts on sensitive receptors that were identified through the scoping study and the site visit include:

» Potential visual impact on users of roads in close proximity to site 7;
» Potential visual impact on residents of settlements and homesteads in close proximity to the proposed site 7;
» Potential visual impact on sensitive visual receptors within the region;
» Potential lighting impacts;
» Potential impacts on general landscape character of the area; and
» Ocular impacts associated with glint and glare.

These impacts are assessed below.

6.8.3. Impact table summarising the significance of visual impacts (with and without mitigation)

Nature of impact: Industrialisation of general landscape character. The assessment indicates that the proposed CSP tower development is likely to be visible and therefore influence landscape character over a wide area. However this impact area is either likely to be partially moderated by landform. The heliostat field is also likely to result in a relatively local impact influencing the character of its immediate surrounding area of the Karoshoek Solar Valley Development area only. It will largely influence areas that are likely to be affected by other adjacent CSP projects and over areas of private land that is generally inaccessible to the public. It is therefore unlikely to significantly influence general perception of the landscape character of the area. The main influencing element is therefore likely to be the main tower structure. Given that the impact of the authorised tower developments within the Karoshoek Solar Valley were originally assessed as moderate. Using the same criteria, it is unlikely that the impact of the proposed power tower will increase this impact. Impacts on character can also be divided into areas to the north and east of the Orange River where they will be moderated by larger landform and areas within the Karoshoek Valley where there will be minimal moderation due to landform		
Relevant Listed activities: GNR 983 Activity: 11(i), 12(xii)(a)(c), 19(i), 28(ii) GNR 984 Activity: 1, 4, 15		
	Without mitigation	**With mitigation**

Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	**North and East of the Orange River** Minor (2) **Karoshoek Valley** Low (4)	 Minor (2) Low (4)
Probability	**North and East of the Orange River** Probable, (3) **Karoshoek Valley** Highly Probable, (4)	 Probable (3) Highly Probable (4)
Significance	**North and East of the Orange River** **Low (27)** **Karoshoek Valley** **Medium (44)**	 **Low (27)** **Medium (44)**
Status	The character of the rural landscape will be modified by authorised and existing development and the proposed development will be in keeping with this character change. For those people that are attracted to the area for its natural attributes and those travelling through the area for recreational and tourism reasons, it is likely that development of natural areas will be seen as a **negative impact**.	**Negative**
Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be **no irreplaceable loss**. However, given the likely long-term nature of the project, it is possible that a proportion of stakeholders will view the loss of view as irreplaceable.	**No irreplaceable loss**
Can impacts be mitigated?	Yes, however, only impacts associated with the lower elements can realistically be mitigated. This will not change the larger impacts associated with the tower structure.	
Mitigation / Management: Mitigation of views of the power tower is not possible due to its scale. Mitigation of the impact of the heliostat field on the landscape of the Karoshoek Solar Valley Development area is possible although this is unlikely to be highly visible from public access areas.		

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

Operations:
» Reinstate any areas of vegetation that have been disturbed during construction;
» Remove all temporary works;
» Monitor rehabilitated areas post-decommissioning and implement remedial actions;
» Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;
» Colouring of mirror backs;

Decommissioning:
» Remove infrastructure not required for the post-decommissioning use of the site;
» Return all affected areas to productive agricultural use;
» Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Residual Risks:
The residual risk relates to loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that existing vegetation outside of the development area is maintained and protected and that effective rehabilitation is undertaken during and after construction as well as on closure of the plant.

Nature of impact: Industrialisation of a natural landscape as seen from local and national roads.

The assessment indicates that short sections of both the N10 (18km to the north) and the N14 (22km to the north) could be affected. To the north east, high ground between the development and the above mentioned roads will largely screen views to these roads and where views of the tower are possible, it is likely to only be the top of the tower that will be seen. Due to distance and topography, heliostats will not be obvious from these areas.

The local roads to the west (Kleinbegin and Kenhardt Roads) are located, at their closest point, approximately 4km and 20km to the west of the site. Due to distance and topography, heliostats are unlikely to be obvious from the Kleinbegin Road and will not be visible from the Kenhardt Road. The Power Tower however will be an obvious element in the landscape from both roads. It is likely that diffuse reflection from the receiver will make the tower more obvious.

The N10 and N14 carry significant amounts of traffic, a proportion of which is likely to be tourism related. The local roads carry infrequent traffic that is mainly of a local nature. The N10 and N14 are therefore more likely to be sensitive to landscape character change.

Relevant Listed activities:
GNR 983 Activity: 11(i), 12(xii)(a)(c), 19(i), 28(ii)
GNR 984 Activity: 1, 4, 15

	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	**N10 & N14** Minor (2) Due to the mitigating effects of distance and landform. **Kenhardt and Kleinbegin Roads** Minor (2) Due to the low amount of traffic and nature of travellers.	Minor (2) Minor (2)
Probability	**N10 & N14** Probable **(3)** **Kenhardt and Kleinbegin Roads** Highly Probable **(4)**	Probable **(3)** Highly Probable **(4)**
Significance	**N10 & N14** **Low (27)** **Kenhardt and Kleinbegin Roads** **Medium (36)**	**Low (27)** **Medium (36)**
Status	The character of the rural landscape will be modified. For those people that are attracted to the area for its natural attributes and those travelling through the area for recreational and tourism reasons, it is likely that development of natural areas will be seen as a **negative impact**.	**Negative**
Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be **no irreplaceable loss**. However, given the likely long-term nature of the project, it is possible that a proportion of stakeholders will view the loss of view as irreplaceable.	**No irreplaceable loss**
Can impacts be mitigated	**Yes,** however, only impacts associated with the lower elements can realistically be mitigated. This will not change the larger impacts associated with the tower structure.	
Mitigation: Planning:		

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

Operations:

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

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site; and
» Return all affected areas to productive agricultural use;
» Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Residual Risks:

The residual risk relates to loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that effective rehabilitation is undertaken.

Nature of impact: Industrialisation of a natural landscape as seen from local homesteads.

The assessment indicates that there are a large number of homesteads and the urban area of Upington and smaller settlements of Leerkrans, Karos and Louisvale within the approximate limit of visibility of the proposed development.

The Orange River Corridor has the largest concentration of homesteads within the study area but a range of small hills separates the site from this area. This means that varying extents of upper sections of the power tower only are likely to be visible from these areas. Given the relative distance, views of the proposed CSP 7 tower are likely to be significantly lower in impact than to those of currently authorised development.

Within urban areas, it is also likely that vegetation or buildings will provide a moderating influence.

The greatest concern lies with homesteads that are in relatively close proximity to the proposed development from which the heliostat field as well as the tower could be obvious. From these areas the tower will be highly obvious, however it will be viewed in the context of other similar development. The main intrusion could possibly result from reflection from the heliostat field making the facility highly obvious. If the heliostat field should be visible, views from elevated areas appear unlikely. This means that the facility is likely to be viewed largely in elevation and that minor undulations in landform and VAC provided by vegetation should help to soften / screen views of the structures.

Three homesteads have been identified to the south and south west of the development that are most likely to be affected and within 7km of the site. However from the site visit these

are all located in low points in the landscape and are likely to be screened by minor ridgelines.

It is possible that mirror backs could be obvious in the landscape due to colour changes in early to mid-morning from the west and late to mid-afternoon from the east.

Views into the site from local homesteads therefore will be very limited and where possible the proposed development will largely be seen in elevation. This means that whilst the character of the landscape surrounding the proposed development will undoubtedly change, the degree of change associated with the proposed project is unlikely to be significant as glimpses of the edge of the development only will be possible.

Relevant Listed activities:
GNR 983 Activity: 11(i), 12(xii)(a)(c), 19(i), 28(ii)
GNR 984 Activity: 1, 4, 15

	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (27)**
Status	The character of the rural landscape will be modified. For those people that are attracted to the area for its natural attributes and those travelling through the area for recreational and tourism reasons, it is likely that development of natural areas will be seen as a **negative impact**.	**Negative**
Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be **no irreplaceable loss**. However, given the likely long-term nature of the project, it is possible that a proportion of stakeholders will view the loss of view as irreplaceable.	**No irreplaceable loss**
Can impacts be mitigated?	**Yes,** however, only impacts associated with the lower elements can realistically be mitigated. This will not change the larger impacts associated with the tower structure.	

Mitigation / Management:
Mitigation of the impact area of the power tower is not possible due to its scale.

Mitigation of the impact of the heliostat field on the landscape of the Karoshoek Valley is possible. This is likely to benefit homesteads within the approximate limit of visibility.

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

Operations:
» Reinstate any areas of vegetation that have been disturbed during construction;
» Remove all temporary works;
» Monitor rehabilitated areas post-decommissioning and implement remedial actions;
» Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;
» Colouring of mirror backs;

Decommissioning:
» Remove infrastructure not required for the post-decommissioning use of the site;
» Return all affected areas to productive agricultural use;
» Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Residual Risks:
The residual risk relates to loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that effective rehabilitation is undertaken.

Nature of impact: Industrialisation of a natural landscape as seen from sensitive uses.

Other sensitive receptors that have been identified within the region include the FM Safaris ecotourism operation to the north east and on the northern side of the Orange River. The assessment indicates that the proposed tower is likely to be visible to a portion of FM Safaris operation. Whilst a view of the development may be possible, it is likely that it will not be obvious as only the top of the tower is likely to be visible over a ridgeline at a minimum distance of 25.5km. The impact of CSP 7 on FM Safaris is therefore likely to be low.

Relevant Listed activities:
GNR 983 Activity: 11(i), 12(xii)(a)(c), 19(i), 28(ii)
GNR 984 Activity: 1, 4, 15

	Without mitigation	**With mitigation**
Extent	Regional (3)	NA
Duration	Long term (4)	NA
Magnitude	Small (0)	NA
Probability	Improbable (2)	NA
Significance	**Low (14)**	NA
Status	**Negative**	NA
Irreplaceable loss	No irreplaceable loss.	NA
Can impacts be mitigated?	**No**	

Mitigation:
No mitigation possible
Residual Risks:
No residual risk.

Nature of impact: Industrialisation of a natural landscape as seen at night.

Aviation warning lights are likely to be required on the top of the CSP tower. It is also likely that operational lighting will be required at buildings and security lighting may be required within the heliostat field. Lighting associated with the proposed project will be seen in the context of lighting that will occur due to authorised development.

Authorised projects within the greater Karoshoek Solar Valley Development are extensive and pose a more major risk to the transformation of the night time landscape. The extent of this transformation is not known.

If flood lighting is deemed necessary for each plant throughout the hours of darkness then general impacts are likely to be significant. However if low level operational lighting is required at buildings then it is likely that each plant will not appear significantly different than the farmsteads that are scattered through the landscape. If the former approach is adopted then floodlighting of the proposed site could be noticeable. If however only low level lighting around buildings is required then the proposed site is likely to have negligible impact on the night time landscape.

Relevant Listed activities:
GNR 983 Activity: 11(i), 12(xii)(a)(c), 19(i), 28(ii)
GNR 984 Activity: 1, 4, 15

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings **(2)**	Local **(1)**
Duration	Long term (4)	(4)
Magnitude	Minor (2)	Small, (0)
Probability	Probable (3)	Very improbable (1)
Significance	**Low (24)**	**Low (5)**
Status	The appearance of a large lit area in an otherwise dark, natural landscape is likely to be seen as a **negative** factor particularly by people wanting to experience the natural landscape.	If the lights are generally not visible then the occasional light is unlikely to be seen as negative.
Irreplaceable loss	It would be possible to change the lighting / camera system so the impact cannot be seen as an irreplaceable loss.	No irreplaceable loss
Can impacts be mitigated?	Yes	

Mitigation / Management:

Planning:

» Plan to utilise infra-red security systems or motion sensor triggered lighting;
» Ensure that lighting is focused on the development with no light spillage outside the site; and
» Keep lighting low, no tall mast lighting should be used.

Residual Risks:

No residual risk has been identified.

Nature of impact: All large scale solar facilities are capable of causing offsite glare that may cause annoyance and visual discomfort.

Typically the main risk of glint and glare associated with Power Tower developments include;

1. Viewed from certain angles, specular reflection from heliostats might result in glint or glare from these surfaces, particularly from elevated viewpoints. Power tower facilities usually have the heliostats arrayed in a circle around the central tower. Where this heliostat configuration is used, some portion of the heliostat field would face viewers regardless of their direction of view, which could increase the potential for glinting and glare from the heliostats.
2. Observations of reflections from power tower receivers have shown the sunlight focused on the tower's receiver by the heliostats during normal operations causes the surface of the receiver to appear to glow with sufficient intensity to be visible for long distances; however, the apparent glow is actually diffuse reflected sunlight. The tower receivers can appear brilliantly white at close distances, and the light from relatively small-scale existing facilities has been observed at distances of 25 miles (40km)[23]. Whilst visible over a long distance, this effect is likely to be less intense than glare observed from other CSP facilities such as parabolic troughs.

In order for there to be a problem it is necessary for the facility to be visible to receivers. From the review of visibility undertaken in assessment of other impacts, it is obvious that the only identified receivers that have the potential to be impacted are those using the Kleinbegin Road from which the heliostats may be visible. Given the distance, the screening effect of vegetation and minor land form which largely serves to hide the lower levels of CSP 7, it is highly unlikely that the proposed project will have the potential for glint and glare impacts. However if it should prove problematic, due to the extent and relative level of the road, mitigation in the form of localised screening should be possible.

Relevant Listed activities:

GNR 983 Activity: 11(i), 12(xii)(a)(c), 19(i), 28(ii)
GNR 984 Activity: 1, 4, 15

	Without mitigation	**With mitigation**

[23] Best Management Practices for Reducing Visual Impacts of Renewable Energy Facilities on BLM Administered Lands, United States Department of Interior, Bureau of Land Management (BLM), first edition, 2013.

Extent	Site and immediate surroundings (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Small (0)	Small (0)
Probability	Very improbable (1)	Very improbable (1)
Significance	**Low (6)**	**Low (5)**
Status	Negative	Negative
Irreplaceable loss	There will be no irreplaceable loss.	There will be no irreplaceable loss.
Can impacts be mitigated?	Yes.	

Mitigation:

» Screening with opaque fencing / earth berms; and

» Careful siting and operation of solar collectors turning mirrors away from the sun during time periods when glare impacts are significantly adverse may substantially reduce or avoid visual impacts from offsite glare.

Cumulative Impact:

The development of the proposed Ilanga CSP 7 within the Karoshoek Solar Valley Development will not significantly alter the risk of glint and glare associated with the already authorized sites.

Residual Risks:

No residual risk has been identified.

Nature of impact:

Construction will be comprised of:

» Clearance of site;
» Construction of associated infrastructure;
» laying of concrete bases for the tower, heliostats and power plant;
» Erection and fixing of structures; and
» Laying of cable / pipe runs and connections.

This work is likely to be completed in 24 to 36 months.

As the site and surrounding area is relatively flat, an overview of the construction work is unlikely. Activity on site is likely to be obvious from vehicles and plant. Once ground work and concrete bases are complete, the structures are likely to progress rapidly.

Interim impacts are likely to include dust from site operations once the site has been cleared, storage areas which may be as high as the heliostat development and delivery trucks using local roads.

It is also possible that wind-blown waste- could be problematic.

From the assessment of impacts of the final development as experienced by local receptors, it is obvious that the site and lower development is unlikely to be obvious. Wind-blown waste,

delivery vehicles on local roads and dust could make the development obvious during construction.		
Relevant Listed activities: GNR 983 Activity: 11(i), 12(xii)(a)(c), 19(i), 28(ii) GNR 984 Activity: 1, 4, 15		
	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings (2)	Site (1)
Duration	Very short duration (1)	Very short duration (1)
Magnitude	Minor (2)	None (0)
Probability	Probable, (3)	Possible (2)
Significance	**Low (15)**	**Low (4)**
Status	Negative	Negative
Irreplaceable loss	There will be no irreplaceable loss.	There will be no irreplaceable loss.
Can impacts be mitigated?	Yes	
Mitigation: » Minimise clearance of vegetation; » undertake dust prevention measures; » Maintain stockpiles to less than 3 m high; and » Manage waste effectively and prevent waste blowing around and off site.		
Residual Risks: The residual risk relates to loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that effective rehabilitation is undertaken.		

6.8.4. Implications for Project Implementation

With the implementation of mitigation measures by the developer, contractors, and operational staff, the severity of impacts of the CSP facility can be reduced to low to medium. The Ilanga CSP 7 Facility can be developed and impacts on visual resources managed by taking the following into consideration:

» The proposed project will have greatest impact on the Karoshoek Valley which is under development for similar projects. Outside the Karoshoek Valley where the majority of sensitive receivers are located impacts are likely to be low.
» Within the Karoshoek Valley, the most critical sensitive receivers are likely to be residents of local homesteads. A small number of people are likely to be affected. Views over the development are unlikely to be possible due to the relative elevation of receivers. This means that the main impact will be a view of the tower set within a relatively natural landscape. Because of the relative elevation of receivers and the VAC of the surrounding landscape nuisance impacts such as glint and glare are unlikely and should be easily mitigated.

» Given the changing character of the setting in which the development is proposed, the distances from the majority of sensitive receptors and the way in which surrounding landform helps to mitigate broader impacts, there is no reason on landscape and visual impact grounds why the proposed project should not be authorised.

6.8 Assessment of Potential Impacts on Archaeological Heritage

The proposed Ilanga CSP 7 Facility was assessed at a desktop level informed by fieldwork. The aim of the study was to identify cultural heritage sites, and document, and assess their importance within local, provincial and national context. The study serves to assess the impact of the proposed project on non-renewable heritage resources, and to submit appropriate recommendations with regard to the responsible cultural resources management measures that might be required to assist the developer in managing the discovered heritage resources in a responsible manner. It is also conducted to protect, preserve, and develop such resources within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999).

General site conditions and features on sites were recorded by means of photographs, GPS locations, and site descriptions. Potential impacts were identified and mitigation measures were proposed. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix G**– Archaeological Heritage Report for more details).

6.8.1. Results of the Archaeological Heritage survey

The larger study area in which the development footprint is located has been subjected to various heritage and archaeological assessments (Beaumont 2005, Gaigher 2012, van Schalkwyk 2011, van der Walt 2014 and Nilssen 2015). These studies showed that almost no significant archaeological sites occur in the area. Although artefacts dating to the Early Stone Age, Middle Stone Age and Later Stone Age were recorded in the larger area, they occur as isolated finds that are temporally mixed, in deflated and un-stratified contexts without organic remains and other cultural materials. As a result, the archaeological record of the larger area is considered to be of low significance.

Within the development footprint, widely dispersed individual scatters of stone tools were recorded. Artefact density at these scatters are so low that they do not represent individual sites but rather background scatter or find spots and are of no heritage significance. Within the broader Karoshoek Solar Valley Development area, a number of sites (refer to **Figure 6.7** and **Table 6.9**) were recorded during the survey. There

is a marked paucity of sites moving from north to south that could be attributed to thick sand cover and the lack of water and raw material for stone tool making (**Figure 6.7**). The majority of the Stone Age finds for the larger Karoshoek Solar Valley Development area is classified as MSA characterised by Levallois cores, blades, pointed flakes and large scrapers with faceted striking platforms. Raw material consists of quartzite, quarts and banded Iron Stone.

LSA artefacts were also recorded but are often mixed with the MSA material and some artefacts could not be positively classified as either being MSA or LSA. LSA finds are found less frequent than MSA material and the finds are characterised by flakes, adzes, small blades and scrapers on quartzite and banded iron stone. Very few ESA (bifacially retouched hand axes) artefacts were noted mostly made from quartzite.

Within the footprint of CSP 7 widely dispersed individual scatters of stone tools were recorded. Artefact density at these scatters are so low that they do not represent individual sites but rather background scatter or find spots and are of no heritage significance.

Table 6.9: Identified heritage features with co-ordinates

Site Number	Type Site	Description	Coordinate (accuracy 4 -8 meters)
459	Early Stone Age and Middle Stone Age	Open air site on ridge.	28° 29' 50.2009" S 21° 29' 13.1604" E
460	Middle Stone Age	Open air site on ridge.	28° 29' 49.0235" S 21° 29' 07.1269" E
461	Ruin and Middle Stone Age Findspot	Cement brick feature consisting of 1 room. Flake with faceted striking platform.	28° 29' 56.3783" S 21° 28' 15.3264" E
462	Middle Stone Age Findspot	Low density scatter of flakes on Banded Iron Stone.	28° 31' 44.4541" S 21° 28' 28.2937" E
463	Middle Stone Age Findspot	Blade with secondary retouch on quartz.	28° 32' 43.6885" S 21° 28' 45.2891" E
464	Middle Stone Age and Late Stone Age Findspot	Low density scatter of flakes on Banded Iron Stone and Quartzite.	28° 31' 20.2943" S 21° 28' 56.2513" E
465	Early Stone Age and Middle Stone Age	Open air site on ridge.	28° 28' 56.3123" S 21° 28' 33.0131" E
466	Memorial	Granite headstone.	28° 26' 13.4483" S 21° 26' 15.3599" E

Site Number	Type Site	Description	Coordinate (accuracy 4 -8 meters)
467	Late Stone Age and Middle Stone Age	Artefacts scattered around several very small seasonal depressions/pans.	28° 29' 37.1437" S 21° 31' 01.3188" E
468	Middle Stone Age Findspot	Low density scatter of flakes with faceted striking platforms.	28° 30' 02.1924" S 21° 30' 55.0367" E
469	Middle Stone Age Findspot	Banded Iron Stone core.	28° 30' 22.6223" S 21° 30' 25.7004" E
470	Middle Stone Age and Late Stone Age	Open air site on ridge.	28° 31' 28.9991" S 21° 31' 43.5000" E
471	Middle Stone Age Findspot	Three miscellaneous flakes.	28° 33' 11.2391" S 21° 31' 45.3756" E
472	Middle Stone Age Findspot	2 Flakes on quartzite on ridge.	28° 31' 44.0075" S 21° 31' 33.8555" E
473	Early Stone Age and Middle Stone Age	Low density of artefacts scattered over an area 26m².	28° 32' 00.0457" S 21° 31' 23.9880" E
474	Late Stone Age	Low density of artefacts scattered over an area 12m².	28° 29' 45.1177" S 21° 31' 12.9072" E
4751	Stone Cairn	Cairn is orientated east to west.	28° 28' 42.4165" S 21° 26' 15.2627" E
4752	Middle Stone Age and Late Stone Age	Open air site on ridge	21° 26' 15.2627" E 21° 25' 41.5683" E

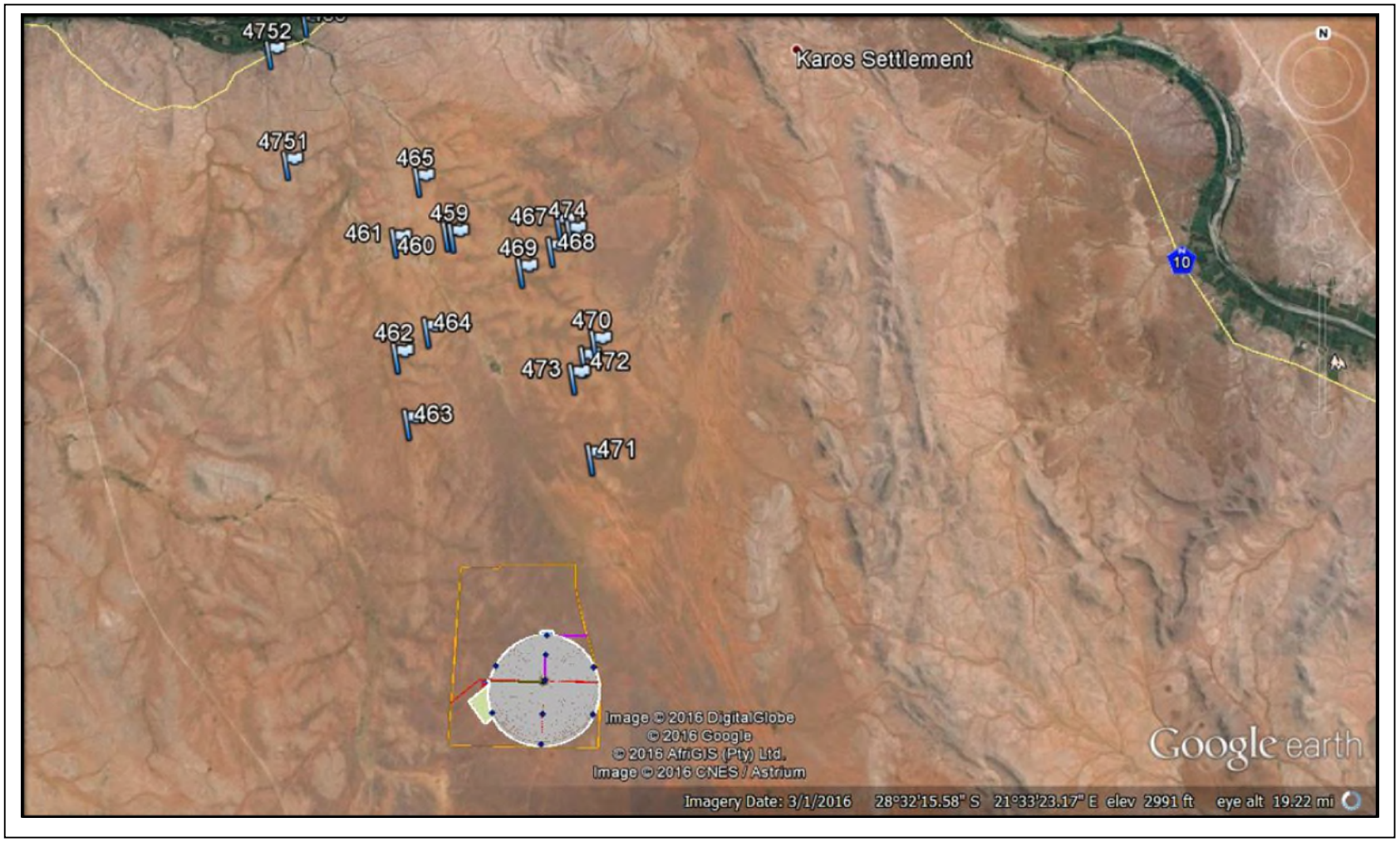

Figure 6.7: Map illustrating the distribution of heritage sites within the larger Karoshoek Solar Valley Development area. No heritage sites of significance were recorded within the development footprint of Ilanga CSP 7 Facility.

Figure 6.9: Site conditions in the eastern portion.

Figure 6.10: Site conditions in the northern portion.

Figure 6.11: Site conditions in the south eastern portion.

Figure 6.12: Site conditions in the southern portion.

Figure 6.13: Range of artefacts and raw material recorded in the larger Karoshoek Solar Valley Development area

6.8.2. Description of the Heritage Impacts

Due to the limited heritage sites within the proposed development area, the impacts to heritage resources by the proposed development are not considered to be significant. However, due to the subsurface nature of archaeological material the possibility of the occurrence of unmarked or informal graves and subsurface archaeological finds cannot be excluded. If during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find.

6.8.3. Impact tables summarising the significance of impacts on heritage resources (with and without mitigation)

Nature: During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects.		
Relevant Listed activities: GNR 983 Activity: 11(i), 19(i), 28(ii), 56(ii) GNR 984 Activity: 1, 15		
	Without mitigation	**With mitigation (Preservation/ excavation of site)**
Extent	Local (2)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Low (3)
Probability	Probable (3)	Improbable (2)
Significance	**Low (30)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes unless sites can be preserved.
Can impacts be mitigated?	Yes	Through preservation or excavation of sites.
Mitigation: Artefacts are scattered too sparsely to be of any significance apart from noting their presence, which has been done in this report. These scatters are given a Generally Protected C field rating.		
Residual Impacts: If sites are destroyed this results in the depletion of archaeological record of the area. However if sites are recorded and preserved or mitigated this adds to the record of the area.		

6.8.4. Implications for Project Implementation

With the implementation of mitigation measures by the developer, contractors, and operational staff, the severity of impacts of the CSP facility can be reduced to low, or avoided. The Ilanga 7 CSP Facility can be developed and impacts on heritage features managed by taking the following into consideration:

» If during the pre-construction phase or during construction, any archaeological finds are made (e.g. graves, stone tools, and skeletal material), the operations must be stopped, and the archaeologist must be contacted for an assessment of the finds.
» Due to the subsurface nature of archaeological material and graves, the possibility of the occurrence of unmarked or informal graves and subsurface finds cannot be excluded, but can be easily mitigated by preserving the sites *in-situ* within the development footprint or excavating such finds in line with an appropriate permit.

If these recommendations are adhered to, the specialist is of the opinion that the development is viable as the development will probably not have a negative impact on the archaeological record of Northern Cape.

6.9 Assessment of Potential Social Impacts

A social impact assessment was conducted for the proposed Ilanga CSP 7 Project. The assessment provided (a) a description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed facility; (b) a description and assessment of the potential social issues associated with the proposed facility; and (c) Identification of enhancement and mitigation aimed at maximising opportunities and avoiding and or reducing negative impacts. Potential social impacts and the relative significance of the impacts are summarised below (refer to **Appendix I** - Social Report for more details).

6.9.1. Results of the Social Study

The socio-economic profile provided an overview of the study area. The following is a summary of the key baseline findings as a result of the study conducted on the ZF Mgcawu District Municipality (ZFDM) and the //Khara Hais Local Municipality (KHLM), in the Northern Cape Province. In summary, the area was found to have the following general characteristics:

» The population of the ZFDM in 2011 was approximately 236 783 people, of which 93 494 people reside in the KHLM.

» The majority of the local population belong to the Coloured group and the most spoken language is Afrikaans.
» 64.6% of the KHLM population comprise the Economically Active Population (EAP); this implies that there is a larger human resource base for development projects to involve the local population. The dependency ratio is high at 54.7.6% of the KHLM population (that is almost a third of the local population) which puts pressure the EAP and the local municipality.
» The female population is slightly more prominent in the KHLM comprising 50.7% of the population.
» More than half of the local population are semi- skilled or low skilled based on education levels. This reflects the rural nature of the region and relatively poor education. The skills profile of the area indicates that the availability of local labour for the proposed project is largely limited to low-skilled /semi-skilled construction workers and a small number of skilled workers.
» There is a high unemployment rate in the KHLM (22.1%) with a large economically active population seeking employment opportunities. Local workers should be utilised as much as possible for the proposed development in order to alleviate local unemployment.
» Higher unemployment and lower income levels in the study area demonstrate the need for job creation.
» The high demand for employment can be addressed (although marginally) through direct job creation during the construction phase of the proposed development
» Access to basic services is generally greater in the KHLM than at a district and provincial level demonstrating that service delivery is generally more accessible (Upington will be the primary area closest to the proposed site).

The proposed development supports the social and economic development through enabling skills development and creating temporary employment opportunities within the local area. The development would mainly focus on economic benefits to the area. Negative dimensions of impacts such as influx of jobseekers into the area putting pressure on the provision of basic services and poverty level have been assessed though this impact assessment.

6.9.2. Description of the Socio-economic Impacts

i) Construction Phase

Impacts associated with the construction phase of the project are usually of a short duration (approximately 24-36 months) and temporary in nature, but could have long-term effects on the surrounding social environment if not managed appropriately.

Direct employment and skills development:

The construction of the proposed project will require a workforce and therefore direct employment will be generated. The proposed development will create employment opportunities for the local community. The nearest town is Upington, located approximately ~30km away. It is estimated that during the construction phase (for the period of approximately 24-36 months) approximately ~700-1000 employment opportunities will be generated for the Ilanga CSP 7 facility. In terms of skills requirements, it is common that highly skilled or skilled labour such as engineers, technical staff and project managers will constitute about 15% of the work force; skilled staff would typically be required to operate machinery and will constitute about 25% of employees, while unskilled staff such as construction and security workers will constitute about 60% of the work force. Employment opportunities for the proposed development will peak during the construction phase and significantly decline during the operation phase. The injection of income into the area in the form of wages will represent an opportunity for the local economy and businesses in the area.

Under the REIPPP Programme, developers are obliged to make a real contribution to local economic development that is to be fulfilled within a 50km radius of the project site (WWF, 2015). Awarded projects are required to employ a certain percentage of the workforce from local communities (located within 50km of the project site). Only "in the event that there are no residential areas or villages within 50km from the project site (are project developers allowed to source workers) in the nearest residential areas or villages to the project site" (DoE 2011). The DoE indicates that the programme offers great potential to realise positive socio economic outcomes- such as job creation, local ownership, SED and ED. The project's direct area of influence will extend to a 50km radius from the proposed site. The urban area located within the 50km radius includes Upington and the smaller settlements include, Dagbreek, Karos and Leerkrans.

The KLM and KHLM is characterised by high levels of unemployment and poverty. There will be significant job opportunities available for low skilled (construction, security, and maintenance workers) and semi-skilled workers, which can be sourced from the local area. Construction workers could be sourced from the nearest local settlements and towns such as Upington, Dagbreek, Karos and Leerkrans. It could be expected that some of the workers from outside the local area would form part of the construction team. Local labour should be sourced from within the 50km radius first and if need be extend the search to the ZFMDM or nationally. Adverse impacts could occur if a large in-migrant workforce, culturally different from the local communities within local area are employed and brought in during the construction phase. While the local labour pool may be qualified for less-skilled jobs, often local hiring will not meet the demands in

professional, technical and supervisory areas. A number of specialist contractors would most likely be brought in from other areas.
The developer will need to demonstrate a commitment to local employment targets in order to maximise the opportunities and benefits for members of the local community. It is likely that an Engineering, Procurement and Construction (EPC) contractor will be appointed by the developer who will hire the necessary employees. The applicant has indicated that training will also be provided to employees during the construction phase of the proposed development. Specific skills training for local communities have the opportunity to develop local employee potential. This is crucial to long-term development of skills and education in the area. This will accelerate the positive benefits and impacts of the development on the economy.

Economic multiplier effects:
There are likely to be opportunities for local businesses to provide services and materials for the construction phase of the development. The local service sector will also benefit from the proposed development. The site is located approximately 30km east of Upington in the Northern Cape Province. Given the relative proximity of the site to Upington, the proponent has indicated that no on-site accommodation is envisaged for the construction phase. Employees will be sourced from the local areas (where possible) and workers will be transported to and from site for the duration of the construction phase. Off-site accommodation in the nearest towns would be required for contract workers and certain employees. The economic multiplier effects from the use of local goods and services opportunities will include, but is not limited to, construction materials and equipment and workforce essentials such as services, safety equipment, ablution, accommodation, transportation and other goods. It is important that a fair and equal opportunity is provided when allowing local service providers to tender for work, and that the municipality is involved throughout the process.

The total construction capital expenditure associated with the establishment of the solar energy facility and associated infrastructure is estimated to be in the region of R2-3 billion (2016 Rand value). Some of the capital expenditure will be spent on local goods and services required for the development of the solar energy facility. In terms of business opportunities for local companies, expenditure during the construction phase will create business opportunities for the regional and local economy. The increase in demand for new materials and services in the nearby area may stimulate local business and local economic development (however locally sourced materials and services may be limited due to availability). There is likely to be a direct increase in industry and indirect increase in secondary businesses.

Also the injection of income into the area in the form of wages will represent an opportunity for the local economy and businesses in the area. Through the

stimulation of employment and income is the creation of new demand within the local and regional economies. With increased income comes additional income for expenditure on goods and services supplied. The intention is to maximise local labour employment opportunities, this is likely to have a positive impact on local communities and have downstream impacts on household income, education and other social aspects. The implementation of the enhancement measures below can increase the opportunities for local area.

In-migration of people (non-local workforce and jobseekers):

The in-migration of people to the area as either non-local workforce of construction workers and/or jobseekers could result in pressure on economic and social infrastructure on the local population (rise in social conflicts). Influx of people into the area, especially by job seekers, could further lead to a temporary increase in the level of crime, cause social disruption and put pressure on basic services. An influx of people looking for economic opportunities could result in pressure on the local population such as rise in social conflicts and change in social dynamics, increase in HIV, pregnancies and drug abuse. Adverse impacts could occur if a large in-migrant workforce, culturally different from the local indigenous group, is brought in during construction. The high unemployment rates and expectations of job creation is already a source of competition among locals and could be exacerbated through outsiders coming into the area resulting in conflict. Such influx could also result in increased pressure on social infrastructure such as existing community infrastructure, social services, municipal services, accommodation, health facilities, transport facilities, basic services and so forth. The KLM and KHLM availability of basic services to meet the current needs of the local population is strained due to a lack of infrastructure required. Influx of people places tremendous strain on the environment and the local municipalities.

The towns and settlements located the closest to the study area (i.e. Upington, Dagbreek, Karos and Leerkrans) are seen as a sensitive social receptor and in-migrants coming into the area could put pressure on social infrastructure; create social problems, tensions and conflicts. Employment opportunities can be sourced from the surrounding local towns and settlements first in the KLM and KHLM, if availability of labour is limited then extend search to the ZFMDM. The KLM population (16 637 people) and KHLM population (93 494 people) could fulfil the majority of the lower and semi-skilled employment opportunities that emerge from the proposed development.

The degree to which societies are disrupted largely depends on the level of local employment achievable and in the case of this project a significant portion of the workforce is expected to be sourced locally (approximately ~40% of the workforce will be sourced from the KLM and KHLM, depending on the skills pool

available) and the overall number of outsiders would not be significant to cause great disruption to the area.

Impacts on daily living and movement patterns (traffic impacts):
An increase in traffic due to construction vehicles and heavy vehicles could create short-term disruptions and safety hazards for current road users. Transportation of project components and equipment to the proposed site will be transported using vehicular / trucking transport. The existing gravel access road will be located off the N10 located approximately 20km east of Upington. The existing access road is located approximately 10km long and traverses the adjacent farm Matjesrivier RE/41 (the developer is in the process of purchasing this farm, the farm is currently utilised for livestock farming); this will be the main access road used to access the proposed site. The primary roads that will be used for transportation of project components and equipment will be the N10 and the secondary existing gravel access road that is off the N10. Increased traffic due to construction vehicles and heavy vehicles could cause disruptions to road users and increase safety hazards. The use of local roads and transport systems may cause road deterioration and congestion. This impact will be magnified since farm roads are not designed to carry heavy traffic and are prone to erosion. An increase of traffic from the rise in construction vehicles is a safety concern for other road users and local communities in the area. The existing gravel access road off the N10 has a low frequency us and is primarily only utilised by the local farmers to access the farm. The adjacent landowner of Farm Matjesrivier RE/41 has indicated that the land is currently leased to a farmer who utilises that land for livestock farming (he does not reside on the farm). However the tenant may leave when their contract expires. The contract may be extended, depending on process of the developers (Emvelo Holdings (Pty) Ltd) purchasing the farm.

The developer has indicated that the number of construction vehicle trips per day would be in the region of ~15-20 trips. There will be an increase in the movement of people during the construction phase. Low and semi-skilled workers will likely be transported to site with busses. Noise, vibrations, dust and visual pollution from construction vehicles and heavy vehicle traffic during the construction phase could cause temporary disruptions in daily living, movement patterns and quality of life for local community members. There are only a few and sparsely populated homesteads or residents living in the nearby area, which reduces this impact.

In terms of national roads involved, the expectation is that the proponent should consult with the relevant roads agency to ensure that they do not contribute to the deterioration of roads without taking some responsibility for repairing the impact that their construction vehicles may have on the road during construction phase.

Safety and security impact:

The perceived decline of security during the construction phase of the proposed project due to the influx of workers and/ or outsiders to the area (as influx of newcomers or jobseekers are usually associated with an increase in crime) may have indirect effects, such as increased safety and security risk for neighbouring properties and damage to property, increased risk of veld fire, stock theft, crime and so forth. The perception exists that construction related activities (influx of jobseekers, and construction workers and so forth) is a contributor to increased criminal activities in an area. Safety and security impacts are a reality in South Africa which needs to be addressed through appropriate mitigation and management measures. The movement of construction workers on and off the site also poses a potential threat to farm infrastructure, such as fences and gates, which may be damaged. All of the farms in the study area are utilised for livestock farming and/or game farming, therefore the development coming into the rural area may expose these farming activities to potential stock theft and poaching. There are no residents living in or near the proposed site.

The impacted and adjacent farm owners utilise their farms for livestock and / or game farming. The influx of construction workers and people coming into the area does increase the risk of stock theft and poaching. The adjacent landowner of Portion 20 of Farm Trooilaps Pan 53 has raised the following concerns; "Exotic game farming activities currently take place on the Farm, close to where CSP 7 is located. With the development proposed to be located so close to where the exotic game are located, this will increase the risk of theft and poaching. The insurance of the game will also increase due to the increased risks that will arise from the Karoshoek Solar Valley developments."

It is viable for the appointed EPC contractor to implement appropriate security measures. It is therefore recommended that the appointed EPC contractor takes these points into consideration and it is important that a security company is appointed and appropriate security procedures and measures implemented.

An increase of traffic from the rise in construction vehicles is a potential safety concern for road users and local communities in the area. The movement of construction related activities crossing over the N10 does have the potential to increase the risk for road users. Also with wear and tear on roads that is not maintained / repaired; the safety risk also increases. The N10 and the access road would mainly be affected and the use of un-roadworthy vehicles, drivers disobeying traffic rules and the obstruction of motorist's views will contribute to this potentially negative impact.

Nuisance Impacts (noise and dust):

Impacts associated with construction related activities include noise, dust and disruption or damage to adjacent properties is a potential issue. Experience from construction of other solar energy facilities in the area indicate that site clearing and construction vehicles traveling on gravel roads does increase the risk of dust and noise being generated, which can in turn impact on adjacent properties. The potential impacts can be addressed by implementing effective mitigation measures. The primary sources of noise during construction would be from the construction equipment and other sources of noise include vehicle/truck traffic, and general construction activities. Noises levels can be audible over a large distance however are generally short in duration. Generation of dust would come from construction activities as well as trucks/ vehicles driving on the gravel access road. With the in-migration of people and construction workers into the area, this will also increase noise impacts. This impact will negatively impact social sensitive receptors. The main social sensitive receptors that raised concerns regarding noise and dust impacting there farm include:

- Farm Trooilaps Pan 20/53 (located south-east of the site): Exotic game farming activities currently take place adjacent to the farm where the CSP 7 plant will be located. The exotic game are very sensitive to noise, dust and movements. The construction activities taking place so close to where the game are located will disrupt the game and have a negative impact on game farming operations.
- Farm Trooilaps Pan RE/53 (located adjacent to the site): The farm is used for hunting game as a leisure activity. The noise and dust generated may negatively impact the tranquillity of the area and negatively impact leisurely activities associated with the purpose of the farm use.

The movement of heavy construction vehicles along the existing gravel access has the potential to generate dust pollution and noise. The nuisance impacts from the construction activities are expected to be negative and will have an impact on surrounding landowners who utilise their farms for game farming activities.

ii) Operation Phase

The CSP facility is designed to be operational for at least ~20-25 years. The potential positive and negative social impacts which could arise as a result of the operation of the proposed project include the following:

Direct employment and skills development:

The operation phase of the project will require a workforce and therefore direct employment will be generated. Although the exact number of permanent workers is not confirmed at this stage, it is estimated that approximately ~50-80 jobs will be generated for the lifetime of the project (approximately ~20-25 years). Given

that solar energy facilities are relatively new in South Africa, a number of highly skilled personnel may need to be recruited from outside the local area. These employees would include skilled engineers (specialised in both electrical and mechanical engineering). Employees that can be sourced from the local municipal pool include the less skilled such as safety and security staff and maintenance crew. Routine activities would include operation of the solar energy facility to produce power, and regular monitoring and maintenance activities to ensure safe and consistent operation. Maintenance will be carried out throughout the lifespan of the solar energy facility and associated infrastructure. Typical activities during maintenance include vegetation control and maintenance around the solar energy facility and along the power line route. Employment opportunities will be created during the operation phase and this is rated as positive impact although limited.

It should be encouraged that as many as possible employees be sourced from within the local municipal pool and if the relevant skills are not available then these should be sought out on a regional/ national basis. The proponent will need to demonstrate a commitment to local employment targets in order to maximise the opportunities and benefits for members of the local community. The proponent has indicated that approximately 30% of the labour force during the operation phase will be sourced from the local area. The focus for employment should be on local people, including women; this will have a maximum positive long-term impact (and if there is sufficient transfer of skills the positive impact can be extended). As the employment opportunities generated during the operation phase are more permanent and sustainable in the long run, as opposed to those generated during the construction phase (which are only temporary), sourcing of local labour during this phase will have long term beneficial impact. The applicant has indicated that training will also be provided to employees. Training is crucial to long-term development of skills and education in the area. This will accelerate the positive benefits and impacts of the development on the economy.

<u>Development of clean, renewable energy infrastructure:</u>
Energy production has been and still is one of the main pivots of the social and economic development of South Africa. South Africa currently relies on coal-generated energy to meet its energy needs. Almost 72% of South Africa's primary energy is from coal, over half used to generate electricity and a quarter used for synfuels production. South Africa's carbon emissions are higher than those of most developed countries partly because of the energy-intensive sectors which rely heavily on low quality coal. Use of low quality coals is the main contributor to GHG emission. The energy-intensive sectors of the economy emit carbon emissions that are higher than those of most developed economies. The use of solar irradiation for power generation is considered a non-consumptive use of a natural resource which produces zero GHG emissions. The generation of

renewable energy will contribute to South Africa's electricity market. The advancement of renewable energy is a priority for South Africa. The government considers the use of renewable energy as a contribution to sustainable development (White Paper on Renewable Energy). As most of the sources are local and naturally available, its use will strengthen energy security as it will not be subjected to disruption by international crisis. Furthermore, recent policy highlights the desirability of clean, green energy and solar generated energy will play a significant role in reaching these quotas (Energy Research Centre UCT, 2004). Given South Africa's reliance on Eskom as a power utility, the benefits associated with an Independent Power Producer based on renewable energy are regarded as an important contribution.

Increasing the contribution of the renewable energy sector to the local economy may contribute to the diversification of the local economy and provide greater economic stability. The growth in the solar energy sector could introduce skills and development into the area. The development of a solar energy facility could therefore add to the stability of the economy, and even though this project is small scale in comparison to the overall potential of the sector, it could contribute to the local economy. The overall contribution to South Africa's total energy requirements of the proposed solar energy facility plant is small; however, the 150MW facility will help contribute to offset the total carbon emissions associated with energy generation in South Africa.

Benefits associated with REIPPP socio-economic development plans and community trust:

According the Department of Energy (DoE) renewable energy projects under the Renewable Energy Independent Power Producer Procurement programme (REIPPPP) are obliged to make a real contribution to local economic development in the area. Awarded projects are required to spend a certain amount of their generated revenue on Socio-Economic Development (SED) and Enterprise Development (ED) and share ownership in the project company with local communities (DoE, 2011).

The developer is required establish a community trust funded by revenue generated from the sale of energy. The community trust will generate a reliable and steady income stream over a 20 year period. The trust will be used to fund development initiatives in the area and support local economic and community development. As the community trust will run for the entire operational phase of 20 years, it allows the local municipality and communities to undertake long term planning. This provides opportunities for positive benefits to the local area. However these benefits can be enhanced. Consultations took place with key local authorities, a few issues were raised from past experiences with the solar energy developments coming into the area. The key issues that the relevant authorities are facing include external workforces being brought into the area, social

responsibilities not being met properly and a lack of communication with the relevant local authorities in terms of the community trust and socio-economic development plans. It is important for the developers to engage and communicate with the local municipality so that the municipality can provide guidance on what's required in the local area for socio-economic development plans. It is also important that the correct representatives are appointed to be part of the community trust. The solar energy developments are supported by the local authorities and it was noted that these developments have the potential to bring in more positive impacts to the local area however the issue raised need to be addressed with new developments coming into the area. Socio-economic spin-offs from the proposed development could contribute to better infrastructure provision and educational investment in the local areas.

An in-depth community needs analysis (CNA) will need to be carried out at a later stage to make sure that the real needs of communities are addressed (in line with the local government) and the correct representatives of the community are appointed to run the community trust; in order for development programmes to significantly contribute towards local economic growth, SED and ED.

Sense of place impacts:

The sense of place is developed over time as the community embraces the surrounding environment, becomes familiar with its physical properties, and creates its own history. The sense of place is created through the interaction of various characteristics of the environment, including atmosphere, visual resources, aesthetics, climate, lifestyle, culture and heritage. Importantly though it is a subjective matter and is dependent on community perceptions.

An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light. The social impacts associated with the impact on sense of place relate to the change in the landscape character and visual impact from the proposed solar energy facility and associated infrastructure.

The adjacent landowners are farmers that utilise the adjacent land for livestock / game farming activities. There are few sensitive social receptors located near the facility (the closest social receptor is located 4km away; a second home utilised by the farm owners of Farm Trooilaps Pan RE/53). The adjacent landowner from the Remaining Extent of Farm Trooilpas Pan 53 has indicated that the farm is utilised for leisure game farming activities (hunting) and there is a second home on the farm that's used to relax on weekends with family or take clients away on hunting trips. The main concern would be the visual impacts and the impact the development would have on the areas sense of place. The purpose of the farm is to escape from the city and developments and for the natural aspect. The

development will be 270m and can been seen from many kilometres away which will negatively affect the leisurely purpose and hunting activities that currently take place on the farm. The anticipated impact on the areas visual quality and sense of place is expected to be low.

Impacts associated with the loss of agricultural land for livestock grazing:

Direct occupation of land by the proposed solar energy facility has the effect of taking the impacted land out of agricultural production, through the occupation of the site by the footprint of the facility (approximately ~1526ha). The study area is located within an agricultural zone mainly focussed along the Orange River. Currently the site and surrounding study area has limited potential for cultivation as a result of the nature of the soils and limited water availability, and is utilised for livestock and cattle grazing. The Ilanga CSP 7 project is proposed to generate up to 150MW in capacity and will be constructed over an area of approximately 1526ha in extent within the broader property. The activities associated with the operation phase will result in a loss of farmland available for grazing for the operation period of 20-25 years. However, the impacted landowner has noted that the farm is currently leased for grazing and the cattle will be sold just before development starts. The tenant that leases that land has agreed to this and also currently leases at least four other farms for livestock farming so this will not have an impact on his farming operations. Therefore the solar energy development will not interfere with livestock farming operations, and thereby the impact is assessed to be of low significance.

Social impacts associated with decommissioning:

Typically, the major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income. This has implications for the households who are directly affected, the communities within which they live, and the relevant local authorities. However, in the case of the proposed development the decommissioning phase is likely to involve the disassembly and replacement of the existing components with more modern technology. This is likely to take place in 20 - 25 years post commissioning. The decommissioning phase is therefore likely to create additional, construction type jobs, as opposed to the job losses typically associated with decommissioning however for a limited period of time.

Given the relatively small number of people employed during the operation phase (~50-80), the social impacts at a community level associated with decommissioning are likely to be limited. In addition, potential impacts associated with the decommissioning phase can be effectively managed with the implementation of a retrenchment and downscaling programme.

6.9.3. Impact tables summarising the significance of social and economic impacts associated with the construction, operation and decommissioning phases (with and without mitigation measures)

Construction Phase

Impacts associated with the construction phase of the project are usually of a short duration (approximately 24-36 months) and temporary in nature, but could have long-term effects on the surrounding social environment if not managed appropriately.

Nature of impact: The creation of employment opportunities and skills development opportunities during the construction phase for the country and local economy		
Relevant Listed activities: GNR 983 Activity: 11(i), 12(xii)(a)(c), 19(i), 28(ii), 56(ii) GNR 984 Activity: 1, 4, 15		
	Without enhancement	**With enhancement**
Extent	Local- Regional (3)	Local- Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (36)**	**Medium (44)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources	N/A	
Can impacts be enhanced	Yes	
Enhancement measures: » Efforts should be made to employ local contractors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria. » A local employment policy is to be adopted to maximise the opportunities made available to the local labour force (sourced from Upington, Dagbreek, Karos and Leerkrans). » The recruitment selection process should seek to promote gender equality and the employment of women. » Training and skills development programmes should be initiated prior to the commencement of the construction phase. » A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process. The EPC contractor should appoint a designated staff member to implement grievance procedures and address issues and complaints. A Public Complaints register must be maintained by the Contractor and monitored by the ECO to record all complaints and queries relating to the project and the action taken to resolve the issue.		
Residual impacts: » Improved pool of skills and experience in the local area.		

- Economic growth for small-scale entrepreneurs.
- Temporary employment during construction phase will result in jobs losses and struggles for local construction workers to find new employment opportunities post construction.

Nature: Significance of the impact from the economic multiplier effects from the use of local goods and services		
Relevant Listed activities: GNR 983 Activity: 11(i), 28 (ii), 56(ii) GNR 984 Activity: 1, 4, 15		
	Without enhancement	**With enhancement**
Extent	Local- Regional (3)	Local- Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Moderate (6)
Probability	Probable (3)	Highly Probable (4)
Significance	**Low (27)**	**Medium (33)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources	N/A	
Can impacts be enhanced	Yes	
Enhancement: » It is recommended that a local procurement policy is adopted by the developer to maximise the benefit to the local economy. » Where feasible, the developer should create a database of local companies, specifically Historically Disadvantaged (HD) which qualify as potential service providers (e.g. construction companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors; these companies should be notified of the tender process and invited to bid for project-related work where applicable. » It is recommended that good and services are sourced from the local area as much as possible; engage with local authorities and business organisations to investigate the possibility of procurement of construction materials, goods and products from local suppliers, where feasible.		
Residual impacts: » Improved local service sector, growth in local business.		

Nature: Added pressure on economic and social infrastructure and increase in social conflicts during construction as a result of in-migration of people.		
Relevant Listed activities: GNR 983 Activity: 11(i), 28 (ii), 56(ii) GNR 984 Activity: 1		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)

Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	

Mitigation:

» A 'locals first' policy should be adopted for construction employment opportunities, especially for semi and low-skilled job categories. Enhance employment opportunities for the immediate local area; nearest towns located in the KLM, and if this is not possible, then the broader focus areas should be considered for sourcing workers such as the ZFMDM.

» Tender document should stipulate the use of local labour as far as possible.

» Prior to construction commencing representatives from the local community (e.g. ward councillor, surrounding landowners) should be informed of details of the construction schedule and exact size of the workforce.

» Recruitment of temporary workers at the gates of the development should not be allowed. A recruitment office should be established by the contractor in a nearby town to deal with jobseekers.

» A security company is to be appointed and appropriate security procedures to be implemented.

» Implement procedures for the control and removal of loiterers at the construction site.

» A comprehensive employee induction programme should address issues such as HIV/ AIDS and sexually transmitted diseases. The induction should also address a code of conduct for employees that would align with community values.

» A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process. The EPC contractor should appoint a designated staff member to implement grievance procedures and address issues and complaints. A Public Complaints register must be maintained by the Contractor and monitored by the ECO to record all complaints and queries relating to the project and the action taken to resolve the issue.

Residual impacts:

Possibility of outside workers remaining in the area after construction is completed and subsequent pressures on local infrastructure and services.

Nature: Impact on daily living and movement patterns - Impacts from an increase in traffic disruptions and movement patterns during the construction phase.

Relevant Listed activities:

GNR 983 Activity: 11(i), 28 (ii), 56(ii)

GNR 984 Activity: 1, 15

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)

Significance	**Medium (30)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	

Mitigation

» All vehicles must be road worthy and drivers must be qualified, obey traffic rules, follow speed limits and made aware of the potential safety issues.
» Heavy vehicles should be inspected regularly to ensure their road safety worthiness.
» Implement penalties for reckless driving for the drivers of heavy vehicles as a way to enforce compliance to traffic rules.
» The developer and engineering, procurement and construction (EPC) contractors must ensure that there is a dedicated safe entrance to the site, and an access control point at the entrance gate off the N10 on Farm Matjesrivier RE/41.
» The developer and engineering, procurement and construction (EPC) contractor's must ensure that the fencing or entrance gates along the access road must either be maintained in the present condition, improved upon or repaired if disturbed due to project activities.
» The developer and engineering, procurement and construction (EPC) contractor's responsibility to ensure roads utilised are either maintained in the present condition or upgraded if disturbed due to project activities.
» A comprehensive employee induction programme must be implemented to cover land access protocols and road safety.
» A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process. The EPC contractor should appoint a designated staff member to implement grievance procedures and address issues and complaints. A Public Complaints register must be maintained by the Contractor and monitored by the ECO to record all complaints and queries relating to the project and the action taken to resolve the issue.

Residual impacts

None anticipated.

Nature: Temporary increase in safety and security concerns associated with the influx of people during the construction phase.

Relevant Listed activities:

GNR 983 Activity: 11 (i), 28 (ii), 56(ii)
GNR 984 Activity: 1, 4

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short term (2)	Short term (2)
Magnitude	High (8)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (33)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	

Can impacts be mitigated	Yes

Mitigation:

» Working hours should be kept within daylight hours during the construction phase, and/or as any deviation that is approved by the surrounding landowners.
» The perimeter of the construction site should be appropriately secured. The fencing of the site should be maintained throughout the construction periods.
» The appointed EPC contractor must appoint a security company and appropriate security procedures and measures are to be implemented.
» Access in and out of the site should be strictly controlled by a security company.
» Provide workers with identity tags and prohibit the access of unauthorized people to the construction site.
» The developer and EPC contractors must ensure that the fencing and / or any other farm infrastructure must either be maintained in the present condition, or repaired if disturbed due to project activities.
» The contractor must ensure that open fires on the site for heating, smoking or cooking are not allowed except in designated areas.
» Contractor must provide adequate firefighting equipment on site and provide firefighting training to selected construction staff.
» The developer and engineering, procurement and construction (EPC) contractors must ensure that any damage / wear and tear to the roads caused by construction related traffic/ project activities are repaired.
» Provision of adequate and strategically placed traffic warning signs and control measures along the access road and N10 to warn road users of the construction activities taking place and displaying road safety messages and speed limits. Warning signs must be visible at all times.
» A comprehensive employee induction programme, covering land access protocols, fire management and road safety. This must be addressed in the construction EMPr as the best practice.
» All vehicles must be road worthy and drivers must be qualified and made aware of the potential road safety issues and follow the speed limits.
» The contractor should have personnel trained in first aid on site to deal with smaller incidents that require medical attention.
» A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process. The EPC contractor should appoint a designated staff member to implement grievance procedure and address issues and complaints.

Residual impacts:

None anticipated.

Nature: Nuisance impacts in terms of a temporary increase in noise and dust		
Relevant Listed activities: GNR 983 Activity: 11(i), 28 (ii), 56(ii) GNR 984 Activity: 1, 15		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)

Magnitude	High (8)	Moderate (6)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (44)**	**Medium (36)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	

Mitigation:

» Dust suppression measures must be implemented on a regular basis along the gravel access road and on the proposed site.
» Vehicles used to transport sand and building materials must be fitted with tarpaulins or covers when travelling on roads.
» Speed limits must be imposed on internal roads to limit dust generation.
» Ensure all vehicles are roadworthy, drivers are qualified and are made aware of the potential noise and dust issues.
» A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process. The EPC contractor should appoint a designated staff member to implement grievance procedures and address issues and complaints. A Public Complaints register must be maintained by the Contractor and monitored by the ECO to record all complaints and queries relating to the project and the action taken to resolve the issue.

Residual impacts:
Damage to roads that is not fixed could affect road users.

Nature: Nuisance impacts and safety risks on game farming activities

Relevant Listed activities:
GNR 983 Activity: 11(i), 28 (ii), 56(ii)
GNR 984 Activity: 1, 15

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	High (8)	Moderate (6)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (44)**	**Medium (36)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	

Mitigation

» Dust suppression measures must be implemented on a regular basis along the gravel access road and on the proposed site.
» Vehicles used to transport sand and building materials must be fitted with tarpaulins or covers when travelling on roads.
» Speed limits must be imposed on internal roads to limit dust generation.
» Ensure all vehicles are roadworthy, drivers are qualified and are made aware of the

potential noise and dust issues.

» Working hours should be kept within daylight hours during the construction phase, and/or as any deviation that is approved by the surrounding landowners.
» The perimeter of the construction site should be appropriately secured. The fencing of the site should be maintained throughout the construction periods.
» The appointed EPC contractor must appoint a security company and appropriate security procedures and measures are to be implemented.
» Access in and out of the site should be strictly controlled by a security company.
» Provide workers with identity tags and prohibit the access of unauthorized people to the construction site.
» An agreement between the developer, EPC contractor and surrounding landowners should be put in place indicating that compensation will be provided for increase in insurance costs for exotic game as a result of the development of the proposed project. Proof in this regard will need to be provided..
» The developer and EPC contractors must ensure that the fencing and / or any other farm infrastructure must either be maintained in the present condition, or repaired if disturbed due to project activities.
» The contractor must ensure that open fires on the site for heating, smoking or cooking are not allowed except in designated areas.
» Contractor must provide adequate firefighting equipment on site and provide firefighting training to selected construction staff.
» A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process. The EPC contractor should appoint a designated staff member to implement grievance procedures and address issues and complaints. A Public Complaints register must be maintained by the Contractor and monitored by the ECO to record all complaints and queries relating to the project and the action taken to resolve the issue.

Residual impacts
None anticipated.

Operation Phase

The CSP Facility is designed to be operational for at least ~20-25 years. The potential positive and negative social impacts which could arise as a result of the operation of the proposed project include the following:

Nature: The creation of employment opportunities and skills development opportunities during the operation phase for the country and local economy		
Relevant Listed activities: GNR 984 Activity: 1		
	Without enhancement	**With enhancement**
Extent	Local- Regional (2)	Local- Regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (40)**	**Medium (48)**

Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources	N/A	
Can impacts be enhanced	Yes	
Enhancement » It is recommended that a local employment policy is adopted to maximise the opportunities made available to the local community. » The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. » Vocational training programs for employees should be established to promote the development of skills.		
Residual impacts Improved pool of skills and experience in the local area.		

Nature: Development of clean, renewable energy infrastructure		
Relevant Listed activities: GNR 984 Activity: 1		
	Without enhancement	**With enhancement**
Extent	Local- Regional- National (4)	Local- Regional- National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (40)**	**Medium (40)**
Status (positive or negative)	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources	Yes (impact of climate change)	
Can impacts be enhanced	No	
Enhancement: » None anticipated		
Residual impacts » Reduce carbon emissions through the use of renewable energy and contribute to reducing global warming. » Contribution towards security of electricity supply.		

Nature: Benefits to the local area from SED/ ED programmes and community trust from REIPPPP social responsibilities		
Relevant Listed activities: GNR 984 Activity: 1		
	Without enhancement	**With enhancement**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Probable (3)	Highly probable (4)

Significance	**Low (30)**	**Medium (48)**
Status (positive or negative)	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be enhanced	No	

Enhancement

» An in-depth community needs assessment (CNA) will need to be carried out to make sure that the real needs of communities are addressed (in line with the local government) and the correct representatives of the community are appointed to run the community trust.
» Engagement and involvement of the local municipality (KLM) with social responsibility plans must be undertaken.

Residual impacts

Improvements in local communities through socio-economic development and enterprise development.

Nature: Sense of place impacts associated with the operation phase of the solar energy facility and associated infrastructure

Relevant Listed activities:
GNR 983 Activity: 11(i), 28(ii), 56(ii)
GNR 984 Activity: 1, 4, 15

	Without mitigation	**With mitigation**
Extent	Local (2)	N/A
Duration	Long term (4)	N/A
Magnitude	High (8)	N/A
Probability	Highly Probable (4)	N/A
Significance	**Medium (56)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	

Mitigation

» Not possible to mitigate impacts associated with the tower.
» Implement mitigation measures and recommendations proposed by the visual specialist as part of the VIA.

Residual impacts

None anticipated if the visual impact will be removed after decommissioning, provided the site is rehabilitated to its original (current) status.

Nature: Impacts associated with loss of farmland available for livestock grazing due to occupation of land by the CSP facility

Relevant Listed activities:
GNR 983 Activity: 11(i), 28(ii), 56(ii)
GNR 984 Activity: 1, 4, 15

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Low (28)**	**Low (28)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	At footprint for the duration of the operation phase of the solar energy facility.	
Can impacts be mitigated	No	
Mitigation: None required due to limited potential of the land.		
Residual impacts: None.		

Decommissioning Phase

The decommissioning phase of the CSP Facility is likely to involve the disassembly and replacement of the existing components with more modern technology. This is likely to take place in 20 - 25 years post commissioning. The decommissioning phase is therefore likely to create additional, construction type jobs, as opposed to the job losses typically associated with decommissioning however for a limited period of time.

Nature: Social impacts associated with retrenchment including loss of jobs and source of income		
Relevant Listed activities: GNR 983 Activity: 11(i), 28(ii), 56(ii) GNR 984 Activity: 1, 4, 15		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (2)
Duration	Short term (1)	Short Term (1)
Magnitude	Moderate (6)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (36)**	**Low (28)**
Status	Negative	Negative
Reversibility	No	
Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Mitigation: » Implementation of a retrenchment and downscaling programme. » All structures and infrastructure associated with the proposed development should be dismantled, removed and transported off-site on decommissioning; & the landscape rehabilitated/re-vegetated.		

Residual impacts:
Loss of jobs and associated loss of income, can impact on local economy and other businesses.

6.9.4. Implications for Project Implementation

» From a social perspective it is concluded that the project is supported, but that mitigation measures should be implemented and adhered to. Positive and negative social impacts have been identified. The assessment of the key issues indicated that there are no negative impacts that can be classified as fatal flaws and which are of such significance that they cannot be successfully mitigated. Positive impacts could be enhanced by implementing appropriate enhancement measures and through careful planning. Based on the social assessment, the following general conclusions and findings have been made:
»
» The potential negative social impacts associated with the construction phase are typical of construction related projects and not just focussed on the construction of CSP facilities (these relate to influx of non-local workforce and jobseekers, intrusion and disturbance impacts, safety and security) and could be reduced with the implementation of the mitigation measures proposed.
» Employment opportunities will be created in the construction and operation phase and the impact is rated as positive even if only a small number of individuals benefit in this regard.
» The proposed project could assist the local economy in creating entrepreneurial development, especially if local business could be involved in the provision of general material and services during the construction and operational phases.
» Capacity building and skills training among employees are critical and would be highly beneficial to those involved, especially if they receive portable skills to enable them to also find work elsewhere and in other sectors.
» The proposed development also represents an investment in infrastructure for the generation of clean, renewable energy, which, given the increased awareness of climate change, represents a positive social benefit for society as a whole.

The following recommendations are made on the basis of the SIA and a thorough review of the concerns and suggestions raised by stakeholders and interested and affected parties during the stakeholder engagement process. The proposed mitigation measures should be implemented to limit the negative impacts and enhance the positive impacts. Based on the social assessment, the following recommendations are made:

» The EPC contractor should appoint a designated staff member to assist with the management of social impacts and to deal with any community issues.

» In terms of employment related impacts, it is important to consider that job opportunities for the unskilled and semi-skilled in the study area could create competition among the local unemployed. Introducing an outside workforce will therefore most likely worsen local endeavours to obtain jobs and provoke discontent as well as put pressure on the local services available. It is imperative that local labour be sourced, wherever possible, to ensure that benefits accrue to the local communities. Efforts should be made to involve local businesses during the construction activities where possible. Local procurement of labour and services/products would greatly benefit the community during the construction and operational phases of the project.
» Local procurement of services and equipment where possible in order to enhance the multiplier effect. This would serve to mitigate other subsequent negative impacts such as those associated with the inflow of outsiders to the area, the increased pressure on the infrastructure and services in the area, as well as the safety and security concerns.
» Involve the community in the process as far as possible (encourage co-operative decision making and partnerships with local entrepreneurs).
» Implement mitigation measures to reduce and avoid negative impacts.
» Employ mitigation measures to minimise the dust pollution and damage to existing roads and fences / gates.
» Safety and security risks should be taken into account during the planning/ construction phase of the proposed project. Access control, security and management should be implemented to limit the risk of crime increasing in the area.

The proposed Ilanga CSP 7 project and associated infrastructure is unlikely to result in permanent damaging social impacts. From a social perspective it is concluded that the project could be developed subject to the implementation of the recommended mitigation measures and management actions contained in the SIA report (Appendix I).

6.10 The No Go Alternative

The no go alternative would result in no impacts on the social and biophysical environment.

The National Integrated Resource Plan (IRP) developed by the Department of Energy has identified the need for power generation from renewable resources such as solar as part of the technology mix for power generation in the country in the next 20 years. The need for the project at a national scale has therefore been determined. The location of the proposed project is further supported by national and provincial planning initiatives in that it is located within a zone identified for such development (i.e. within REDZ 7 as defined by the national government and within the Solar Corridor as defined by the Provincial SDF).

South Africa's per capita greenhouse gas emissions are amongst the highest in the world due to reliance on fossil fuels. The proposed project will contribute to South Africa achieving goals for implementation of renewable energy and 'green' energy and will aid in meeting national commitments for reduction of greenhouse gas emissions (as per the Kyoto Protocol and COP21 agreements). With South Africa's commitment to reducing its CO_2 emissions (in terms of the COP21 Agreement), coupled with the increasing demand for electricity, the 'no-go option' is not considered a viable alternative.

At both a provincial and national level, it should be noted that the Ilanga CSP 7 Facility is not unique. In that regard, a significant number of solar energy facility developments are currently proposed in the region. Therefore, when considering the desirability of the no go option for the specific project, the costs and benefits of the proposed project must be considered.

The implementation of the project is expected to result in a number of environmental costs, as detailed within this report. This could include:

» Direct loss of biodiversity, flora and fauna due to the clearing of land for the construction and utilisation of land for the Ilanga CSP 7 Facility (which is limited to the development footprint of 1519.19ha). The cost of loss of biodiversity is expected to be limited as a result of the wide distribution of the affected vegetation type and the limited presence of species of conservation concern within the development area.
» Visual impacts associated with the CSP Facility. The cost of loss of visual quality to the area is expected to be low as a result of the location of the facility in relation to sensitive visual receptors, as well as the nature of the topography of the area.
» Change in land-use and loss of land available for agriculture on the development footprint. The cost in this regard is expected to be limited due to the limited footprint of the facility (less than 15% of the broader site), the low agricultural potential of the property and the fact that current agricultural activities can continue on the remainder of the property during construction and operation.

These costs are expected to occur at a local and site level and are considered acceptable provided the mitigation measures as outlined in this EIA and the EMPr are implemented. No fatal flaws associated with the proposed project have been identified.

The positive implications of establishing the Ilanga CSP 7 Facility on the demarcated site include:

- The project will result in important socio-economic benefits at the local and regional scale through job creation, procurement of materials and provision of services and other associated downstream economic development (as detailed in Chapter 2 of this report). These will persist during the preconstruction, construction and operational phases of the project.
- The project is considered to be a suitable land use for the proposed site due to the low potential for commercial agriculture. Development of the facility will require the implementation of appropriate management actions which could have positive impacts on the surrounding areas specifically in terms of alien vegetation and erosion management.
- The project contributes towards the Provincial and Local goals for the development of renewable energy as outlined in the respective SDFs and IDPs.
- The project is located within an area demarcated for solar development at a Provincial and Local scale, and is located within an area where a number of CSP facilities are already authorised (facilitating consolidation of similar infrastructure). The location is therefore considered desirable.
- The project serves to diversify the economy and electricity generation mix of South Africa by addition of solar energy to the mix. As a result of the on-site storage associated with the project, it has the potential to provide extended periods of power (for 18 hours a day) to the grid. This will assist in stabilising the power supply during the periods of the day when this is required most.

The benefits of the project are expected to occur at a national, regional and local level. As the costs to the environment at a site specific level have been largely limited through the appropriate placement of infrastructure on the site within lower sensitivity areas, the expected benefits of the project are expected to partially offset the localised environmental costs of the project.

The No-Go Alternative would represent a lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. Given South Africa's position as one of the highest per capita producer of carbon emissions in the world, as well as its commitments to reduction in greenhouse gas emissions, this would represent a negative social cost. In addition, the implementation of the no go option would result in a lost opportunity at a local and regional level from a socio-economic perspective as a result of no opportunities for employment or socio-economic upliftment.

The no go alternative is therefore not considered desirable at a local, regional and national scale.

ASSESSMENT OF POTENTIAL CUMULATIVE IMPACTS CHAPTER 7

As discussed in the previous chapter, CSP trough developments may have effects (positive and negative) on natural resources, the socio-economic environment and on the people living in a project area. The preceding impact assessment chapter has reported on the assessment of the impacts associated with the Ilanga CSP 9 Facility largely in isolation (from other similar developments).

As detailed within this report, the development of renewable energy generation capacity is supported at a National and Provincial level from a policy perspective. As a result of the location of the Ilanga CSP 9 Facility within an identified solar energy development node, it can be expected that projects of a similar nature will be developed in this node. As a result, it is important to follow a precautionary approach in accordance with NEMA to ensure that the potential for cumulative impacts are considered and minimised where required and possible. This chapter provides an assessment of the cumulative impacts expected to be associated with the proposed project when considered together with other similar developments in the area.

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

Requirement	Relevant Section
3(j) an assessment of each identified potentially significant impact and risk , including (i) cumulative impacts, (ii) the nature, extent, 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.	This chapter focuses on the assessment of the cumulative impacts associated with the Ilanga CSP 9 Facility as a whole.

7.2 Approach Taken to Assess Cumulative Impacts

The cumulative impacts that have the potential to be compounded through the development of the proposed CSP facility and its associated infrastructure in proximity to other similar developments include impacts such as those listed below. The role of the cumulative assessment is to test if such impacts are relevant to the Ilanga CSP 9 Project in the proposed location when considered together with other similar developments:

- Unacceptable loss of threatened or protected vegetation types or species through clearing, resulting in an impact on the conservation status of such flora or ecological functioning;
- Unacceptable risk to aquatic habitat resulting due to the increase in the extent of hard or impermeable surfaces in the greater area;
- Unacceptable risk to avifauna through loss of habitat, infringement on breeding areas, or risk to collision-prone species;
- Unacceptable loss of or impact to the soil and agricultural potential in the area.
- Unacceptable risk to bats collision with the CSP infrastructure;
- Unacceptable loss of heritage resources;
- Complete or whole-scale change in sense of place and character of an area and unacceptable visual intrusion;
- Positive and negative contribution from a socio-economic perspective; and
- Contribution to climate change mitigation.

The scale at which the cumulative impacts are assessed is important. For example the significance of the cumulative impact on the regional or national economy will be influenced by solar developments throughout South Africa, while the significance of the cumulative impact on visual amenity may only be influenced by solar developments that are in closer proximity to each other, up to 30 km apart in this instance. For practical purposes a sub-regional scale has been selected for this cumulative evaluation.

Figure 7.1 indicates the location of the Ilanga CSP 7 Facility in relation to all other known renewable energy project developments within a 30km radius of the site. These projects were identified using the Department of Environmental Affairs Geographic Information System digital data developed by the CSIR[24] and current knowledge of projects being proposed in the area. In the case of the proposed Ilanga CSP 7 Facility, there are at least 14 other facilities, 2 of which are preferred bidder projects (refer to **Figure 7.1** and **Table 7.1**), all at various stages of approval.

[24] Available online at https://dea.maps.arcgis.com/

Table 7.1: Other projects/ developments within 30km from the Ilanga CSP 7 Project site

Project Name	DEA Ref. No	Location	Approximate distance from the Karoshoek Solar Valley Project development site	Project Status
Ilanga Solar Thermal Power Plant	12/12/20/2056	Lot 944 Karos Settlement	Within the Karoshoek Solar Valley development site	Preferred Bidder Round 3; under construction
Karoshoek Solar Valley Development	14/12/16/3/3/2/289 14/12/16/3/3/2/290 14/12/16/3/3/2/291 14/12/16/3/3/2/292 14/12/16/3/3/2/293 14/12/16/3/3/2/294 14/12/16/3/3/2/295 14/12/16/3/3/2/296 14/12/16/3/3/2/297 14/12/16/3/3/2/298 14/12/16/3/3/2/299	Matjesriver RE and 2/41, Annashoek 3/41, Karos 956 and Zandemm 944	All within the Karoshoek Solar Valley development site	Received Authorisation
25MW Solar Energy Facility, North-East Of Upington, NC Province	12/12/20/2169	Remaining Extent of the Farm 418	20km north	Received Authorisation
Upington Airport PV Solar Energy Facility	12/12/20/2146	Upington International Airport	25km north west	Preferred Bidder Round 2; construction completed
Kheis Solar Phase 3 phases	14/12/16/3/3/2/569 14/12/16/3/3/2/570 14/12/16/3/3/2/571	Portion 7 and Portion 9 of the Farm Namakwari 656	30km south east	Received Authorisation
Albany Solar Energy Facility	14/12/16/3/3/2/639	Remainder of Farm Albany 405	25km north east	In Process
Avondale Solar Park 1	14/12/16/3/3/2/618	Portion 1 of the Farm Avondale No. 410	20km north	In Process

Project Name	DEA Ref. No	Location	Approximate distance from the Karoshoek Solar Valley Project development site	Project Status
Ilanga CSP tower facilities 8 and 9 within Karoshoek solar valley development	14/12/16/3/3/2/904	Lot 944 Karos Settlement, Trooilaps Pan 4/53	Within the Karoshoek Solar Valley Development site.	Ilanga CSP 9 is in process and CSP 8 is currently on hold- the application form has not been submitted as yet.
Ilanga tower 1, Ilanga CSP 2, 3, 4 and 5 facilities within Karoshoek solar valley development	14/12/16/3/3/2/861 14/12/16/3/3/2/862 14/12/16/3/3/2/864 14/12/16/3/3/2/866 14/12/16/3/3/2/868	Matjesriver RE and 2/41, Annashoek 3/41, Karos 956, Trooilaps Pan 4/53 and Zandemm 944	Within the Karoshoek Solar Valley Development site.	In Process

The potential for cumulative impacts are summarised in the sections which follow and have been considered within the detailed specialist studies, where applicable (refer to **Appendices D – L**).

It should be noted that not all the CSP facilities presently under consideration by various developers will be constructed. It is possible that not all proposed developments will be granted the relevant permits by the relevant authorities (DEA, DOE, NERSA and Eskom). Reasons in this regard may include:

» There may be limitations to the capacity of the existing or future Eskom grid.
» Not all proposed CSP facilities will be able to reduce negative impacts to acceptable levels or able to mitigate adequately (fatally flawed) and may therefore not receive environmental authorisation.
» There are stringent requirements to be met by applicants in terms of the REIPPPP and a highly competitive process that only rewards the most competitive and efficient projects.
» Not all proposed facilities will eventually be granted a generation license by NERSA and sign a Power Purchase Agreement with Eskom. Not all developers will be successful in securing financial support to advance their projects further.

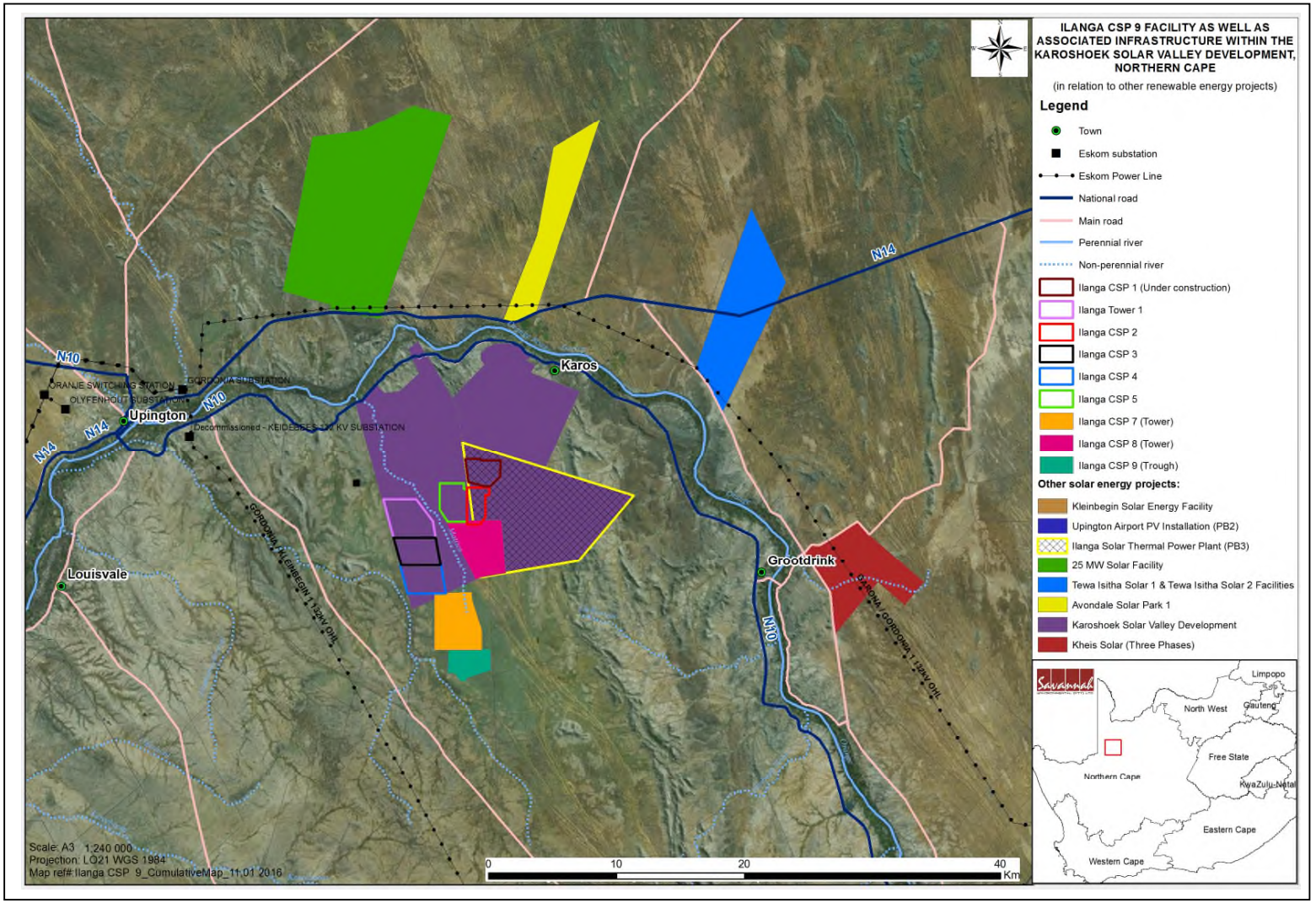

Figure 7.1: Solar energy projects surrounding the Ilanga CSP 7 Facility (these projects areas were identified using the Department of Environmental Affairs Geographic Information System digital data developed by the CSIR. It must be noted that this secondary product has not yet been verified by DEA)

As there is uncertainty as to whether all the above-mentioned developments will be implemented, it is also difficult to quantitatively assess the potential cumulative impacts. The cumulative impacts of other known renewable energy developments (mainly solar) in the broader area and the Ilanga CSP 9 Facility are therefore qualitatively assessed in this Chapter. As these cumulative impacts are explored in more detail, the trade-offs between promoting renewable energy (and the associated benefits in terms of reduction in CO_2 emissions – a national interest) versus the local and regional environmental and social impacts and benefits (i.e. impacts on bird populations, landscape, tourism, flora, local economy, employment etc.) will become evident. It is only when these trade-offs are fully understood, that the true benefits of renewable energy can be assessed.

7.3 Cumulative Impacts on Ecological Processes

No fine-scale conservation planning has been done in the district and as a result, no Critical Biodiversity Areas have been defined. The site also does not fall within areas that have identified as focus areas under the National Protected Areas Expansion Strategy, indicating that the development areas do not occur within areas that have been identified as being important for biodiversity maintenance at a landscape scale.

There is however a large amount of solar development in the area, which raises the possibility of significant cumulative impact in the area. The DEA map available showing proposed projects does not however show the actual extent of development in most cases and shows the entire affected cadaster, which may have one or several solar developments on it. As a result, the actual extent of development is most likely significantly less than suggested by the DEA map. Nevertheless, cumulative impacts in the area are likely to increase significantly in the future should all projects be developed. The main cumulative impact of development in the area is likely to be habitat loss and the disruption of landscape connectivity for fauna. The contribution of development in the Karoshoek area to the impact on protected plant species is likely to be moderate as the open plains habitat in the area contains few species of conservation significance and the density of protected tree species is also relatively low and concentrated along the larger drainage lines.
The large amount of development in the Karoshoek area and beyond would potentially create a significant impact on landscape connectivity in the area. However, in reality, this is not likely to occur, as there are many ridges in the area that would not be developed, which would facilitate landscape connectivity. In addition, there are also some large drainage lines that would also not be developed and which would be used by species which avoid the upland areas. Therefore, development in the Karoshoek area is likely to impact on landscape connectivity at a local level only and there are still likely to be sufficient intact areas remaining at a broader scale to allow for broad-scale faunal movement.

However, in order to facilitate this, it is important there are not extensive electrified fences in the area and each development should preferably be individually fenced.

Impact Nature: The facility would contribute to cumulative habitat loss and broad-scale ecological processes in the area.
There are a number of approved and planned facilities in the area and these will ultimately result in significant habitat loss in the area. However, currently, the location of these facilities is within lower sensitivity open plains and the important features of the area have not been significantly impacted to date. Due to the arid nature of the area, it is important that the mobility of fauna in the area is not impacted as many arid fauna respond to the unpredictability of these systems by moving extensively across the landscape. These impacts can be reduced by ensuring that fauna are still able to move about the landscape and are not impeded by extensive tracts of electrified fencing.

	Cumulative Contribution of Proposed Project	**Cumulative Impact without Proposed Project**
Extent	Regional (2)	Regional (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium (4)	Low (3)
Probability	Probable (3)	Probable (3)
Significance	**Medium (30)**	**Low (27)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Only partly as much of the impact stems from the presence and operation of the facility.	

Mitigation

» The development footprint should be kept to a minimum and natural vegetation should be encouraged to return to disturbed areas.
» An open space management plan should be developed for the site, which should include management of biodiversity within the fenced area, as well as that in the adjacent rangeland.
» No fauna should be persecuted within the facility area and any problem animals should be humanely captured and released outside the facility area.
» It is important there are not extensive electrified fences in the area and each development should preferably be individually fenced so that fauna can pass between the different facilities.

7.3.1. Implications for Project Implementation

Cumulative impacts on ecological processes considering the proposed project and other similar projects in the area are expected to be of low significance with the implementation of appropriate mitigation measures. As a result, there are no

ecological fatal flaws or impacts that cannot be mitigated that should prevent the development from being approved.

7.4 Cumulative Impacts on Avifauna

Cumulative impacts are defined as "Impacts that result from incremental changes caused by either past, present or reasonably foreseeable actions together with the project" (Hyder, 1999, in Masden et al. 2010).

Thus, in this context, cumulative impacts are those that will impact the general avian communities in and around the Karoshoek solar development, mainly by other solar farms and associated infrastructure. This will happen via the same factors identified here viz: collision, avoidance, displacement and incineration. Therefore, we need to know as a starting point the number of solar farms around the region within 50 km, and secondly, to know their impact on avifauna.
There are 20 proposed or approved solar farms of various sizes within 50 km of Karoshoek (Figure 5) and an operational CSP Tower (Khei Solar One) 40 km north-west of Karoshoek solar valley. Given the general assumption that footprint size and bird impacts are linearly related for CSP solar farms, a starting point in determining cumulative impacts is to determine:

» the number of bird displaced per unit area, by habitat destruction, disturbance, or displacement;
» the number of birds killed by collision with the structures on site;
» the number of birds killed by collision with infrastructure leading away from the site;
» the number of birds killed by flying through the solar flux of CSP tower sites.
» the rate of avian mortality per surface area of the mirrored surfaces of the CSP facilities per year;
» the surface area of the mirrored surfaces of each CSP facility;
» the reduction in flow of the Orange River causing more birds to seek other water sources; and
» the number of solar facilities within 30 km of the Karoshoek site.

As there are currently no post-construction mortality data or displacement data for any of these aspects in South Africa, a quantitative analysis of Cumulative Impacts for birds in and around the Orange River is not possible. In addition, quantification or even evaluation of cumulative impacts is uncertain as there is not a generalized knowledge of the large scale movements or connection between bird populations within the region, or if present cumulative impacts will be reflected by a very rapid decline of bird populations, i.e. above that expected from a single facility operation. Further monitoring will help validate and determine these types of impacts.

Cumulative Impacts for birds in and around the Orange River's solar farms. Once the data is collected and published (or released to other specialists), covering a minimum of 12 months, we can quantify this aspect.

Orange River water off–take rates are considerations already under investigation by hydrologists. However, the influence on the Orange River's wetland birds, which use the river as a linear oasis (Simmons & Allan 2002), needs to be assessed. This arises because the Orange River flow is reduced at certain times of year to very low rates. But at all times no less than 20% of the flow is required as an ecological reserve to maintain ecological functioning of the river (http://orangesenqurak.com/challenge/water+demand /environmental+flows.aspx). Further off-take amounting to over 1.1 million m^3, (3 CSP tower sites x 250 000 m^3 and 5 CSP trough sites x 80 000m^3) particularly at low flow (November-December) may force some wetland species to seek other water sources. With 20 other solar farm applications within 50 km, all potentially using the Orange River as a source of water, approximately 20 million m^3 of water per annum may be drawn in future. Given that 5 500 million m^3 is the average run-off to the mouth (ORESACOM 2007), this represents only 0.4% of the annual flow. At high flow this will make little difference to the river ecology, but at low flow it may have a more major impact.
This may become an issue for the CSPs and the bank of mirrored surfaces that will be in the environment surrounding the river environs. If the evaporation ponds or the Lake Effect of Kagen et al. (2014) attracts such water-seeking wetland birds then the off-take of water from the Orange River may exacerbate this effect. We would predict:

» a seasonal influx of wetland birds attracted to the CSP Tower 7 site in the low-flow season and an increase in mortality;
» greater mortality with time, as more and more solar developments take increasing amounts of water away at low-flow periods, reducing wetland habitat in the Orange River.

A simple calculation of the Cumulative Impact of this would be related to:

» the *rate* of avian mortality per surface area of the mirrored surfaces of the CSPs per year;
» the total surface area of the mirrored surfaces of each CSP in the area;
» the number of solar farms within 50 km of the Karoshoek site; and
» the reduction in flow of the Orange River causing more birds to seek other water sources; and
» the number of solar farms within 50 km of the Karoshoek site.

In 2016 we cannot yet quantify all of these variables, so a prediction of Cumulative Impact is not possible. Data gathering and sharing over even just one 12-month period, of one or more solar farms, will allow us to determine impacts on Orange River avifauna.

Nature of impact: Cumulative impacts on avifauna in the area (resulting in a decline of bird populations due to collision with the tower or heliostats).		
	Without mitigation	**With mitigation**
Extent	Regional (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (8)	Moderate (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Moderate (60)**	**Low (30)**
Status	Negative	Negative
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Possible	Possible
Can impacts be mitigated?	Yes	-
Mitigation: » The minimisation of this impact is mainly achieved through the avoidance of infrastructure siting, in the no-go areas during the layout planning phase. » An operation monitoring programme is essential to determine the actual impact and necessity of additional mitigation measures.		

7.4.1. Implications for Project Implementation

Cumulative impacts on avifauna considering the proposed project and other similar projects in the area are expected to be of low significance with the implementation of appropriate mitigation measures. As a result, there are no fatal flaws or impacts that cannot be mitigated that should prevent the development from being approved.

7.5 Cumulative Impacts on Bats

CSP facilities which are proposed as part of the Karoshoek Solar Facility are located within Bushmanland Arid Grassland and Gordonia Duneveld, both of which have a low potential for bat roosting and foraging habitat. The cumulative impacts associated with loss of habitat are therefore considered to be limited.

The risk of mortality as a result of interactions with the solar facility infrastructure (such as the ACC) at the Ilanga CSP 7 Facility is considered to be low as there is little potential for bats to come into contact with heated surfaces and/or steam. Therefore, the contribution of this project to cumulative impacts is expected to be limited.

Cumulative impact: Local bat populations, if impacted in significantly, have a slow recovery rate due to bats having a low level of annual reproduction.		
	Without mitigation	With mitigation
Extent	Regional (2)	Regional (2)

Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Minor (2)
Probability	Highly Probable (4)	Very Improbable (1)
Significance	**Medium (52)**	**Low (5)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation: On all CSP facilities, including tower and parabolic through types, buildings housing steam condensers and other hot surfaces/liquids should be closed up thoroughly and have no overhanging roofs or overlapping sheets with holes of 1.5cm or more in diameter.		

Cumulative impact: Local bat populations, if impacted in significantly, have a slow recovery rate due to bats having a low level of annual reproduction.		
	Without mitigation	With mitigation
Extent	Regional (2)	Regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Minor (2)
Probability	Highly Probable (4)	Very Improbable (1)
Significance	**Medium (52)**	**Low (5)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation: On all CSP facilities, including tower and parabolic through types, buildings housing steam condensers and other hot surfaces/liquids should be closed up thoroughly and have no overhanging roofs or overlapping sheets with holes of 1.5cm or more in diameter.		

7.6 Cumulative Impacts on Soil and Agricultural Potential

The project site is currently used for livestock farming. However, the grazing capacity is very low (approximately 40-50 ha/large stock unit), which is due to the dominant climatic conditions and prevailing soil conditions. Rainfall is erratic, both locally and seasonally and therefore cannot be relied on for agricultural practices. Very low rainfall, along with other soil-related factors lead to low vegetative cover throughout the area. The area consists of shallow soil with rock outcrops and sandy soils and the whole site can be better utilised for development (such as power generation) in comparison to any other practise.

This project site is not regarded as a viable commercial farming site and would be suited to house the facility.

The main potential cumulative impact would be soil removal due to wind erosion caused by developments off site. Due to the nature of the soil removal process, once topsoil is taken up into the atmosphere, wind action can deposit it over a large area and at a considerable distance, depending on the strength and duration of the wind acting upon the soils. Where a large number of developments occur in close proximity to one another, some sort of co-ordinated mitigation plan would be required to ensure that poor soil management procedures on one site do not lead to impacts on another site that actually has implemented mitigation measures correctly.

Nature of impact: Cumulative impacts on wind erosion potential in the area (resulting in transfer of topsoil sediments by wind action).		
	Without mitigation	**With mitigation**
Extent	Local (3)	Local (2)
Duration	Long Term (4)	Long Term (4)
Magnitude	Low (4)	Minor (2)
Probability	Highly Probable (3)	Improbable (2)
Significance	**Low (33)**	**Low (16)**
Status	Negative	Negative
Reversibility	Irreversible	Reversible
Irreplaceable loss of resources?	Possible	Possible
Can impacts be mitigated?	Yes	Yes
Mitigation: Ensure that the footprint for vegetation removal is restricted to as small an extent as possible. In addition, appropriate soil conservation measures to combat wind erosion (windbreaks, geotextiles on the soil surface and immediate re-establishment of vegetation) should be implemented and monitored on at least a six-monthly basis. In addition: regular consultation and reporting by responsible officers for any and all developments in the area, as improper management at one site could well cause problems at other site, due to unpredictable and possibly widespread sediment transport by wind, especially under the prevailing dry climate.		

7.6.1. Implications for Project Implementation

Cumulative impacts on soil and agricultural potential as a result of the proposed project are expected to be low as a result of the climatic conditions and the low agricultural and grazing potential in the area. The contribution of the project to cumulative impacts is therefore expected to be low to negligible. Appropriate soils erosion management measures must be implemented during construction to minimise loss of topsoil resources. As a result, there are no fatal flaws or impacts

that cannot be mitigated that should prevent the development from being approved.

7.7 Cumulative Visual Impacts

There are a number of CSP projects authorised within the Karoshoek Solar Valley Development area, one of which is already under development (i.e. Ilanga CSP facility). These will transform this area by introducing an industrial character into the area. However, from review of these projects as well as a site visit, a substantial area of relatively natural landscape will remain between public access areas such as the Kleinbegin Road and the N10 and the developed areas. This will soften the impact of the industrial elements. The steep ridgelines and koppies will also help to contain the impact ensuring that surrounding areas are relatively unaffected.

Figure 7.2 indicates the cumulative area that will be affected by the proposed extended Ilanga CSP 1 project taking into account known existing and authorised power towers. The proposed 275m high structure will marginally increase the visibility of development on Ilanga CSP 1. It is also likely that within the intersection between the approximate limit of visibility of the authorised 200m high structure of the adjacent project on Site 3b, the proposed 275m high structure and the existing Power Tower to the west of Upington that all three Power Tower structures that are considered in the analysis will be visible, particularly from higher areas of the landscape.

Intermittent views are possible to the west past the main focus area. To the east there is a visibility shadow between the main 5km focus area and the edge of the approximate limit of visibility where it becomes visible again from ridgelines.

The area around Upington has been identified by the Department of Environmental Affairs as a Renewable Energy Development Zone (REDZ 7). These zones have been put forward in order to focus development and inform planning. In addition, the provincial Spatial and Development Framework has identified the area as being part of the Solar Development Corridor. In the Upington area this has resulted in numerous renewable energy project applications. This focus is likely to transform the landscape character of the area.

The development of the proposed extension of Ilanga 7 Project will marginally increase cumulative visual impacts associated with currently authorised projects. However, it is therefore likely to result in an increase in cumulative impacts associated with authorised development within the Karoshoek Valley.

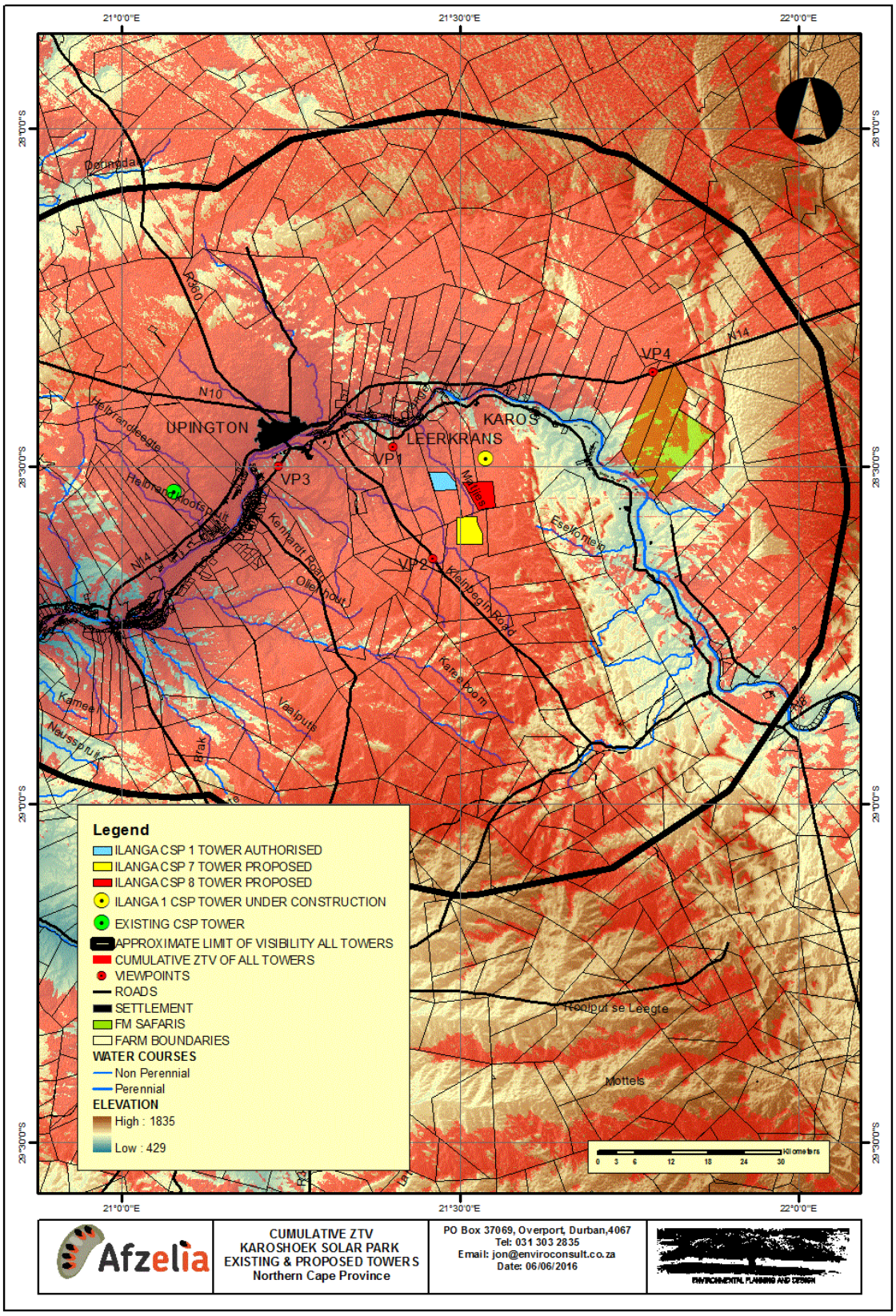

Figure 7.2: Cumulative ZTV of CSP Trough Projects within the Karoshoek Solar Valley Development Area.

Nature: Landscape Change
Adding to the industrialisation of landscape character associated with the authorised project as well as other authorised projects in the Karoshoek Valley.

The assessment has shown that the proposed project is unlikely to significantly extend the impact of authorized sites. It will however intensify impacts within the Karoshoek Valley.

	Without mitigation	**With mitigation**
Extent	Region, (3)	Region, (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Minor to Low (3)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Medium to Low (30)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, but only the impact of low elements including heliostats and minor buildings.	

Mitigation:
Low level impacts associated with the heliostat field can be mitigated.

Planning:

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

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Remove all temporary works;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions;
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;
- Colouring of mirror backs;

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all affected areas to productive agricultural use;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Nature: The visibility of the facility to, and potential visual impact on users of roads in close proximity
Proposed Solar projects within the Karoshoek Valley will add industrial elements to an otherwise natural landscape. Industrialisation of a natural landscape as seen from the local Kleinbegin and Kenhardt roads to the west and the N10 and N14 to the north.

The assessment indicates that due to intervening landform, CSP 7 is unlikely to have any

significant impact on either the N10 or N14.

The local roads to the west (Kleinbegin and Kenhardt Roads) are located relatively close to the west of the site. The power tower will be visible from this area. It will be seen in the context of other authorised towers and will generally appear within a relatively natural setting.

Due to distance and topography, heliostats are unlikely to be obvious to the Kleinbegin Road or visible to the Kenhardt Road.

The Power Tower will be add an obvious industrial element in the view from these roads. It is likely that diffuse reflection from the receiver will make the tower more obvious. In cumulative terms this will slightly intensify the impact associated with authorised projects.

	Without mitigation	**With mitigation**
Extent	Region, **(3)**	Region, **(3)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Minor, **(2)**	Minor, **(2)**
Probability	Highly Probable, **(4)**	Highly Probable, **(4)**
Significance	**Medium, (36)**	**Medium, (36)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	**Yes**, however, only impacts associated with the lower elements can realistically be mitigated. This will not change the larger impacts associated with the tower structure.	

Mitigation:
Low level impacts associated with the heliostat field can be mitigated.
Planning:

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

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Remove all temporary works;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions;
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;
- Colouring of mirror backs;

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all affected areas to productive agricultural use;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Nature: Industrialisation of a natural landscape as seen from local homesteads.
The project will only have a significant impact on homesteads within the Karoshoek Valley. The most major impact will occur where heliostats are visible. It is unlikely that this will occur. This means that the only impact is likely to be the sight of an additional tower within the valley landscape. In cumulative terms this will slightly intensify the impact associated with authorised projects.

	Without mitigation	**With mitigation**
Extent	Region, **(3)**	Region, **(3)**
Duration	Long term, **(4)**	Long term, **(4)**

Magnitude	Small, **(0)**	Small, **(0)**
Probability	Highly Probable, **(4)**	Highly Probable, **(4)**
Significance	**Low, (28)**	**Low, (28)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	**Yes**, however, only impacts associated with the lower elements can realistically be mitigated. This will not change the larger impacts associated with the tower structure.	

Mitigation:
Low level impacts associated with the heliostat field can be mitigated.
Planning:

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

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Remove all temporary works;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions;
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;
- Colouring of mirror backs;

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Return all affected areas to productive agricultural use;
- Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Nature: Industrialisation of a natural landscape as seen from sensitive uses.
Other sensitive receptors that have been identified within the region include the FM Safaris ecotourism operation to the north east and on the northern side of the Orange River.

The assessment indicates that the proposed tower is likely to be visible to a portion of FM Safaris operation. Whilst a view of the development may be possible, it is likely that it will not be obvious as only the top of the tower is likely to be visible over a ridgeline at a minimum distance of 25.5km.

The impact of CSP 7 on FM Safaris is therefore likely to be low but may add slightly to impacts associated with closer projects particularly Ilanga 1 and CSP 1.

	Without mitigation	**With mitigation**
Extent	Regional **(3)**	NA
Duration	Long term **(4)**	NA
Magnitude	Small **(0)**	NA
Probability	Very Improbable **(1)**	NA
Significance	**Low (7)**	NA
Status (positive or negative)	**Negative**	NA
Reversibility	High	NA
Irreplaceable loss of resources?	No irreplaceable loss	NA
Can impacts be mitigated?	**No**	

Mitigation:
No mitigation possible.

Nature: The cumulative impact of the lighting associated with other solar energy projects in the area.

Currently lighting in the area is comprised of occasional low level lights associated with isolated homesteads. The project is therefore seen in a relatively dark area during night time hours.

There is potential for security lighting and operational lighting associated with solar energy projects to transform the night time landscape in the area.

The extent of lighting associated with solar projects in the area is not known. The assessment found that;

» If full security floodlighting of facilities is required then, the proposed project could add slightly to impacts associated with this project;
» If full security floodlighting is not required and only low level lighting of operational areas (buildings), then the proposed extension will add negligible additional impact to the authorised project.

In the former case, the proposed project will add slightly to cumulative impacts.

In the latter case, the proposed extension will not add to cumulative impacts.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings **(2)**	Local **(1)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Minor **(2)**	Small **(0)**
Probability	Probable **(3)**	Very improbable **(1)**
Significance	**Low (24)**	**Low (5)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

1) Use of motion sensors to turn on security lights when needed.
2) Use of infrared security systems.
3) Preventing light spill through careful design.

Nature: The cumulative impact of the project on glint and glare associated with solar projects in the area.

The assessment indicates that the proposed project is unlikely to create glint and glare impacts. It is therefore also unlikely to contribute to glint and glare associated with solar projects in the area.

	Without mitigation	**With mitigation**
Extent	Local **(1)**	NA
Duration	Long term **(4)**	NA
Magnitude	Small **(0)**	NA
Probability	Very improbable **(1)**	NA
Significance	**Low (5)**	**NA**
Status (positive or negative)	Negligible	NA
Reversibility	High	NA
Irreplaceable loss of resources?	No	NA
Can impacts be mitigated?	NA	NA
Mitigation: Mitigation is not necessary as no impact is anticipated.		

Nature: Visual impacts associated with construction of the proposed project.
The site is unlikely to be visible to receptors. Impacts are likely to include dust from site operations once the site has been cleared, storage areas which may be as high as the heliostat development and delivery trucks using local roads.

It is also possible that waste-blow could be problematic.

Subject to timing, construction of the proposed project could add slightly to cumulative impacts including:

» Waste blow;
» Dust; and
» Construction traffic.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings, **(2)**	Local**, (1)**
Duration	Very short duration, **(1)**	Very short duration, **(1)**
Magnitude	Minor **(2)**	Small, **(0)**
Probability	Probable, **(3)**	Improbable, **(2)**
Significance	Low, **(15)**	Low, **(4)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	There will be no irreplaceable loss.	There will be no irreplaceable loss.
Can impacts be mitigated?	Yes	

Mitigation:

» Minimise clearance of vegetation;
» undertake dust prevention measures;
» Maintain stockpiles to less than 3 m high; and
» Manage waste effectively and prevent waste blowing around and off site.

7.7.1. Implications for Project Implementation

The cumulative assessment indicated that the proposed development of Ilanga CSP 7 will generally marginally increase cumulative visual impacts associated with currently authorised projects. This is due to the fact that it is located further from possible sensitive receptors than other already authorised development. As a result, there are

no fatal flaws or impacts that cannot be mitigated that should prevent the development from being approved.

7.8 Cumulative Heritage Impacts

Through Cultural Resource Management (CRM) studies for developments in the area, heritage sites are identified and protected from accidental damage. This can be regarded as a positive impact as it adds to the heritage database of the area.

In terms of the cumulative impact of the proposed Ilanga CSP 7 Facility and other developments in the area, the potential for impact on the heritage landscape is increased slightly. However, as no sites of heritage value have been identified within the development area, the project is not expected to have any impact with regards to heritage. The contribution to cumulative impacts is therefore expected to be negligible.

Nature of impact: Heritage impacts associated with the establishment of numerous CSP Facilities in the area on the archaeology of the area		
	Without mitigation	**With mitigation (preservation/excavation of sites)**
Extent	Local (2)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low to minor (3)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (22)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes unless sites can be preserved.
Can impacts be mitigated?	Yes	Through preservation or excavation of sites.
Mitigation: » Identified resources are being recorded and mitigated for projects such as these that would have otherwise remained unidentified. » In terms of the impact on the cultural landscape the impact is considered low, with the correct mitigation measures as well as the vast physical area in which these projects are constructed.		

7.8.1. Implications for Project Implementation

Cumulative impacts on heritage resources as a result of the proposed project are expected to be low as a result of the absence of sites of significance within the development footprint. The contribution of the project to cumulative impacts is therefore expected to be negligible. Impacts on heritage sites within the region as a result of a large number of solar facilities are expected to be of low significance with

the implementation of appropriate mitigation measures. As a result, there are no fatal flaws or impacts that cannot be mitigated that should prevent the development from being approved.

7.9 Cumulative Social Impacts

7.10 Cumulative Socio-Economic Impacts

Possible cumulative impacts as a result of other similar projects and associated infrastructure in the area could have cumulative negative and positive impacts for the local community. Cumulative impacts have been considered as part of the social impact assessment and identified where relevant. The cumulative impacts of the project are related to the construction and operation phases. The site for the proposed development is located within less than 10km from other renewable energy facilities. The impact of solar facilities on the landscape is considered to be a key issue in certain parts of South Africa where there is a growing number of solar energy facility applications. Portions of the Northern Cape, including the proposed development area, are earmarked as potential solar energy hubs (Northern Cape PSDF 2012). There are a number of projects proposed and authorised projects in the vicinity of the Karoshoek Solar Valley Site, within the ZF Mgcawu District.

The Karoshoek Solar Valley Development falls within the identified geographical area most suitable for the rollout of the development of solar energy projects within the Northern Cape Province as identified by the provincial SDF. This implies that projects of the same nature will be consolidated in one area creating a node, and ultimately aiming to reduce the potential for cumulative impacts associated with such developments when spatially fragmented. It is also important to note that it is unlikely that all proposed renewable energy facilities located in the region will be built due to capacity constraints on the Eskom grid and the limits placed on renewable energy targets. The cumulative impacts for the proposed Ilanga CSP 7 project facility have been assessed to be acceptable.

Nature: An increase in employment opportunities, skills development, SED and business opportunities with the establishment of more than one solar energy facility		
	Cumulative Contribution of Proposed Project	**Cumulative Impact without Proposed Project**
Extent	Local- Regional (3)	Local- regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (39)**	**Medium (33)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	

Irreplaceable loss of resources	N/A
Can impacts be enhanced	Yes
Confidence in findings	High

Enhancement

The establishment of a number of solar energy facilities in the area has the potential to have a positive cumulative impact on the area in the form of employment opportunities, skills development, business opportunities and SED/ED. The positive benefits will be enhanced if local employment policies are adopted and local services providers are utilised by the developers to maximise the project opportunities available to the local community.

Construction & Operational Phase		
Nature: Negative impacts and change to the local economy with an in-migration of labourers, businesses and jobseekers to the area.		
	Cumulative Contribution of Proposed Project	**Cumulative Impact without Proposed Project**
Extent	Local (3)	Local (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (39)**	**Medium (33)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	
Confidence in findings	Medium	

Mitigation

» Develop a recruitment policy/ process (to be implemented by contractors), which will source labour locally, where feasible.
» Working together with government agencies to ensure service provision is in line with the development needs of the local area.
» Forming joint ventures with community organisations, through Trusts, which can provide local communities with benefits, such as employment opportunities and services.

Operational Phase		
Nature: Visual impacts and change in the sense of place impacts associated with the establishment of more than one solar energy facility in the area		
	Cumulative Contribution of Proposed Project	**Cumulative Impact without Proposed Project**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Moderate (6)
Probability	Probable (3)	Probable (3)

Significance	**Medium (42)**	**Medium (36)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	No	
Mitigation » None anticipated from a social perspective		

The impact is assessed to be negative; local to regional in extent; long-term; moderate intensity and probable. The overall impact is likely to have a **medium negative significance** to the local area.

Nature: Social impacts associated with retrenchment including loss of jobs and source of income associated with decommissioning		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (2)
Duration	Short term (1)	Short Term (1)
Magnitude	Moderate (6)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (36)**	**Low (28)**
Status	Negative	Negative
Reversibility	No	
Irreplaceable loss of resources?	No	
Can impact be mitigated?	Yes	
Mitigation » Implementation of a retrenchment and downscaling programme » All structures and infrastructure associated with the proposed development should be dismantled, removed and transported off-site on decommissioning; & the landscape rehabilitated/ re-vegetated.		
Residual impacts Loss of jobs and associated loss of income, can impact on local economy and other businesses.		

7.10.1. Implications for Project Implementation

Cumulative impacts on the socio-economic environment as a result of the proposed project are expected to be both positive and negative. Impacts are expected to be of medium significance (both positive and negative) with the implementation of enhancement or mitigation measures. There are no fatal flaws or impacts that cannot be mitigated that should prevent the development from being approved.

7.11 Contribution of the Project to Climate Change Mitigation

South Africa is a country with an economy dependent on coal for the majority of its electricity, an energy-intensive industrial sector and an energy sector responsible for 82% of total GHG emissions, making it the 12th highest world emitter of GHG[25].

It has been reported internationally that the move towards renewable energy for electricity generation needs has resulted in decreased greenhouse gas emissions. The International Energy Agency announced in March 2015 that 2014 carbon dioxide emissions from the energy sector levelled off for the first time in 40 years, this has happened without being linked to an economic downturn. This was attributed to the increase in the use of renewable energy sources by China and OECD countries[26]. As GHG emissions associated with the provision of energy services are a major cause of climate change, this move to renewable energy and subsequent reduction in CO_2 emissions is considered as a positive contribution towards climate change mitigation.
The South African Government recognises the need to diversify the mix of energy generation technologies within the country and to reduce the country's reliance on fossil fuels which contribute towards climate change and are therefore not environmentally friendly. This is in accordance with the prescriptions of the United Nations Convention on Climate Change 1994 (UNFCCC) and its associated Kyoto protocol of 1997.

Consequently, the South African Government has recognised the need to move towards cleaner energy and has therefore set targets for cleaner energy technologies (including of 17GW renewable energy contribution to new power generation capacity) by 2030 (IRP, 2011). This is to be produced from wind, solar, biomass, gas and small-scale hydro facilities. Renewable energy plays a key role in mitigating global greenhouse gas emissions by radically lowering the emissions profile of the global energy system (International Renewable Energy Agency (IRENA), 2015). The proposed CSP facility will assist in reducing the country's CO_2 emissions associated with energy supply relative to fossil fuels (e.g. coal). Development of numerous such facilities will have a cumulative positive impact on CO_2 emissions as this will reduce reliance on power generation from fossil fuels. This will aid the country in meeting the commitments made under the COP 21 Agreement, to which the Government has committed to become a signatory.

This is considered to be a significant positive impact for the environment and society at an international level.

[25] Greenhouse Gas Inventory for South Africa: 2000-2010

[26] http://ecowatch.com/2015/03/23/renewables-mitigate-climate-change/

7.12 Conclusion regarding Cumulative Impacts

Cumulative impacts and benefits on various environmental and social receptors will occur to varying degrees with the development of several renewable energy facilities in South Africa. The most significant of these will be the contribution towards a reduction in greenhouse gas emissions and consequent assistance with climate change mitigation. The current study assesses the cumulative impacts associated with the Ilanga CSP 7 Facility together with similar facilities within the region.

The alignment of renewable energy developments with the IRP and the global drive to move away from the use of non-renewable energy resources and to reduce greenhouse gas emissions is undoubtedly positive. The social and economic benefits of renewable energy developments at a local, regional and national level have the potential to be significant. However, there is a lack of understanding of the cumulative impacts on other environmental and social receptors such as birds, visual amenity and landscape character of the affected areas largely due to limited information of impacts from existing facilities within the country. This assessment is therefore qualitative.

Table 7.2 provides a summary of the expected cumulative impacts associated with the proposed project on the identified site.

Table 7.2: Summary of cumulative impact significance for Ilanga CSP 9 Facility

Specialist assessment	Cumulative Impact Significance (Pre-Mitigation)	Cumulative Impact Significance (Post Mitigation)
Ecology	Moderate	Minor
Avifauna	Moderate	Minor
Bats	Moderate	Minor
Visual Impact	Minor	Minor
Agriculture and soils	Minor	Minor
Heritage Impact	Minor	Minor
Social Impacts	Moderate	Minor

Considering the findings of the specialist assessments undertaken for the project, the cumulative impacts for the proposed Ilanga CSP 7 Facility will be acceptable and the majority are rated as being of **low significance** with the implementation of appropriate mitigation. On this basis, the following can be concluded considering the Ilanga CSP 9 Facility:

Considering the findings of the specialist assessments undertaken for the project, the cumulative impacts for the proposed Ilanga CSP 7 Project will be acceptable and the majority are rated as being of **minor significance** with the implementation of appropriate mitigation. On this basis, the following can be concluded considering Ilanga CSP 7 Project:

- The construction of the project will not result in the unacceptable loss of threatened or protected plant species. The proposed development is acceptable from an ecological perspective.
- The construction of the project will not result in unacceptable loss of or impact to the soil and agricultural potential in the area.
- Low risk to avifauna through loss of habitat, infringement on breeding areas, or risk to collision-prone species is expected.
- Low risk to bats through loss of habitat, infringement on roosting areas, or risk to fatalities is expected.
- The construction of the project will not result in the complete or whole-scale change in sense of place and character of the area nor will the project result in unacceptable visual intrusion. Two preferred bidder projects will be constructed in the area, which will create an existing impact and alteration to the current sense of place.
- The construction of the project will not result in unacceptable loss of or impact to heritage resources.
- The project will not significantly increase the negative impact on the social environment. However, an increase in positive impacts, specifically as a result of job creation and socio-economic benefits, can be expected.
- The project will contribute towards a reduction in greenhouse gas emissions from energy generation and will aid the country in meeting the commitments made under the COP 21 Agreement, to which the Government has committed to become a signatory.

Based on a detailed evaluation, the cumulative impacts associated with the construction and operation of the proposed Ilanga CSP Facility and other proposed renewable energy facilities in the region (with specific reference to the preferred bidder projects – Ilanga CSP 1 and the Upington Airport PV Solar Energy Facilities) are considered to be acceptable. The low potential for cumulative impacts and risks makes the location of this project within the REDZ a desirable location for further consideration provided that environmental impacts are mitigated to suitable standards as recommended within this EIA Report.

CONCLUSIONS AND RECOMMENDATIONS CHAPTER 8

Emvelo Holdings (Pty) Ltd ("Emvelo"), an independent power developer of concentrating solar power (CSP) plants in South Africa, is proposing the development of a Concentrated Solar Power (CSP) Facility and associated infrastructure to form part of the Karoshoek Solar Valley Development located approximately 30 km east of Upington. The proposed site is located within the //Khara Hais Local Municipality and !Kheis Local Municipality, which fall within the jurisdiction of the greater ZF Mgcawu District Municipality in the Northern Cape Province (refer to Figure 1.1). The proposed project is to be known as the **Ilanga CSP 7** Project and is to make use of tower technology. The Ilanga CSP 7 Project is proposed to generate up to 150MW in capacity and will be constructed over an area of approximately 1519.19 ha in extent within the broader property.

The facility will have a development footprint of up to 1000 ha, to be placed within a broader project site of ~11 173 ha to form part of the larger Karoshoek Solar Valley Development and will include the following associated infrastructure:

» Central tower up to 270m with a molten salt receiver on top of the tower.
» Waste management infrastructure including evaporation dams and a wastewater treatment facility.
» Access roads[27] to the site and internal access roads.
» On-site substation and associated 132kV power line linking the facility to the Karoshoek Solar Valley substation or to the national electricity grid.
» Karoshoek Solar Valley substation and associated 132kV and 400kV power lines connecting to the National Grid.
» A water supply pipeline from the Orange River (including water treatment and storage reservoirs).
» Operational buildings, including offices and workshops.
» The solar collector field consisting of heliostats, all systems and infrastructure related to the control and operation of the heliostats.
» The power block/power island comprising of a conventional steam turbine generator with an ACC and associated feed water system.
» Molten Salt Circuit which includes the thermal storage tanks for storing low and high temperature liquid salt, a central solar thermal tower receiver, pipelines and molten salt to steam heat exchangers.
» Auxiliary facilities and infrastructure consisting of the switch yard, step up transformers, 132 kV power evacuation lines, access routes, water supplies and facility start up generators.

[27] Note that the associated linear infrastructure, i.e. access road to the site, power line infrastructure and water supply pipeline will be assessed through a separate Basic Assessment process.

The following infrastructure will be **shared infrastructure** for all the proposed projects within the Karoshoek Solar Valley Development. This infrastructure is to be assessed within a separate Basic Assessment process:

» On-site substation and associated 132kV power line linking the facility to the national electricity grid;
» Access roads (main and access roads within the property boundary); and
» A water pipeline from the Orange River (including abstraction point, water pre-treatment and storage reservoirs).

A summary of the details and dimensions of the planned infrastructure associated with the Ilanga CSP 9 Facility is provided in **Table 8.1**.

Table 8.1: Details of the proposed Ilanga CSP 7 Project

Province	**Northern Cape Province**
District Municipality	ZF Mgcawu (Siyanda) District Municipality
Local Municipality	//Khara Hais Local Municipality (KHLM) !Kheis Local Municipality (KLM)
Ward number(s)	1 & 14
Nearest town(s)	Upington
Farm name(s) and number(s)	Matjiesrivier 41, Trooilaps Pan 53
Portion number(s)	Portion 2 of the Farm Matjiesrivier 41 Portion 4 of the Farm Trooilaps Pan 53
SG 21 Digit Code (s)	C03600000000004100002
	C03600000000005300004
Current zoning	Agricultural
Site corner Co-ordinates	North-West: 28° 34'30.69"S 21° 29'40.62"E North-East: 24° 34'25.90"S 21° 31'28.63"E South-West: 28° 36'52.53"S 21° 29'41.16"E South-East: 28° 36'52.02"S 21° 31'57.63"E
Contracted capacity of facility	150MW
Heliostat field	6m pedestal which will occupy up to 800ha
Details of the Power Tower	Approx. 50m in diameter (~10ha) and ~270m high
Power island and steam turbine and generator	Will occupy ~6.5ha and they are ~40m in high
Molten salt storage tanks	2 tanks each 40m in diameter, 30 to 40m high
Footprint of the CSP facility	1000 ha
Full extent of the CSP Facility	1519.19 ha
Extent of broader site	11 173 ha
Internal access roads	6m wide, 18 km in length
Site access	The study site is accessible via the N10 between Upington to Groblershoop. Access to the site will be off the N10 located to the north of the site via an

	existing gravel road, which will be upgraded for the purposes of the project[28].
Services required	» Water will be sourced from the Orange River (Gariep River). » Refuse material disposal - all refuse material generated from the proposed development will be collected by a contractor and will be disposed of at a licensed waste disposal site off site. This service will be arranged with the municipality and suitable contractors when required. » Sanitation – all sewage waste will be collected by a contractor and will be disposed of at a licensed waste disposal site during the construction phase. This service will be arranged with the municipality when required during the operational phase as sewage will be temporarily stored in septic tanks. » Wastewater during operation – wastewater from the power generation process will be disposed of within appropriately lines evaporation ponds.

[28] The construction of this road is the subject of a separate Basic Assessment process

8.1 Legal Requirements as per the EIA Regulations for the undertaking of an Environmental Impact Assessment Report, 2014

This chapter of the EIA report includes the following information required in terms of Appendix 3: Content of Environmental Impact Assessment Reports:

Requirement	Relevant Section
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 as to how these findings and recommendations have been included in the final assessment report.	A summary of the findings of the specialist reports is included within Section 8.3. The recommendations made by the specialists are included in Chapter 6 and within the specialist reports contained in Appendix D - L. A summary of the recommendations for the Ilanga CSP 7 Facility is included in Section 8.8.
3(l) an environmental impact statement which contains (i) a summary of the key findings of the environmental impact assessment, (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.	An environmental impact statement (overall conclusion) is included in Section 8.7. A summary of the key findings of the environmental impact assessment is included in Sections 8.3.1 – 8.3.6. A map superimposing the proposed activities and its associated infrastructure on the environmental sensitivities of the preferred development area indicating the area that should be avoided, including buffers, is included in Section 8.5 and Figure 8.1. A summary of the costs (negative) and benefits (positive) and risks of the proposed Ilanga CSP 7 Facility is included in Section 8.6.
3(n) the final proposed alternatives which respond to the impact management measures, avoidance and mitigation measures identified through the assessment.	The final proposed alternatives for the Ilanga CSP 7 Facility which respond to the impact management measures, avoidance and mitigation are included as a mitigation strategy to ensure that impacts are minimised as far as possible. This is included in Section 8.2.
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.	Conditions to be included in the authorisation of the Ilanga CSP 7 Facility are included in Section 8.8.
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.	A reasoned opinion as to whether the Ilanga CSP 7 Facility should receive authorisation and the conditions that should form part of the authorisation is included in Section 8.8.

The EIA process for the proposed Ilanga CSP 7 Project has been undertaken in accordance with the EIA Regulations published in Government Notice GN38282 of December 2014, in terms of Section 24(5) of NEMA (Act No. 107 of 1998), and includes an assessment of the activities associated with the construction and operation of the Ilanga CSP 9 Facility.

The EIA Phase aimed to achieve the following:

» Provide an overall assessment of the social and biophysical environments affected by the proposed development footprint as part of the project;
» Assess potentially significant impacts (direct, indirect and cumulative, where required) associated with the proposed CSP facility;
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts; and
» Undertake a fully inclusive public involvement process to ensure that I&APs are afforded the opportunity to participate, and that their issues and concerns are recorded.

8.2 Alternatives Considered for the Ilanga CSP 9 Facility

In accordance with the requirements outlined in Appendix 3 of the EIA Regulations 2014, the consideration of alternatives including site, activity, technology and site access alternatives, as well as the "do-nothing" alternative should be undertaken. If no alternative development locations for the activity were investigated, the motivation for not considering such must be included. The follow sections address this requirement.

8.2.1 Site Alternatives

The consideration of the suitability of the site for the proposed project is in line with a typical mitigation hierarchy:

4. First Mitigation: avoidance of adverse impacts as far as possible by use of preventative measures (in this instance a sensitivity analysis assisted in the avoidance of identified ecological- and avifauna sensitive areas).
5. Second Mitigation: minimisation or reduction of adverse impacts to 'as low as practicable' (in this instance minimisation of impact on identified ecological and avifauna sensitive areas through implementing mitigation).
6. Third Mitigation: remedy or compensation for adverse residual impacts, which are unavoidable and cannot be reduced further.

In determining the preferred site for the proposed facilities within the Karoshoek Solar Valley Development, a 'funnel-down approach' was used and commenced with the consideration of the larger ~11 173 ha site.

The siting of the Ilanga CSP 9 within the broader Karoshoek Solar Valley Development considered various critical technical criteria (as discussed in Section 2.2.1), as well as the sensitivity of the broader site in order to inform the positioning of the facility, and provincial and local planning in terms of renewable energy development. The site location is constrained by other authorised and proposed facilities within the Karoshoek Solar Valley Development, as well as environmentally sensitive areas (such as drainage lines, dunes and outcrops). The area within which the facility is planned does not infringe on any identified areas of high sensitivity defined in the scoping assessment. In addition, the broader site is located within the identified Solar Development Corridor as defined by the PSDF, as well as within a proposed REDZ (Zone 7) for solar development. The siting of the Ilanga CSP 7 Facility is considered to be acceptable from an environmental perspective.

8.2.2 Layout and Design Alternatives

A broader study area of approximately 11 173 ha is being considered, within which the development footprint for the project of approximately 1519 ha in extent would be appropriately located. The site can adequately accommodate the proposed CSP Project with a contracted capacity of 150 MW CSP Project. It is anticipated that the project and its associated infrastructure (i.e. on-site substation and internal roads, etc.) can be appropriately positioned to avoid areas of environmental sensitivity. The environmental sensitivities (visual, ecological, avifaunal and heritage sensitivities) identified during the scoping phase have informed the layout of the proposed facility (refer to **Figure 8.1**). All identified sensitivities and their associated buffers were excluded from the proposed development footprint. Therefore no layout alternatives were considered.

8.2.3 Technology Options

CSP technology was determined as the preferred technology for the proposed development site (i.e. over wind and photovoltaic (PV) technologies) based on the available resource and potential for power generation. Tower technology has been identified as the preferred technology as this technology has the potential to be much more efficient than trough technology, because they have far higher concentration ratios. Troughs produce heat at around 400 degree Celsius, whereas towers have the potential to produce up to 550 degree Celsius, allowing more efficient use of turbines at higher temperatures. CSP has a huge potential for localisation in comparison to wind and PV. Therefore no technology alternatives will be considered. CSP is preferred over PV technology as it will provide power for longer periods (as a result of storage), and has the potential to provide baseload supply should this be required.

8.2.4 Water source alternatives

CSP technologies function through the generation of steam to drive a conventional steam turbine and generator. Therefore, suitable and sufficient water resources will be required over the life of the facility. During its operation the Ilanga CSP 7 Facility will require approximately 240 000m^3/annum of water during the 30 to 36 month construction phase and 300 000 to 400 000m^3/annum during the operational phase of the project.

The following alternative water sources were considered:

» Piping water from the //Khara Hais Local Municipality or the !Kheis Local Municipality;
» Abstraction from groundwater resources; or
» Abstraction from the Orange River.

Following investigation of these water sources by the applicant, the following conclusions have been made:

» There are no municipal water pipelines within close proximity to the site. It would therefore be required that lengthy pipelines be constructed in order to provide water to the site. This alternative is not considered technically and economically feasible.

» As the area is arid in nature, groundwater supply is limited. Abstraction of this resource would most likely impact on the supply available to local users in the area as a result of the limited yield. This alternative is not considered to be feasible from a technical and environmental (social) perspective.

» The Department of Water and Sanitation (DWS) has been requested to provide an indication that water could be available from the Orange River for the project. This confirmation was still outstanding at the time of compiling this report. Based on previous correspondence with DWS, it is understood that power generation is considered to be a strategic priority and that water would therefore be made available for this purpose. Therefore the abstraction of water from the Orange River is considered a feasible alternative. A water supply pipeline is required to be constructed from the abstraction point to the facility, a distance of 21km. This infrastructure is assessed within a separate Basic Assessment process.

» The abstraction of water from the Orange River is therefore considered as the only feasible alternative.

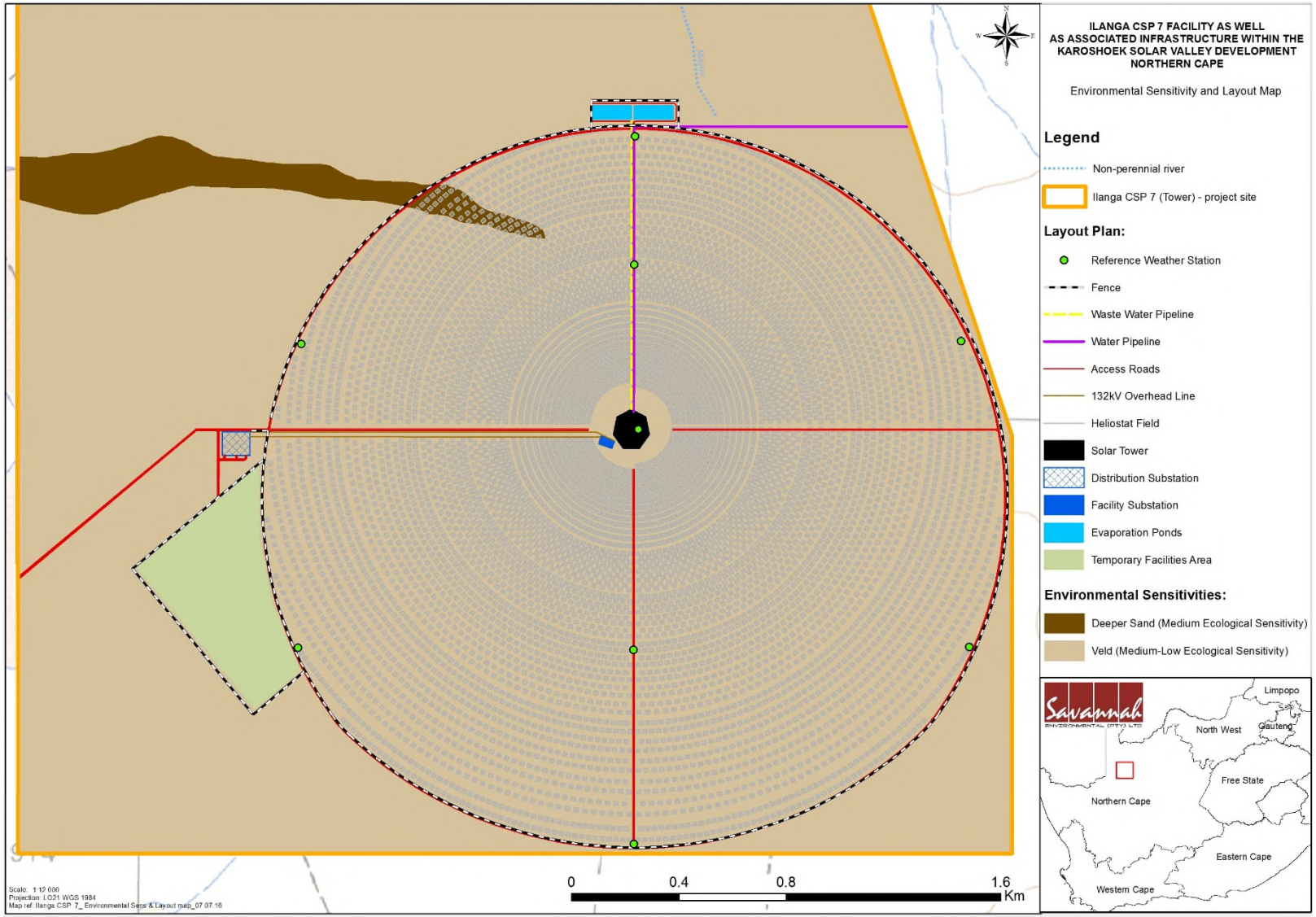

Figure 8.1: Combined Layout and Environmental Sensitivity Map for the Ilanga CSP 7 Facility illustrating areas of medium to low sensitivity within the proposed layouts to be approved by DEA (A3 map included in **Appendix P**).

8.3 Evaluation of the Proposed Project

The preceding chapters of this report together with the specialist studies contained within **Appendices D – L** provide a detailed assessment of the environmental impacts that may result from the proposed project. This chapter concludes the EIA Report by providing a summary of the conclusions of the assessment of the proposed development area for the Ilanga CSP 9 Facility and the associated infrastructure. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental team during the course of the EIA and presents an informed opinion of the environmental impacts associated with the proposed project.

The assessment of potential environmental impacts presented in this report is based on a preliminary layout of the troughs and associated infrastructure provided by Emvelo Holdings (Pty) Ltd. A broader project site of approximately 11 173 ha is being considered, within which the development footprint for the proposed Ilanga CSP 7 Project of approximately 1000 ha in extent would be appropriately located. It is anticipated that the project and its associated infrastructure (i.e. on-site substation and internal roads, etc.) can be appropriately positioned to avoid areas of environmental sensitivity. The environmental sensitivities (ecological and avifauna sensitivities) identified during the EIA phase have informed the layout of the proposed facility (refer to **Figure 8.1**).

No environmental fatal flaws were identified to be associated with the proposed facility. However the following potentially significant environmental impacts have been identified through the EIA Phase.

» Local site specific impacts resulting from the physical modification/disturbance of the site primarily during the construction phase.
» Impact on soil and agricultural potential.
» Impacts on avifauna.
» Impact on Bats.
» Impacts on water resources.
» Visual impacts.
» Impacts on the social environment.
» Cumulative impacts.

8.3.1 Local site-specific impacts

The Ilanga CSP Tower 7 site consists of open *Stipagrostis* grassland on flat open plains considered to be largely of low to moderate sensitivity. Within this habitat type there are few listed or protected plant species present and the significance of impacts on vegetation within these areas would be low. The density of protected species, largely *Boscia albitrunca* is fairly high and a relatively large number

would be affected by the development. Due to the homogenous nature of the habitat for fauna, faunal diversity is likely to be low and faunal species of concern are not likely to be abundant at the site. There are no features at the site considered to be very high sensitivity or present a no go area.

Due to the large amount of development proposed in the area, the development of the site will contribute to cumulative impact. However, the affected Bushmanland Arid Grassland vegetation type is extensive and the extent of habitat loss (ca. 1500ha) resulting from the development would not significantly impact the remaining extent of this vegetation type at the national level, although some local impact on this vegetation type is likely given the large extent of development within this vegetation unit within the broader Karoshoek solar development area. Consequently the impact of the development on the future conservation potential of the area is considered moderate at a local level and low at the national level.

There are no highly sensitive features within the development footprint and the abundance of *Boscia albitrunca* is identified as the only significant feature of the site. As the development of the site would certainly lead to the loss of several hundred individuals of this species, an offset for the loss within the current as well as the other Karoshoek developments should be investigated. However, this should take place in an integrated manner for all the Karoshoek developments and not on a piecemeal basis for each development and should consider the broader connectivity and landscape level processes in the area. Although the development would result in the loss of fairly large numbers of *Boscia*, this is not a rare or threatened tree species and the development would not compromise the local populations of this species which remains widespread in the area.

Overall, and with the suggested mitigation measures implemented, the impacts of the development are likely to be of moderate to low significance and no impacts of high significance are likely. As a result, there are no ecological fatal flaws or impacts that cannot be mitigated that should prevent the development from being approved.

8.3.2 Impacts on Avifauna

Potential impacts on avifauna as a result of the proposed project include displacement of nationally important species from their habitats by the presence of the heliostat mirrors, loss of habitats for such species due to direct habitat destruction, disturbance during construction of the array and feather singeing, or direct mortality, if aerial birds fly through the solar flux.

From the monitoring undertaken on the site, the impact zone of the CSP Tower 7 site lies on the interface of Nama Karoo and Kalahari Savanna. Bird atlas data, combined with our own, indicates that the Karoshoek Solar Valley area supports

up to 114 bird species, including 14 species ranked in the top 100 collision-prone species. Six of these species are also red-listed: Black Harrier *Circus maurus*, Lanner Falcon *Falco biarmicus,* Kori Bustard *Ardeotis kori,* Ludwig's Bustard *Neotis ludwigi*, Verreaux's Eagle *Aquila verreauxi* and Secretarybird *Saggitarius serpentarius.* Harriers, eagles and bustards are highly collision-prone species, and the raptors are highly aerial birds, and may be impacted the CSP solar flux. Similarly, the proximity to the Orange River may attract wetland species seeking other wetland areas, and cause mortality as birds attempt to land on the heliostats. In addition, resident birds will lose habitat totaling ~950 ha in the increased area.

Since the degree and significance of bird impacts will be related to the abundance and movements of key species, we calculated bird densities in the expanded site footprint and the passage rate of the collision-prone birds through the site. In total we recorded 30 species on the CSP Tower 7 site. Our 1 km surveys revealed a similar species richness of smaller birds in both the wet season and dry season (15.3 v 13.2 species km^{-1}). The **Passage rate** of larger collision-prone birds was medium-low at 0.42 birds per hour of observation, and it was higher the wet season than the dry season. Two red-data bustards were recorded on site and two high-sensitivity areas were apparent on the CSP Tower 7 area. No wetland birds were seen. Sandgrouse regularly traversed the site (2.7 birds h^{-1}) in both seasons and those commuting at high levels are at risk from the solar flux. Some large Sociable Weaver nests were present on site, and displaced birds may attempt to build on the heliostat mirror infrastructure. This represents a high impact site, and medium-high with appropriate mitigation.

With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of avifaunal impacts of the Ilanga CSP 7 Facility are of moderate to low. The Ilanga CSP 7 Project can be developed and impacts on avifauna managed by taking the following into consideration:

» The CSP tower site avoid the two high sensitivity areas identified.
» Bird scaring techniques are used on the mirrors and the tower, including rotating prisms, avian distress calls and experimental use of Torri lines (ribbons used on trawlers to deter albatrosses from taking baited hooks and drowning), if birds are found to impact the CSP infrastructure.
» Systematic monitoring during construction and post-construction of the CSP facility is recommended by trained ornithologists given the high probability of avian impacts at the CSP Tower 7 facility on collision-prone birds.

8.3.3 Impacts on Bats

Potential impacts on bats as a result of the proposed CSP Tower 1 Facility could include:

» Reductions in the extent of bat foraging and roosting habitat; and
» Mortality as a result of the interaction with the proposed infrastructure.

Impacts are expected to be limited as a result of the limited potential of the vegetation on the site to provide foraging and roosting habitat as well as a result of the proposed design of the facility.

As impacts of solar thermal facilities on bats is poorly understood, it is considered important to document any impacts which may be identified during operation. It is recommended that any bat carcasses recorded are also documented during operational bird monitoring and the cause of such mortality investigated by an appropriate specialist. As is proposed for the facility design, buildings housing steam condensers should be closed up thoroughly and have no overhanging roofs or overlapping sheets with holes of 1.5cm or more in diameter.

8.3.4 Impact of Soil and Agricultural Potential

The overall impacts of the proposed facility on agriculture and soil conditions will be low, principally because of the climatic conditions and the low agricultural and grazing potential of the site. The project site is currently used for livestock farming. However, the grazing capacity is very low (approximately 40-50 ha/large stock unit), which is due to the dominant climatic conditions and prevailing soil conditions. Rainfall is erratic, both locally and seasonally and therefore cannot be relied on for agricultural practices. Very low rainfall, along with other soil-related factors lead to low vegetative cover throughout the area. The area consist of shallow soil with rock outcrops and sandy soils and the whole site can be better utilised for development (such as power generation) in comparison to any other practise. This project site is not regarded as a viable commercial farming site and would be suited to house the facility.

There is the potential for the loss of soil resources through erosion, particularly during the construction phase. This impact can be effectively minimised through the implementation of appropriate management and mitigation measures including implementation of an appropriate stormwater management plan and regular monitoring of the occurrence, spread and potential cumulative effects of erosion. Impacts post-mitigation are expected to be of low significance.

8.3.5 Impacts on water resources

Impacts on water resources associated with the proposed facility relate largely to the abstraction of water from the Orange River System, as well as potential impacts on the water quality of the river due to sedimentation and/or contamination. Abstraction of water may result in modification of instream

habitats which may in turn result in changes to the aquatic fauna and flora communities which includes species and ecosystems of conservation importance. The significance of potential impacts were rated as medium prior to implementation of mitigation measures. Potential mitigation measures include the careful management and re-use of process water thereby reducing the requirement for abstraction. A culture of water preservation should be developed and encouraged in the CSP facility. Implementation of the recommended mitigation measures will reduce the significance of the impact to low post-mitigation.

8.3.6 Visual impacts

The following potential visual receptors that have been identified include:

» A small number of homesteads that occur within the approximate limit of visibility of the heliostat field;
» A large number of homesteads and urban areas that could be affected by the power tower;
» Local road to the west (Kleinbegin and Kenhardt Roads) that could be affected by the heliostat field and the power tower;
» The N10 and N14 National roads to the north that could be affected by the power tower; and
» The FM Safaris ecotourism operation on the northern side of the Orange River.

The proposed project will have greatest impact on the Karoshoek Valley which is under development for similar projects. Outside the Karoshoek Valley where the majority of sensitive receivers are located impacts are likely to be low.

Within the Karoshoek Valley, the most critical sensitive receivers are likely to be residents of local homesteads. A small number of people are likely to be affected. Views over the development are unlikely to be possible due to the relative elevation of receivers. This means that the main impact will be a view of the tower set within a relatively natural landscape. Because of the relative elevation of receivers and the VAC of the surrounding landscape nuisance impacts such as glint and glare are unlikely and should be easily mitigated.

Given the changing character of the setting in which the development is proposed, the distances from the majority of sensitive receptors and the way in which surrounding landform helps to mitigate broader impacts, there is no reason on landscape and visual impact grounds why the proposed project should not be authorised.

8.3.7 Impacts on the social environment

The proposed development site is located within a rural setting and is removed from settlements and homesteads. Impacts on the social environment are expected during both the construction phase and the operation phase of the CSP facility. Impacts are expected at both a local and regional scale. Impacts on the social environment as a result of the construction of the CSP facility can be mitigated to impacts of low significance or can be enhanced to be of positive significance to the region.

Positive impacts associated with the project are largely due to job creation opportunities, business opportunities for local companies, skills development, and training. The proposed project could assist in alleviating poverty amongst some individuals in the study area through the provision of permanent employment opportunities. Should all proposed facilities within the Karoshoek Solar Valley Site be developed, the cumulative positive impacts would be of great value to the communities in the area.

The development of a renewable energy facility of this nature will have a positive impact at a national and international level through the generation of "green energy" which would lessen South Africa's dependency on coal generated energy and the impact of such energy sources on the bio-physical environment. The proposed project would fit in with the government's aim to implement renewable energy projects as part of the country's energy generation mix over the next 20 years as detailed in the Integrated Resource Plan (IRP).

Potential negative impacts which require mitigation relate to an influx of workers and jobseekers to an area (whether locals are employed or outsiders are employed) and an associated perceived risk of an increase in crime in the area, and traffic and intrusion influences during construction. As a limited number of workers are proposed to be housed on site, certain impacts could arise as a result of worker conduct at this site. Stringent mitigation is required to be implemented to reduce these impacts to acceptable levels.

Impacts on farming activities may occur as a result of the proposed development. However, due to the limited agricultural potential of the proposed development site, and the low rainfall in the area, the impact on agricultural potential as a result of the loss of land associated with the development is not expected to be significant. In fact, the proposed development may present opportunities for additional agriculture on the site and surrounds in that the water supply infrastructure could be utilised to transport water to irrigate crops within these areas. This would be a positive impact.

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8.3.8 Impacts on the social environment

The proposed development area is located within a rural setting and is removed from settlements and homesteads. Impacts on the social environment are expected during both the construction phase and the operation phase of the CSP facility. Impacts are expected at both a local and regional scale. Impacts on the social environment as a result of the construction of the CSP facility can be mitigated to impacts of low significance or can be enhanced to be of positive significance to the region. The assessment of the key issues indicated that there are no negative impacts that can be classified as fatal flaws and which are of such significance that they cannot be successfully mitigated.

Positive impacts associated with the project are largely due to job creation opportunities, business opportunities for local companies, skills development, and training. The proposed project could assist in alleviating poverty amongst some individuals in the study area through the provision of permanent employment opportunities. Should all proposed facilities within the Karoshoek Solar Valley Site be developed, the cumulative positive impacts would be of great value to the communities in the area. The proposed project could assist the local economy in creating entrepreneurial development, especially if local business could be involved in the provision of general material and services during the construction and operational phases. Capacity building and skills training among employees are critical and would be highly beneficial to those involved, especially if they receive portable skills to enable them to also find work elsewhere and in other sectors.

The proposed development also represents an investment in infrastructure for the generation of clean, renewable energy, which, given the increased awareness of climate change, represents a positive social benefit for society as a whole.

8.3.9 Assessment of Potential Cumulative Impacts

Based on the information available at the time of undertaking the EIA, there are at least 14 other facilities, 2 of which are preferred bidder projects within a 30 km radius of the site all at various stages of approval. However, not all the CSP facilities presently under consideration by various developers will be constructed due to various reasons, as detailed in Chapter 7.

The cumulative impacts that have the potential to be compounded through the development of the CSP facility and its associated infrastructure in proximity to other similar developments include impacts such as those listed below. The role of the cumulative assessment is to test if such impacts are relevant to the Ilanga CSP 7 Project in the proposed location when considered together with other

similar developments. The following can be concluded considering the Ilanga CSP 7 Project:

- The construction of the project will not result in the unacceptable loss of threatened or protected plant species. The proposed development is acceptable from an ecological perspective.
- The construction of the project will not result in unacceptable loss of or impact to the soil and agricultural potential in the area.
- Low risk to avifauna through loss of habitat, infringement on breeding areas, or risk to collision-prone species is expected.
- Low risk to bats through loss of habitat, infringement on roosting areas, or risk to fatalities is expected.
- The construction of the project will not result in the complete or whole-scale change in sense of place and character of the area nor will the project result in unacceptable visual intrusion. Two preferred bidder projects will be constructed in the area, which will create an existing impact and alteration to the current sense of place.
- The construction of the project will not result in unacceptable loss of or impact to heritage resources.
- The project will not significantly increase the negative impact on the social environment. However, an increase in positive impacts, specifically as a result of job creation and socio-economic benefits, can be expected.
- The project will contribute towards a reduction in greenhouse gas emissions from energy generation and will aid the country in meeting the commitments made under the COP 21 Agreement, to which the Government has committed to become a signatory.

Based on a detailed evaluation, the cumulative impacts associated with the construction and operation of the proposed Ilanga CSP Facility and other proposed renewable energy facilities in the region (with specific reference to the preferred bidder projects – Ilanga CSP 1 and the Upington Airport PV Solar Energy Facilities) are considered to be acceptable. The low potential for cumulative impacts and risks makes the location of this project within the REDZ a desirable location for further consideration provided that environmental impacts are mitigated to suitable standards as recommended within this EIA Report. Cumulative impacts discussed above have been considered within **Chapter 7** and the detailed specialist studies (refer to **Appendices D - L**).

8.4 Environmental Sensitivity Mapping

From the specialist investigations undertaken for the proposed CSP Facility, a number of sensitive areas were identified (refer to **Figure 8.1** and the A3 map in **Appendix N**). The following sensitive areas/environmental features have been identified on the site:

» **Ecology:** The majority of the site consists of open plains considered to be medium-low sensitivity on account of the low abundance of species and habitats of concern within these areas. The main issue of concern within these areas is the abundance of *Boscia albitrunca* which has a moderately high density across the site. This species aside, the site is otherwise considered favourable for development as there are few other species or features of concern present. There is a limited area that receives some occasional runoff along the western margin of the site, but it has not developed into a drainage line and is considered only marginally more sensitive than the surrounding plains. The sensitivity of the site is very homogenous and overall it contains no significant features of higher sensitivity and there are no areas within the site that are considered no go or of very high sensitivity. Although there is a NFEPA river mapped through the site, the site visit confirms that this feature is not present on the ground and is not discernible on satellite imagery either.

» **Avifauna:** A total of 114 bird species were recorded on the 17 bird atlas cards from the Ilanga solar development and similar areas to the west (following the proposed Ilanga power line) submitted to the Animal Demography Unit from 2007 to 2014 (Appendix 1 of the Specialist Report). Of these, 8 were collision-prone as ranked by BARESG (2014), and only 2 were red-listed (Kori Bustard Ardeotis kori and Lanner Falcon Falco biarmicus).

» However, four additional red data species we noted in the two site visits: a Black Harrier Circus maurus, breeding Verreaux's Eagles Aquila verreauxii, a Secretarybird Sagittarius serpentarius, and numerous Ludwig's Bustards Neotis ludwigi. Thus, 6 red-data species occur in the development area. A further 8 collision-prone species were recorded, giving 14 collision prone/red data species in total for the greater Karoshoek Solar Valley development area. A total of 72 species were recorded which will be added to the SABAP2 data base. In summary, a total of 14 collision-prone species occur in the greater Karoshoek solar development areas, of which six are red-listed.

Since the degree and significance of bird impacts will be related to the abundance and movements of key species, we calculated bird densities in the expanded site footprint and the passage rate of the collision-prone birds through the site. In total we recorded 30 species on the CSP Tower 7 site. Our 1 km surveys revealed a similar species richness of smaller birds in both the wet season and dry season (15.3 v 13.2 species km^{-1}). The **Passage rate** of larger collision-prone birds was medium-low at 0.42 birds

per hour of observation, and it was higher the wet season than the dry season. Two red-data bustards were recorded on site and two high-sensitivity areas were apparent on the CSP Tower 7 area. No wetland birds were seen. Sandgrouse regularly traversed the site (2.7 birds h^{-1}) in both seasons and those commuting at high levels are at risk from the solar flux. Some large Sociable Weaver nests were present on site, and displaced birds may attempt to build on the heliostat mirror infrastructure. This represents a high impact site, and medium-Low with appropriate mitigation.

Not much research in South Africa is presently available to determine the impact of CSP trough and tower technology on the South African avian community, so a minimum of 12 months' post-construction monitoring at this site by trained ornithologists is strongly recommended. The specialist also recommend that all available precautions are taken to avoid threatened species and wetland birds being attracted to the troughs. If species are attracted and collide with the CSP troughs by mistaking them for open water then it is recommend that innovative bird deterrent techniques are used, such as the Torri lines mentioned above and in the avian Scoping Report (Simmons and Martins 2015).

If these recommendations can be followed and prove effective, it is believed that the Ilanga CSP 7 Facility can be allowed to proceed with minimal impact to the avifauna of the area.

Environmental (natural environment, economic and social) costs can be expected to arise from the project proceeding. This could include:

» Direct loss of biodiversity, flora and fauna due to the clearing of land for the construction and utilisation of land for the Ilanga Tower 1 Facility (which is limited to the development footprint of 703ha). The cost of loss of biodiversity is expected to be limited as a result of the wide distribution of the affected vegetation type and the limited presence of species of conservation concern within the development area.
» Visual impacts associated with the CSP Facility. The cost of loss of visual quality to the area is expected to be low as a result of the location of the facility in relation to sensitive visual receptors, as well as the nature of the topography of the area.
» Change in land-use and loss of land available for agriculture on the development footprint. The cost in this regard is expected to be limited due to the limited footprint of the facility (less than 15% of the broader site), the low agricultural potential of the property and the fact that current agricultural activities can continue on the remainder of the property during construction and operation.

These costs are expected to occur at a local and site level and are considered acceptable provided the mitigation measures as outlined in the EMPr are adhered to. No environmental fatal flaws associated with the proposed project have been identified.

The positive implications of establishing the Ilanga CSP 7 Facility on the demarcated site include:

» The project will result in important socio-economic benefits at the local and regional scale through job creation, procurement of materials and provision of services and other associated downstream economic development (as detailed in Chapter 2 of this report). These will persist during the preconstruction, construction and operational phases of the project.
» The project is considered to be a suitable land use for the proposed site due to the low potential for commercial agriculture. Development of the facility will require the implementation of appropriate management actions which could have positive impacts on the surrounding areas specifically in terms of alien vegetation and erosion management.
» The project contributes towards the Provincial and Local goals for the development of renewable energy as outlined in the respective SDFs and IDPs.
» The project is located within an area demarcated for solar development at a Provincial and Local scale, and is located within an area where a number of CSP facilities are already authorised (facilitating consolidation of similar infrastructure). The location is therefore considered desirable
» The project serves to diversify the economy and electricity generation mix of South Africa by addition of solar energy to the mix. As a result of the on-site storage associated with the project, it has the potential to provide extended periods of power (for 18 hours a day) to the grid. This will assist in stabilising the power supply during the periods of the day when this is required most.

The benefits of the project are expected to occur at a national, regional and local level. As the costs to the environment at a site specific level have been largely limited through the appropriate placement of infrastructure on the site within lower sensitivity areas, the expected benefits of the project are expected to partially offset the localised environmental costs of the project.

9.6. Overall Conclusion (Impact Statement)

Global climate change is widely recognised as being one of the greatest environmental challenges facing the world today. How a country sources its energy plays a big part in tackling climate change. As a net off-setter of carbon, renewable energy technologies can assist in reducing carbon emissions, and can play a big part in ensuring security of energy supply, as other sources of energy are depleted or become less accessible. South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result, South Africa is one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer of carbon emissions. With the

aim of reducing South Africa's dependency on coal generated energy, and to address climate change concerns, the South African Government has set a target, through the Integrated Resource Plan (IRP) for electricity to develop 17.8 GW of renewables (including 8.4GW solar) within the period 2010 – 2030.

The need for the project at a national scale has therefore been determined. The location of the proposed project is further supported by national and provincial planning initiatives in that it is located within a zone identified for such development (i.e. within REDZ 7 as defined by the national government and within the Solar Corridor as defined by the Provincial SDF).

Environmental (natural environment, economic and social) costs can be expected to arise from the project proceeding. This could include:

» Direct loss of biodiversity, flora and fauna due to the clearing of land for the construction and utilisation of land for the Ilanga CSP 7 Facility (which is limited to the development footprint of 1000 ha). The cost of loss of biodiversity is expected to be limited as a result of the wide distribution of the affected vegetation.
» Visual impacts associated with the CSP Facility. The cost of loss of visual quality to the area is expected to be low as a result of the location of the facility in relation to sensitive visual receptors, as well as the nature of the topography of the area.
» Change in land-use and loss of land available for agriculture on the development footprint. The cost in this regard is expected to be limited due to the limited footprint of the facility (less than 15% of the broader site), the low agricultural potential of the property and the fact that current agricultural activities can continue on the remainder of the property during construction and operation.

These costs are expected to occur at a local and site level and are considered acceptable provided the mitigation measures as outlined in the EMPr are adhered to. No fatal flaws associated with the proposed project have been identified.

» The potential to harness and utilise solar energy resources within the Northern Cape Province.
» The project will assist the South African government in reaching their set targets for renewable energy and consequent reduction in greenhouse gas emissions from energy generation.
» The project will assist the South African government in the implementation of its green growth strategy and job creation targets.
» The project will assist the district and local municipalities in reducing level of unemployment through the creation of jobs and supporting local business.
» The National electricity grid in the Northern Cape Province will benefit from the additional generated power.
» Promotion of clean, renewable energy in South Africa.

» Creation of local employment, business opportunities and skills development for the area.

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated from the proposed project conclude that:

» There are **no environmental fatal flaws** that should prevent the proposed CSP Plant and associated infrastructure from proceeding on the identified site, provided that the recommended mitigation and management measures are implemented, and given due consideration during the process of finalising the facility layout.
» The proposed development on the site will create a localised reduction of indigenous trees and shrubs, geophytes and other species of conservation concern, but not to a degree that the current conservation status of such species will be negatively affected.
» From an **ecological** perspective, there are no features at the site considered to be very high sensitivity or present a no go area and the abundance of species of concern within the development area is also low. While there are some protected species present, there are no species of high conservation concern present and no significant impacts can be expected on the local populations of the protected species present. Overall and with the implementation of the recommended mitigation measures, the impacts of the development are likely to be of moderate to low significance and no impacts of high significance are likely. As a result, there are no ecological fatal flaws or impacts that cannot be mitigated that should prevent the development from being approved.
» From a **soil** and **agricultural** perspective, the overall impacts of the proposed facility on agriculture and soil conditions will be low, principally because of the climatic conditions and the low agricultural and grazing potential of the site. There have never been any substantial farming practices (agriculture or grazing) on the property because of the dominant climatic conditions and prevailing soil conditions. Very low rainfall, along with other soil-related factors lead to low vegetative cover throughout the area. The soil and rock type properties tend to be very homogenous in the area and the whole site can be better utilised for development (such as that for power generation) in comparison to any other practise. This project site is not regarded as a viable commercial farming site and would be suited to house the facilities. There is the potential for the loss of soil resources through erosion, particularly during the construction phase. This impact can be effectively minimised through the implementation of appropriate mitigation measures including implementation of an appropriate stormwater management plan and regular monitoring of the occurrence, spread and potential cumulative effects of erosion. Impacts post-mitigation are expected to be of low significance.
» The **avifauna** of the area may be affected by the infrastructure of the CSP plant. However, the significance will be high to low since few collision-prone species are expected to occur on the site. The interaction of Sandgrouse (recorded in

abundance on the site) with the proposed facility is unknown. However, a well-structured and systematic construction and post-construction assessment, as laid out in the Environmental Management Programme in conjunction with Management interventions will determine this and can provide appropriate mitigations.

» From a **bat** perspective, Potential impacts on bats as a result of the proposed Ilanga CSP 7 Facility. Impacts are expected to be limited as a result of the limited potential of the vegetation on the site to provide foraging and roosting habitat as well as a result of the proposed design of the facility. As impacts of solar thermal facilities on bats is poorly understood, it is considered important to document any impacts which may be identified during operation. It is recommended that any bat carcasses recorded are also documented during operational bird monitoring and the cause of such mortality investigated by an appropriate specialist. As is proposed for the facility design, buildings housing steam condensers should be closed up thoroughly and have no overhanging roofs or overlapping sheets with holes of 1.5cm or more in diameter.

» From a **heritage** perspective, widely dispersed individual scatters of stone tools are known to occur in the larger study area. Artefact density at these scatters are so low that they do not represent individual sites but rather background scatter or find spots. However several Stone Age sites occur in the larger area. The sites consist of a LSA artefact scatter around depressions that contain seasonal water and stream bed margins that was utilised in the past. The impacts to heritage resources by the proposed development are not considered to be highly significant and the impact on archaeological sites is acceptable.

» From a **visual** perspective, the proposed extension to the authorised project will not result in visual impacts that were not considered in the original application for authorisation. Due to the nature of the site and the surrounding area, impacts of the proposed extension of the project will marginally increase visual impacts associated with the authorised project.

» The development will have both positive and negative **social** impacts. It will create employment and business opportunities for locals during both the construction and operational phases and represent an investment in clean, renewable energy infrastructure. The potential for cumulative impacts also exists due to the proximity of the other authorised and proposed CSP within the Karoshoek Valley, one of which is already under development (i.e. Ilanga CSP facility on Site 1.2)., however, these impacts are not considered to represent a fatal flaw, and in addition, there is no indication if (or when) other developments will take place.

The significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures. With reference to the information available at this planning approval stage in the project cycle, the **confidence** in the environmental assessment undertaken is regarded as **acceptable**.

8.5 Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the impacts associated with the development of the Ilanga CSP 7 Facility can be managed and mitigated to an acceptable level. In terms of this conclusion, the EIA project team support the decision for environmental authorisation. The layout plan as presented is considered acceptable.

The following conditions would be required to be included within an authorisation issued for the project:

» Following the final design of the facility, a revised layout must be submitted to DEA for review and approval prior to commencing with construction.
» An independent Environmental Control Officer (ECO) should be appointed to monitor compliance with the specifications of the EMPr for the duration of the construction period.
» Areas disturbed during construction should be rehabilitated as quickly as possible and an on-going monitoring programme should be established to detect and quantify any alien species.
» During construction, unnecessary disturbance to habitats should be strictly controlled and the footprint of the impact should be kept to a minimum.
» All mitigation measures detailed within this report and the specialist reports contained within Appendices **D** to **L** to be implemented.
» The draft Environmental Management Programme (EMPr) as contained within **Appendix M** of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed solar energy facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project.
» A comprehensive stormwater management plan should be compiled for the developmental footprint prior to construction.
» An ecological walk through survey for the CSP plant and associated infrastructure (such as pipeline, power line and access roads) must be undertaken prior to construction.
» A permit to be obtained for removal of protected trees and provincially protected flora that are affected.
» Post-construction avifaunal and bat monitoring (12 months) should be started as the facility becomes operational, bearing in mind that the effects of the CSP facility may change over time. The results of this monitoring programme should be considered after the first year to inform the need to continue with the programme and/or implement additional mitigation measures.

» A Water Use License for relevant water uses is to be obtained from DWS prior to commencement of the water use.
» All other relevant and required permits must be obtained from the relevant regulating authorities.

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