ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
DRAFT ENVIRONMENTAL IMPACT REPORT

PROPOSED ILANGA CSP 5 FACILITY, NEAR UPINGTON, NORTHERN CAPE PROVINCE

DRAFT FOR PUBLIC REVIEW

25 April 2016 -30 May 2016

Prepared for:

Emvelo Holdings (Pty) Ltd
22 Fredman Drive
Sandton
2010

Prepared by:

Savannah Environmental Pty Ltd

UNIT 10, BLOCK 2
5 WOODLANDS DRIVE OFFICE PARK,
CORNER WOODLANDS DRIVE & WESTERN
SERVICE ROAD, WOODMEAD, GAUTENG
PO BOX 148, SUNNINGHILL, 2157
TEL: +27 (0)11 656 3237
FAX: +27 (0)86 684 0547
E-MAIL: INFO@SAVANNAHSA.COM
WWW.SAVANNAHSA.COM

PROJECT DETAILS

DEA Reference No.	:	14/12/16/3/3/2/864
Title	:	Environmental Impact Assessment Process Draft EIA Report for the Ilanga CSP 5 Facility near Upington, Northern Cape Province
Authors	:	Savannah Environmental (Pty) Ltd Tebogo Mapinga Jo-Anne Thomas Gabriele Wood
Sub-consultants	:	Simon Todd Consulting Garry Paterson of ARC-Institute for Soil, Climate and Water Jon Marshall of Afzelia Jaco van der Walt of Heritage Contracts Candice Hunter of Savannah Environmental (with external review by Neville Bews) Dr Rob Simmons of Bird and Bat Unlimited Environmental Consultants Peter Kimberg of the Biodiversity company and Stuart Dunsmore of Fourth Element
Client	:	Emvelo Holdings (Pty) Ltd
Report Status	:	Draft Environmental Impact Assessment Report for public review
Review Period	:	25 April 2016 – 30 May 2016

When used as a reference this report should be cited as: Savannah Environmental (2016) Environmental Impact Assessment Report: Ilanga CSP 5 Facility near Upington, Northern Cape Province

PURPOSE OF THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Emvelo Holdings (Pty) Ltd, an independent power developer of concentrating solar power (CSP) plants in South Africa, is proposing to develop an additional Concentrated Solar Power (CSP) Facility and associated infrastructure adjacent to the authorised Site 1.4, DEA Ref No.: 14/12/16/3/3/2/299) within the Karoshoek Solar Valley Development. The site is located approximately 30 km east of Upington within the Khara Hais Local Municipality in the Northern Cape (refer to **Figure 1.1**). The proposed project is to be known as the **Ilanga CSP 5** Project. The **Ilanga CSP 5** Project is proposed to generate up to 50MW in capacity and will be constructed within an area of approximately 200ha in extent within the broader property.

The purpose of the additional CSP facility currently being investigated is to facilitate the increase in capacity of the authorised Site 1.4 from 100MW to 150MW in order to meet the generating capacity thresholds specified by the Department of Energy (DoE) in its Expedited Bid Window of the Renewable Energy Independent Power Producers Procurement (REIPPP) Programme (Tender No: DOE/003/13/14 – as amended from time to time).

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

This EIA Report consists of the following sections:

» **Chapter 1** provides background to the Project and the environmental impact assessment, and an introduction to the rationale behind the selected site and technology proposed.
» **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

DEA REQUIREMENTS FOR THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

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 16 February 2016, and where in the draft EIR the requirements have been addressed within this report for ease of reference.

Table 1: Information Requested by DEA

DEA Ref. #	Items in terms of Scoping Acceptance Requirements	Report Reference
	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 I&APs as part of the DSR and SR must be taken into consideration when drafting the EIR	A Comments & Response Report is included in Appendix C which includes all comments received on the project to date.
	Ensure that mitigation measures and recommendations in the specialists studies must be addressed the EIAr and the EMPr	All mitigation measures in specialist studies are included in both the EMPr and the main EMP.
	Please ensure that comments from all relevant stakeholders are submitted to the Department with the FEIR including: » Northern Cape of Environment and Nature Conservation » Department of Agriculture, Forestry and Fisheries » Provincial Departments of Agriculture » South African Civil Aviation Authority » SENTEC » Department of Transport » Khara Hais Local Municipality » Mgcawu (Siyanda) District Municipality » Department of Water and Sanitation » South African National Roads Agency Limited » South African Heritage Resource Agency » Endangered Wildlife Trust » Birdlife South Africa » Department of Mineral Resources » Department of Rural Development and Land Reform » DEA: Directorate Biodiversity and Conservation	"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"

DEA Ref. #	Items in terms of Scoping Acceptance Requirements	Report Reference
	» Square Kilometre Array	
	Ensure that EIAr and EMPr comply with Appendix 3 and Appendix 4 of 2014 Regulations	The EIAr and EMPr comply with Appendix 3 and Appendix 4 of 2014 Regulations.
	Address all issues raised by organs of state and I&APs	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 various stakeholders/ Proof that attempts 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
i	Detailed motivation and reasons on the applicability of Activity 14 of GN R.983 and Activity6 of GN R.984. 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	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. Adequately assess impacts associated with activity GN R.983 Item 19.	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). Excavated material will be sourced from the site. The impacts associated with activity 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	All listed activities are the same and correct in the EIAr and the application form.	Comment noted. The application form will be amended if required and submitted with the final EIAR.

DEA Ref. #	Items in terms of Scoping Acceptance Requirements	Report Reference
v	Should any activities under GN R.985 be applicable, an amended application form as well as written comments must be obtained and submitted to the DEA confirming their applicability to the development.	Comment noted
vi	The EIAr must provide the technical details for the proposed facility in a table format as well as their description and/or dimensions.	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 as well as the start, middle and end points of all linear activities	The four corner coordinate points for the proposed development site have been included in Table 2.1 in Chapter 2 of this report.
viii	The EIAr must provide the following: » Clear indication of the envisioned area for the proposed concentrated solar power facility; » 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.
xii	The following listed activities applied for may trigger Section 19 and S21 of the National Water Act No. 36 of 1998: GN R. 983 Activity 12, and 19. The EAP is advised to include a hydrological Assessment as part of the EIAr	A water resource report forms part of the report- refer to Appendix F.
xiii	Provide proof of availability of water for the facility from the relevant authority	DWS has confirmed availability of water required for the CSP facility- refer to Appendix F-1.
xiv	The EIAr must adequately assess and provide a comparative analysis for alternative water sources and 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	The impacts of a water abstraction point in the Orange River and a pipeline to pipe the water to the facility 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. The pipeline to pipe the water to the facility will be assessed in a separate BA process.
xvii	In terms of reference for the avifaunal assessment must also investigate the following: » Indicate the impacts that the proposed activity may have on avifauna	An avifaunal assessment which covers the wet and dry season was conducted, as considered most appropriate to the area under consideration. The report identified impact and cumulative impacts

DEA Ref. #	Items in terms of Scoping Acceptance Requirements	Report Reference
	» Must cover at minimum the summer and winter seasons » Mitigation measures to discourage the avifauna from entering the solar field, limit nesting and breeding grounds within the solar field » Assessment of the cumulative impact on avifauna within the site and within the local area.	and mitigation measures were recommended. Please refer to Appendix E and Chapter 6 and 7 of this report.
xviii	The terms of reference for the agricultural study must include the following: » Assessment of the loss of agricultural land; » The current state of agricultural activities on land; and » The impact of the loss of agricultural land within the property as well as the cumulative impact of the loss of agricultural land on the site and within the area.	The agricultural assessment conducted by Savannah environmental was peer reviewed by Garry Paterson who confirmed that the site has low agricultural potential and that a detailed assessment will not be required- refer to Appendix H of this report.
xix	All in-house specialists to be used for any specialists study must be peer reviewed by external specialists (ecological, socio-economic and agriculture etc.)	The Social Assessment conducted by Savannah was peer reviewed by an external review - Neville Bews. Refer to Appendix I of this report.
xx	EIAr must assess all identified impacts including traffic and geotechnical impacts.	EIAr assesses all identified impacts including traffic and geotechnical impacts. Please note that the traffic impacts were assessed in detailed in the Social Impact Assessment Report Please refer to Appendix I and Appendix K.
xxi	Socio-economic report must provide a comparative analysis of the competing land uses on the property	The Socio-economic report provides a comparative analysis of the competing land uses on the property- refer to Appendix I.
xxii	The EIAr must also include a comment and response report in accordance with Appendix 2h (ii) 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.
xxiii	EIAr must also include the detailed inclusive of the PPP in Accordance with Regulation 41 of the EIA Regulation.	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.
xxiv	Details of the future plans for the site and infrastructure after decommissioning in 20-	Future plans for the site and infrastructure after decommissioning in

DEA Ref. #	Items in terms of Scoping Acceptance Requirements	Report Reference
	30 years and the possibility of upgrading the proposed infrastructure to more advanced technologies.	20-30 years and the possibility of upgrading the proposed infrastructure to more advanced technologies have been included in Chapter 2 section 2.5.
xxv	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.
xxvi	The ElAr must provide detailed description of the need and desirability. 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. The need and desirability must take into account cumulative impacts of the proposed development.	The ElAr provides a detailed description of the need and desirability- refer to Chapter 2.
xxvii	A copy of the final site layout map. 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: » Parabolic trough positions and its associated infrastructure; » Positions of the power island, steam turbine and generator, molten salt storage tanks, water storage reservoir tanks, lined evaporation 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;	A copy of the final site layout map is included in Appendix N (A3 Maps) of this report.

DEA Ref. #	Items in terms of Scoping Acceptance Requirements	Report Reference
	» The location of sensitive environmental features on site e.g. CBAs, heritage sites, wetlands, drainage lines etc. that will be affected by the facility and its associated infrastructure; » Substation(s) and/or transformer(s) sites including their entire footprint; » Connection routes (including pylon positions) to the distribution/transmission network » All existing infrastructure on the site, especially roads » Buffer areas; » Buildings, including accommodation; and » All "no-go" areas.	
xxviii	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 EIA process is included in Appendix N (A3 Maps) of this report.
xxix	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.
xxx	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.
	EMP	
i	All recommendations and mitigation measures recorded in the EIAr and the	All recommendations and mitigation measures recorded in the EIAr and the

DEA Ref. #	Items in terms of Scoping Acceptance Requirements	Report Reference
	specialist studies conducted	specialist studies conducted have been included in the EMPr (refer to Appendix K).
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 EIA process.	An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA 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 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	A traffic management plan has been

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	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.	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 flows. Drainage measures must promote the dissipation of storm water run-off.	A storm water management plan has been compiled and is included in Appendix I of the EMPr.
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.
xv	Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other	Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments,

DEA Ref. #	Items in terms of Scoping Acceptance Requirements	Report Reference
	environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants.	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
	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).
	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.
	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.
	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 6.
	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
	Furthermore, it must be reiterated that, should an application for Environmental Authorisation be subject to the provisions of Chapter II, Section 38 of the National Heritage Resources Act, Act 25 of 1999, then this Department will not be able to make nor	Comment noted

DEA Ref. #	Items in terms of Scoping Acceptance Requirements	Report Reference
	issue a decision in terms of your application for Environmental Authorisation pending a letter from the pertinent heritage authority categorically stating that the application fulfils the requirements of the relevant heritage 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.	
	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 EIA REPORT

This **Environmental Impact Assessment Report** has been made available for public review at the following places, which lie in the vicinity of the proposed project area from **25 April 2016 – 30 May 2016:**

» Upington Public Library

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 **30 May 2016**

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

EXECUTIVE SUMMARY

Background and Project Overview

Emvelo Holdings (Pty) Ltd, an independent power developer of concentrating solar power (CSP) plants in South Africa, is proposing to develop an additional Concentrated Solar Power (CSP) Facility and associated infrastructure adjacent to the authorised Site 1.4, DEA Ref No.: 14/12/16/3/3/2/299) within the Karoshoek Solar Valley Development. The site is located approximately 30 km east of Upington within the Khara Hais Local Municipality in the Northern Cape (refer to **Figure 1**). The proposed project is to be known as the **Ilanga CSP 5** Project.

The **Ilanga CSP 5** Project[1] under investigation through this Draft EIAr is proposed to generate up to 50MW in capacity and will be constructed over an area of approximately 700ha in extent within the broader property.

The proposed site is located Portion 3 of the Farm Matjiesrivier 41 located approximately approximately 30 km east of Upington within the Khara Hais Local Municipality in the Northern Cape Province.

The Ilanga CSP 5 Facility is proposed to utilise the solar parabolic trough technology with a generation capacity of up to 150MW in total, and energy storage of up to 6 hours (using molten salts technology). The trough system will be comprised of parabolic collectors (i.e. trough-shaped reflectors which focus the solar radiation onto a receiver at its focal point), a receiver tube/heat collection element (i.e. a metal absorber containing the heat transfer fluid surrounded by a glass envelope which absorbs the solar energy received from the parabolic trough), a sun-tracking system (i.e. an electronic control system and associated mechanical drive system used to focus the reflector onto the sun), and support structure (i.e. holds the parabolic trough in accurate alignment with incoming solar radiation while resisting the effects of the wind). The collected heat energy in the heat transfer fluid 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.

The consolidated 150MW Ilanga CSP 5 Project will have a development footprint of up to 610 ha, to be placed within a broader site of ~5400 ha to form part of the larger Karoshoek Solar Valley Development and will include the following associated infrastructure (refer to **Figure 2**):

» Parabolic troughs utilising a heat transfer fluid (HTF).
» Internal access roads.

[1] Previously referred to as the additional CSP facility associated with authorised CSP site Karoshoek LFTT 2 (1 x 100 MW Parabolic Trough) Site 3.

» Power Plant/Power Island: power island with steam turbine generator, auxiliary boilers, dry cooling and molten salt storage.
» Associated infrastructure: access roads, plant substation, power line, water abstraction point and supply pipeline, water storage tanks, packaged water treatment plant, lined evaporation ponds, and workshop and office buildings.

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).

The overarching objective for the Ilanga CSP 5 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.

Evaluation of the Proposed Project

The preceding chapters of this report together with the specialist studies contained within **Appendices D - J** provide a detailed assessment of the environmental impacts on the social and biophysical environment as a result of the proposed project. This chapter concludes the EIA Report by providing a summary of the conclusions of the assessment of the proposed site for the Ilanga CSP 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 (for the 150MW facility) provided by Emvelo Holdings (Pty) Ltd. A broader study area of approximately 5400ha is being considered, within which the development footprint for the proposed Project (Ilanga CSP 5) of approximately 150 ha in extent would be appropriately located. The site can adequately accommodate the proposed larger 150MW CSP Project with a footprint of 684ha (proposed facility and authorised facility. 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 and taking the location of the authorised facilities into consideration. The environmental sensitivities (ecological and avifauna sensitivities) identified during the EIA phase have informed the layout of the proposed facility (Refer to **Figure 3).** All identified sensitivities were excluded from the proposed development were feasible.

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 (refer to **Table 1, 2** and **3** for the summery of the impacts):

» Local site specific impacts resulting from the physical modification/disturbance of the site primarily during the construction phase.
» Impacts on avifauna.
» Impacts on water resources.
» Visual impacts.
» Impacts on the social environment.
» Cumulative impacts.

Local site-specific impacts

The Ilanga CSP 5 site consists largely of deeper soils associated with in-filled valleys of dense Rhigozum trichotomum and Stipagrostis with conspicuous stands of Boscia albitrunca. As many as 3000 Boscia trees would be impacted by the development, which is considered a significant loss to the local population. This exceeds the guideline loss for triggering an offset from DAFF and direct engagement with DAFF will need to be started should the developer wish to develop the site. Furthermore, the additional development sites in the Karoshoek Solar Valley would contribute significant additional loss of trees from the area and the overall cumulative impact is considered to be high in the local context. Boscia albitrunca is however widespread and the loss of the trees from the area would not be significant at the national scale.

Due to the relatively homogenous nature of the habitat for fauna, faunal diversity is likely to be moderate to 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, although the cumulative impact on the Boscia trees is considered to be a significant local impact.

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. However, the

site does not consist of typical Bushmanland Arid Grassland and rather consists of densely vegetated in-filled valleys which are considered to be of above-average significance for fauna and more vulnerable to cumulative impact due to the limited extent of the affected habitat. Consequently the impact of the development on habitat loss, fragmentation and the future conservation potential of the area is considered of moderate to high overall magnitude and of local significance.

Although there are no highly sensitive features within the development footprint the abundance of protected trees is high and the overall impact of the development cannot be mitigated to a low level as a result. The loss of the protected trees is considered to be a significant local impact but would not be highly significant at the national scale. Should the development of the site proceed, active engagement of DAFF would be required to deal with the permitting and possible offsetting required for the loss of the Boscia trees at the site. Overall, and with the suggested mitigation measures implemented, the impacts of the development are likely to be of moderate significance and no impacts of high significance are likely.

Impacts on Avifauna

Potential impacts on avifauna as a result of the proposed project include disturbance during construction and operation, loss of habitat and potential for collision with the troughs and associated infrastructure. From the monitoring undertaken on the site, a total of 114 bird species were recorded on the 14 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. Of these, 8 were collision-prone as ranked by the BARESG (2014), and only 2 were red-listed (Kori Bustard and Lanner Falcon).

However, it was observed that four additional red data species in our two site visits: a Black Harrier, breeding Verreaux's Eagle, a Secretarybird, and numerous Ludwig's Bustards. Thus, 6 red-data species occur on site. A further 8 collision-prone species were recorded on the Karoshoek Solar Valley development area, giving 14 collision prone/red data species in total.

Because the SABAP data were completely missing for pentads away from the Orange River we tallied every species recorded in the transects, VPs and incidental observations 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** occur on the Ilanga

solar development site, **of which six are red-listed.**

With the implementation of mitigation measures by the developer, contractors, and operational staff, the severity of avifaunal impacts of the Ilanga CSP 5 Facility can be reduced to low, or avoided. The CSP 5 Facility can be developed and impacts on avifauna managed by taking the following into consideration:

» A threatened bustard and some wetland birds may be impacted. The significance for displacement and avoidance will be medium–low this red data species.
» Mitigation measures include avoiding the medium sensitivity areas identified.
» For the wetland birds, korhaans and raptors the significance is lower because they are less collision-prone and less threatened.
» Sandgrouse, which were very numerous on site, are unlikely to react to mirrored surfaces as they do not land on water.
» A structured and systematic construction and post-construction assessment, as laid out in the Environmental Management Programme (above) by trained ornithologists will determine the impacts and provide appropriate mitigations.
» Little research in South Africa is presently available to determine the impact of CSP trough and tower technology on the South African avian community. Therefore, a full 12-months of post-construction monitoring at this site by trained ornithologists (able to distinguish Ludwig's from Kori Bustards) is strongly recommended.
» It is 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 recommended that innovative bird deterrent techniques are used, such as the Torri lines mentioned in the avian Scoping Report (Simmons and Martins 2015).
» If these recommendations can be followed and prove effective, it is expected that the Ilanga CSP 5 development can proceed with the least impact to the avifauna of the area.

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. However, the majority of impacts can be reduced to low significance with the implementation of appropriate mitigation measures, and the proposed development should, therefore, have limited impact on the overall status of the riparian systems

within the region. Impacts on the Orange River system due to water abstraction, and site-specific impacts on in-stream biota are difficult to quantify due to the highly regulated nature of the system.

The only significant risk to the project is the water use license not being granted by the Department of Water and Sanitation. Although dry cooling will be practiced which will reduce water requirements, the Orange River system is under pressure in terms of water requirements.

Visual impacts

Potential visual impacts on sensitive receptors that have been identified through scoping and the site visit include:

» The visibility of the facility to, and potential visual impact on homesteads that have been identified as potentially being impacted;
» The visibility of the facility to, and potential visual impact on users of roads in close proximity;
» The visibility of the facility to, and potential visual impact on sensitive receptors;
» Visual impacts associated with construction of the proposed project;
» Possible impact of glint and glare; and
» The possible impact of lighting associated with night time operation, and security lights.

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 5 Facility can be developed and impacts on visual resources managed by taking the following into consideration:

» The affected landscape has a degree of visual absorption capacity due to occasional head height shrubs particularly in valley lines as well as the minor ridgelines that bisect the valley floor.
» The project will almost always be viewed from a similar level as the development meaning that it will largely be seen in elevation. This will mean that overviews of the full extent of development will not be possible from public access areas.
» Mitigation should be focused on maintaining natural vegetation which will provide a degree of screening and ensuring that development levels are not elevated above the natural landform.

The assessment indicates that the development of the additional area on Ilanga CSP 5 is likely to have minimal additional visual impact over and above that associated with the authorised site.

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 5 project in the proposed location when considered together with other similar developments. The following can be concluded considering the Ilanga CSP 5 Facility:

» 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.
» Low risk to avifauna through loss of habitat, infringement on breeding areas, or risk to collision-prone species 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 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 the **Chapter 7** and the detailed specialist studies (refer to **Appendices D – J**).

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).

The viability of establishing a CSP trough facility with an additional generating capacity of 50MW on a site within the Karoshoek Solar Valley Development on Portion 3 of the Farm Matjiesrivier 41, located approximately 30 km east of Upington within the //Khara Hais Local Municipality in the Northern Cape has been established by Emvelo Holdings (Pty) Ltd. The positive implications of establishing a CSP Plant on the identified site within the Northern Cape include:

» 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.
» 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. 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. 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.

» The **avifauna** of the area may be affected by the infrastructure of the CSP plant. However, the significance will be medium 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 **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 are expected to be of limited to the site and mainly of low significance.

» 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 5 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:

» As far as possible, the design and layout of the CSP Plant should consider and accommodate areas of high environmental sensitivity.
» 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 **J** to be implemented.
» The draft Environmental Management Programme (EMPr) as contained within **Appendix K** 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 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.

Table 1: Summary of pre-mitigation and post mitigation impacts of the bio-physical and socio-economic environment during the **planning and construction phase** of the project

Environmental Aspect	Impact	Pre-mitigation Significance	Post Mitigation Significance
Ecology (Flora and Fauna)	Impacts on vegetation and protected plant species	**High (60)**	**Medium (50)**
	Disturbance, transformation and loss of habitat will have a negative effect on resident fauna	**Medium (36)**	**Low (28)**
	Increased Alien Plant Invasion Risk	**Medium (40)**	**Low (21)**
Avifauna	Habitat Loss – Destruction, Disturbance and Displacement	**High (65) (Bust)** **Medium-low (21) (Rapt)** **Low (6) (WetB)** **Low (21) (Korh)**	**Medium (40) (Bust)** **Low (16) (Rapt)** **Low (6) (WetB)** **Low (12) (Korh)**
Heritage	Disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects.	**Medium(26)**	**Low (24)**
Social	Creation of employment and business opportunities	**Medium (36)(+)**	**Medium (44)(+)**
	Added pressure on economic and social infrastructure and increase in social conflicts during construction as a result of in-migration of jobseekers.	**Low (24)**	**Low (18)**
	Impact on daily living and movement patterns - Impacts from an increase in traffic disruptions and movement patterns during the construction phase.	**Medium (24)**	**Low (12)**
	Temporary increase in safety and security concerns associated with the influx of people during the construction phase.	**Low (27) (-)**	**Low (14) (-)**
	Nuisance impacts in terms of a temporary increase in noise and dust	**Low (15) (-)**	**Low (12) (-)**

Table 2: Summary of pre-mitigation and post mitigation impacts of the bio-physical and socio-economic environment during the **operation phase** of the project

Environmental Aspect	Impact	Pre-mitigation Significance	Post Mitigation Significance
Ecology (Flora and Fauna)	The operation and presence of the facility may lead to disturbance or persecution of fauna.	**Medium (30)**	**Low (16)**
	The loss of landscape connectivity.	**Medium (40)**	**Medium (36)**
Avifauna	Fatalities due to collision with mirrored surfaces	**Mow (16) (Bust)** **Low (16) (Rapt)** **Medium (50) (WetB)** **Low (14) (Korh)**	**Low (7) (Bust)** **Low (7) (Rapt)** **Low (24) (WetB)** **Low (6) (Korh)**
Water Resource	Changes in biotic communities due to changed habitat structure;	**Low()**	**Low ()**
	Loss of aquatic habitat	**Low()**	**Low ()**
	Loss of sensitive species	**Low()**	**Low ()**
Visual Impact	Industrialisation of general landscape character.	**Medium (40)**	**Low (24)**
	Industrialisation of a natural landscape as seen from local homesteads.	**Low (24)**	**Low (12)**
	Industrialisation of a natural landscape as seen from the local Kleinbegin road to the west and the N10 to the north.	**Medium (30)**	**Low (16)**
	Industrialisation of a natural landscape as seen from sensitive uses.	**Low (7)**	**Low (7)**
	Visual impacts associated with construction of the proposed project.	**Low (15)**	**Low (4)**
	Impacts of glint and glare can vary from permanent eye injury, persistence of vision that could make driving on local roads dangerous to low level nuisance	**Low (6)**	**Low (6)**
	Industrialisation of a natural landscape as seen at night.	**Low (24)**	**Low (10)**
Social	Creation of employment opportunities and skills	**Medium (32) (+)**	**Medium (40) (+)**

Environmental Aspect	Impact	Pre-mitigation Significance	Post Mitigation Significance
	development opportunities during the operation phase for the country and local economy		
	Development of clean, renewable energy infrastructure	**Medium (40) (+)**	**High (40) (+)**
	Benefits to the local area from SED/ ED programmes and community trust from REIPPPP social responsibilities	**Low (30) (+)**	**Medium (48) (+)**
	Impacts associated with loss of farmland available for livestock grazing due to occupation of land by the CSP facility	**Low (28) (+ and -)**	**Low (28) (-)**

Table 3: Summary of pre-mitigation and post mitigation impacts of the bio-physical and socio-economic environment during the **decommissioning phase** of the project

Environmental Aspect	Impact	Pre-mitigation Significance	Post Mitigation Significance
Ecology (Flora and Fauna)	Disturbance or persecution of fauna during the decommissioning phase	**Medium (21) –**	**Low (15)**
	Alien plants are likely to invade the site as a result of disturbance created during decommissioning.	**Medium (30)**	**Low (21)**
	Increased erosion risk during decommissioning	**Low (28)**	**Low (15)**
Social	Social impacts associated with retrenchment including loss of jobs and source of income	**Low (28) (-)**	**Low (20) (-)**

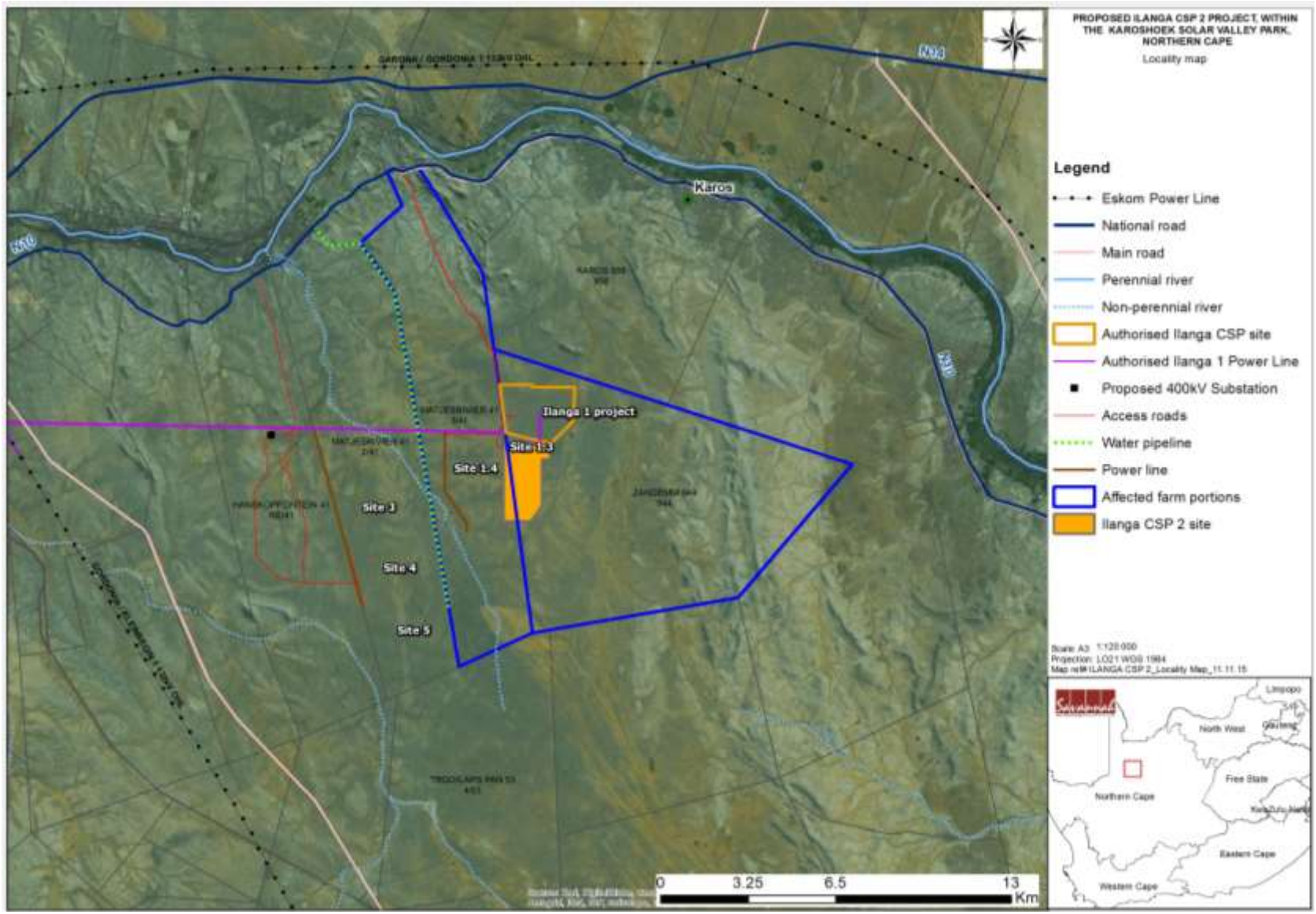

Figure 1: Locality Map of the proposed Ilanga CSP 5 Project (previously refered to as Site 5)(Refer to Appendix N A3 Maps)

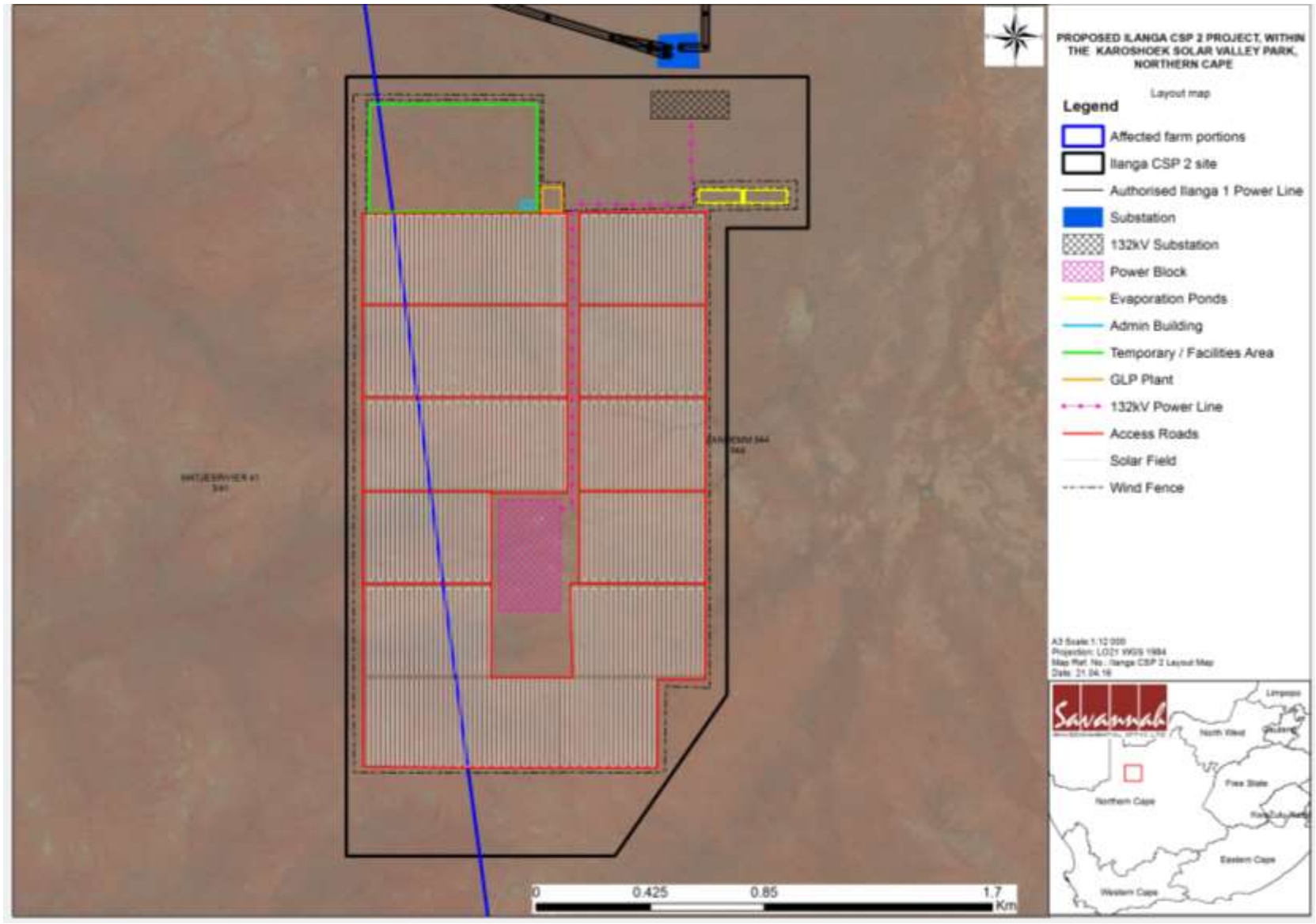

Figure 2: Preliminary Layout Map for the proposed Ilanga CSP 5 Project (Refer to **Appendix N** A3 Maps)- to be approved by DEA

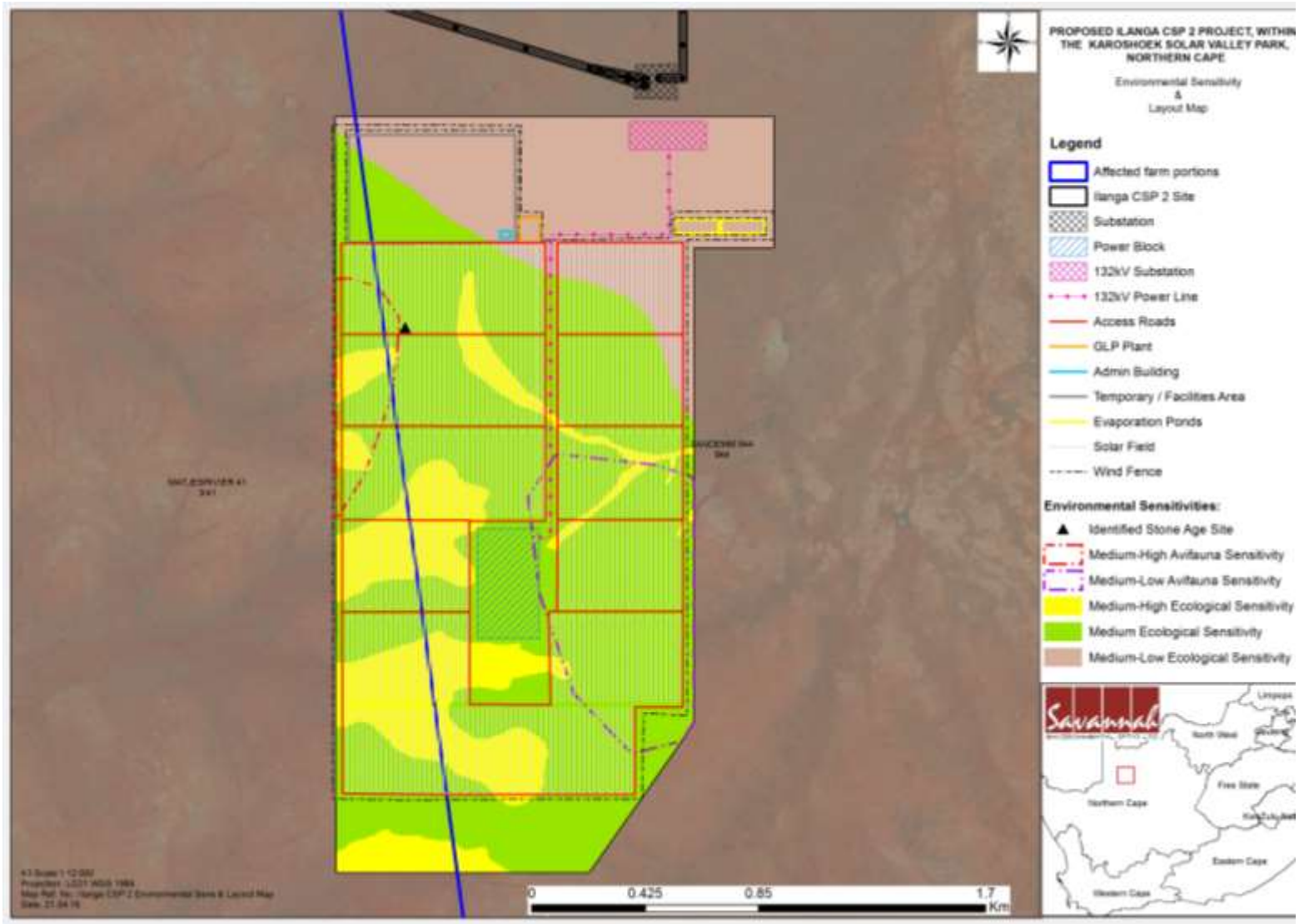

Figure 3: Environmental Sensitivity Map for the proposed Ilanga CSP 5 Facility (refer to **Appendix N** for the A3 Map)

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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 energy 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, an independent power developer of concentrating solar power (CSP) plants in South Africa, is proposing to develop an additional Concentrated Solar Power (CSP) Facility and associated infrastructure adjacent to the authorised CSP site Karoshoek LFT 2 (1 x 100 MW Parabolic Trough) Site 1.4, DEA Ref No.: 14/12/16/3/3/2/299) within the Karoshoek Solar Valley Development. The site is located approximately 30 km east of Upington within the Khara Hais Local Municipality in the Northern Cape (refer to Figure 1.1). The proposed project is to be known as the **Ilanga CSP 5** Project. The **Ilanga CSP 5** Project is proposed to generate up to 50MW in capacity and will be constructed within an area of approximately 200 ha in extent within the broader property.

The purpose of the additional CSP facility currently being investigated is to facilitate the increase in capacity of the authorised Karoshoek PT facility (Site 1.4) from 100MW to 150MW in order to meet the generating capacity thresholds specified by the Department of Energy (DoE) in its Expedited Bid Window of the Renewable Energy Independent Power Producers Procurement (REIPPP) Programme (Tender No: DOE/003/13/14 – as amended from time to time).

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 commercial solar electricity generating facilities by virtue of the prevailing climatic conditions (primarily as the economic viability of a solar energy 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 through the Strategic Environmental Assessment (SEA) undertaken for renewable energy development by the Department of Environmental Affairs (DEA)[2].

It is the developer's intention to bid the Ilanga CSP 5 Project under the Department of Energy's (DoE) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme. The power generated from the Ilanga CSP 5 Project will be sold to Eskom and will feed into the national electricity grid. Ultimately, the project is

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

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

This EIA Report consists of the following sections:

» **Chapter 1** provides background to the Project and the environmental impact assessment, and an introduction to the rationale behind the selected site and technology proposed.
» **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. Background to the project

Emvelo Holdings (Pty) Ltd is proposing the development of an additional Concentrated Solar Power (CSP) Facility and associated infrastructure adjacent to the authorised CSP site Karoshoek LFT (1 x 100 MW Parabolic Trough) Site 1.4, DEA Ref No.: 14/12/16/3/3/2/299) within the Karoshoek Solar Valley Development on Portion 3 of the Farm Matjiesrivier 41, located approximately 30 km east of Upington within the Khara Hais Local Municipality in the Northern Cape (refer to **Figure 1.1**).

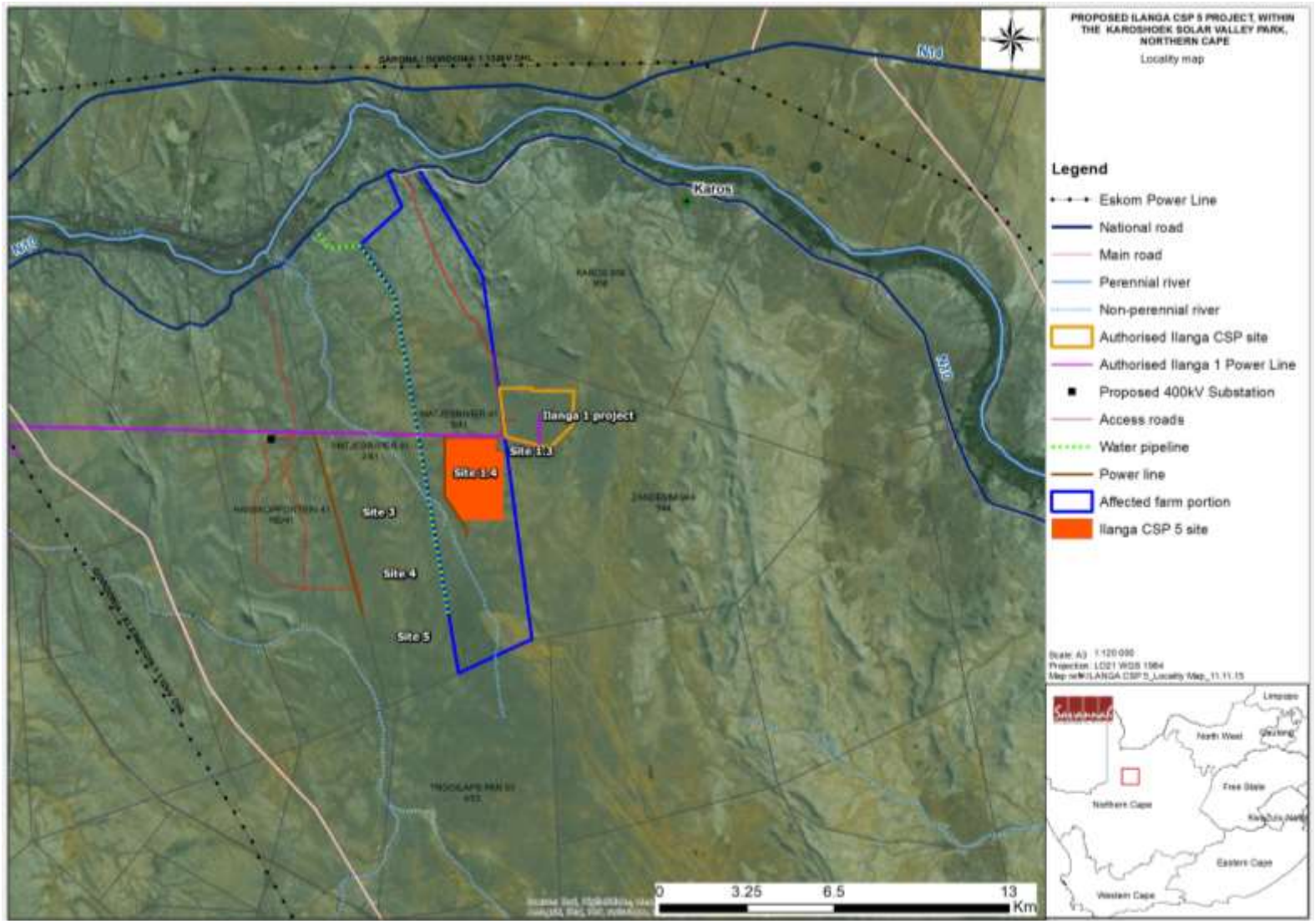


Figure 1.1: Locality map showing the proposed location of Ilanga CSP 5 Project within the extent of Portion 3 of the Farm Matjiesrivier 41 (Refer to **Appendix N** – Maps for A3)

The Ilanga CSP 5 Project is proposed to generate up to 50MW in capacity and will be constructed over an area of approximately 200ha in extent within the broader property.

It is the intention of the developer to develop the proposed project together with the already authorised project, i.e. the project is to be developed as a single 150MW facility.

The Ilanga CSP 5 Facility is proposed to utilise the solar parabolic trough technology with a generation capacity of up to 150MW in total, and energy storage of up to 6 hours (using molten salts technology). The trough system will be comprised of parabolic collectors (i.e. trough-shaped reflectors which focus the solar radiation onto a receiver at its focal point), a receiver tube/heat collection element (i.e. a metal absorber containing the heat transfer fluid surrounded by a glass envelope which absorbs the solar energy received from the parabolic trough), a sun-tracking system (i.e. an electronic control system and associated mechanical drive system used to focus the reflector onto the sun), and support structure (i.e. holds the parabolic trough in accurate alignment with incoming solar radiation while resisting the effects of the wind). The collected heat energy in the heat transfer fluid 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.

The consolidated 150MW Ilanga CSP 5 Project will have a development footprint of up to 648 ha, to be placed within a broader site of ~5400 ha (i.e the extent of the affected farm portions) to form part of the larger Karoshoek Solar Valley Development and will include the following associated infrastructure:

» Parabolic troughs utilising a heat transfer fluid (HTF).
» Internal access roads.
» Power Plant/Power Island: power island with steam turbine generator, auxiliary boilers, dry cooling and molten salt storage.
» Associated infrastructure: access roads, plant substation, power line, water abstraction point and supply pipeline, water storage tanks, packaged water treatment plant, lined evaporation ponds, and workshop and office buildings.

The power plant/power island, plant substation, water storage tanks, packaged water treatment plant, lined evaporation ponds, and workshop and office buildings authorised as part of the Karoshoek LFT (Site 1.4) facility will be utilised for the larger 150MW facility.

The following infrastructure will be **shared infrastructure** for all the proposed projects within the Karoshoek Solar Valley Development:

» 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).

This infrastructure is to be assessed within a separate Basic Assessment process.

The overarching objective for the Ilanga CSP 5 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.

A detailed description of the project components listed above is provided in Chapter 2 of this report.

1.2. Conclusions from the Scoping Phase

Several desktop specialist studies were undertaken during the scoping phase for the purposes of identifying potential impacts and potential fatal flaws 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 scoping assessment indicates that the development of the proposed project will impact to a limited extent on relatively natural areas surrounding the development area. The character of affected areas will change due to the extent of authorised solar power projects in the area. These will have the effect of industrialising the character of the landscape surrounding them. The assessment has indicated that the proposed new facility is unlikely to add significantly to the visual impact associated with the already authorised facilities.

Further, 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.

Archaeological resources

Archaeological sites are expected in the form of widespread stone artefact scatters mainly from the Middle Stone Age (MSA) and Later Stone Age (LSA), Early Stone Age (ESA) material is also recorded to the north west of the study area. Areas where granite outcrops occur with "pans" or shallow depressions that contain seasonal water, as well as areas along stream beds might contain sites. Farming infrastructure can occur throughout the study area but is not anticipated to be older than 60 years. No standing structures could be identified through this desk-top level study. Some stone cairns are recorded in the wider region and could be graves and similar occurrences can be expected in the study area. Family cemeteries might be found in association with farmsteads and labourer dwellings. 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 will have a Generally Protected B (GP.B) field rating apart from graves and rock art that could have a Generally Protected A (GP.A) field rating and all sites should be mitigatable and no red flags are identified.

Ecological sensitive features

The pans which are located outside although in relative close proximity to Site 1.4 should be considered sensitive and should not be impacted as far as possible. The drainage system which occurs within this site is diffuse and not very well-differentiated from the surrounding landscape. The areas mapped as part of the drainage system in the sensitivity map are in the form of bare or sparsely vegetated areas on the ground. These areas probably only have some overland flow in exceptional circumstances, but have become more silty and less vegetated on account of silt deposition from the surrounding areas.

The study area is characterised by the presence of a large drainage line in the north east of the site, which contains a number of very large *Boscia albitrunca* specimens. There is also a low exposed ridge which forms the western bank of the drainage line. From previous investigations on the site it has been confirmed that the ridge has some areas of low quartzitic outcrops which contain numerous *Adenium oleifolium* plants, which is a protected species in the Northern Cape. This area should be avoided as far as possible. If some development must impinge on this area, the National Botanical Gardens in Kirstenbosch should be approached to remove the affected individuals as they have requested this species for their collections.

It is possible that this drainage lines and possibly the rocky outcropping will extend into the area for the proposed new facility. Furthermore, the above-mentioned

protected and listed species are likely to extend into the area for the proposed new facility.

The potentially sensitive areas/environmental features that were out lined and mapped during the scoping phase (shown in **Figure 1.2**) include:

» Areas of ecological sensitivity; and
» Potential heritage features.

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

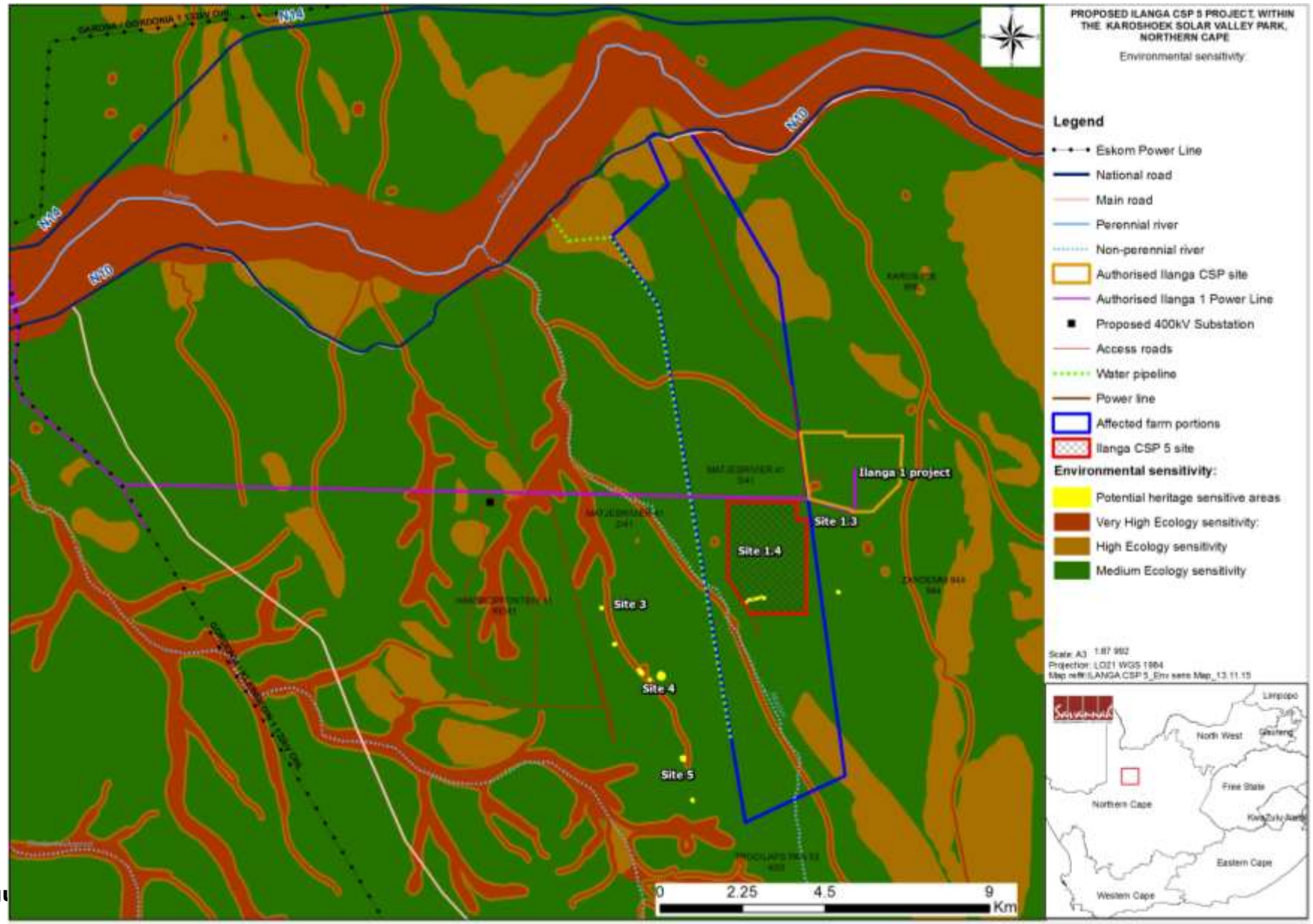
No environmental or social fatal flaws that would prevent the project from being assessed further were identified to be associated with the broader site during the Scoping stage of the EIA process and the Final Scoping Report was accepted by DEA on 16 February 2016 (reference number: 14/12/16/3/3/2/864).

1.3. Requirement for an Environmental Impact Assessment Process

The construction and operation of the proposed Ilanga CSP 5 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[3] and the Northern Cape Department of Environment and Nature Conservation (DENC) will act as a commenting authority.

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


PROPOSED ILANGA CSP 5 PROJECT WITHIN THE KAROSHOEK SOLAR VALLEY PARK, NORTHERN CAPE
Environmental sensitivity
Legend
Eskom Power Line
National road
Main road
Perennial river
Non-perennial river
Authorised Ilanga CSP site
Authorised Ilanga 1 Power Line
Proposed 400kV Substation
Access roads
Water pipeline
Power line
Affected farm portions
Ilanga CSP 5 site
Environmental sensitivity:
Potential heritage sensitive areas
Very High Ecology sensitivity:
High Ecology sensitivity
Medium Ecology sensitivity
Ilanga 1 project
Site 1.3
Site 1.4
Site 3
Site 4
Site 5
N14
N10
0 2.25 4.5 9 Km
Limpopo
North West
Gauteng
Free State
Northern Cape
KwaZulu-Natal
Eastern Cape
Western Cape

Figu

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 5 Facility has been accepted by the DEA (under Application Reference number: 14/12/16/3/3/2/864).

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 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.

1.4. Details of the Environmental Assessment Practitioner

Savannah Environmental was contracted by Emvelo Holdings (Pty) Ltd as the independent environmental consulting company to undertake the EIA process for the proposed Ilanga CSP 5. 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. The project team responsible for this project includes:

» *Tebogo Mapinga* - is a Senior Environmental Consultant, 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 6 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 and holds a Master of Science degree. She has 18 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 scoping report:

» Ecology (Flora and Fauna) – Simon Todd of Simon Todd Consulting
» Avifauna - Dr Rob Simmons of Bird and Bat Unlimited Environmental Consultants
» Soils and Agricultural Potential –Dr Garry Paterson of ARC-Institute for Soil, Climate and Water
» Heritage – Jaco van der Walt of HCAC Heritage Consultants
» Visual – John Marshall of Afzelia Environmental Consultants & Environmental Planning and Design
» Social – Candice Hunter of Savannah Environmental (with external review by Neville Bews)
» Water Resources – Peter Kimberg of the Biodiversity company and Stuart Dunsmore of Fourth Element

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 5 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.

2.1. Nature and extent of the Ilanga CSP 5 Project

The project is proposed to be developed on Portion 3 of the Farm Matjiesrivier 41, located approximately 30 km east of Upington within the //Khara Hais Local Municipality (ZF Mgcawu District Municipality) in the Northern Cape. This site falls within the larger Karoshoek Solar Valley Development area which comprises a number of authorised CSP projects, including the Preferred Bidder Ilanga CSP facility currently under construction. The site is highly preferred by virtue of climatic conditions, relief and aspect, the availability of land, and proximity to a viable point of connection to the National grid through Eskom's Main Transmission Substation (MTS) Substation. The site is located immediately adjacent to authorised CSP sites (1.3, 1.4; 3, 4 & 5) and the Ilanga 1 Preferred Bidder Project (refer to Figure 1.1). In addition, the site falls within the Solar Development Corridor identified within the Northern Cape PSDF, as well as within Zone 7 of the REDZ. The site is therefore considered to be highly desirable for the proposed project.

2.1.1. Components of the Proposed Project

Solar power generating facilities use the energy from the sun to generate electricity. Concentrating Solar Power (CSP) collects the incoming solar radiation and concentrates it (focusing or combining it), on a single point, thereby increasing the potential electricity generation. The authorised CSP Site 1.4 (Karoshoek LFT) will consist of parabolic trough technology with a heat transfer fluid (HTF) with a generating capacity of 100MW consisting of the following infrastructure:

» Parabolic troughs utilising a heat transfer fluid (HTF).
» Power Plant/Power Island: power island with steam turbine generator, auxiliary boilers, dry cooling and molten salt storage.
» Associated infrastructure: access roads, plant substation, power line, water abstraction point and supply pipeline, water storage tanks, packaged water treatment plant, lined evaporation ponds, and workshop and office buildings.

The proposed Ilanga CSP 5 Project is proposed to include several parabolic troughs with a generating capacity of up to 50 MW and internal access roads and will be

developed together with the authorised Karoshoek LFT Site 1.4. A summary of the details and dimensions of the planned infrastructure associated with the Project is provided in Table 2.1.

Table 2.1: Details of the proposed Ilanga CSP 5 Project

Component	Description/ Dimensions
Location of the site	Portion 3 of the Farm Matjiesrivier 41
Municipal Jurisdiction	//Khara Hais Local Municipality which falls within the jurisdiction of the Mgcawu District (Siyanda) Municipality
Ward number	14
SG Code	C03600000000004100003
Nearest Town	Upington
Site Co-ordinates (centre of site)	Lat: 28°30'35.32"SLong: 21°30'34.43"E
Contracted capacity of facility	50MW
Details of the Parabolic troughs	Parabolic troughs (6m high) solar field with a development footprint up to 200 ha.
Full extent of CSP Facility	684 ha
Extent of broader site	5400
Internal access roads	6m wide, 21 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.
Services required	» Water will be sourced from the Orange 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 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 5 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**).

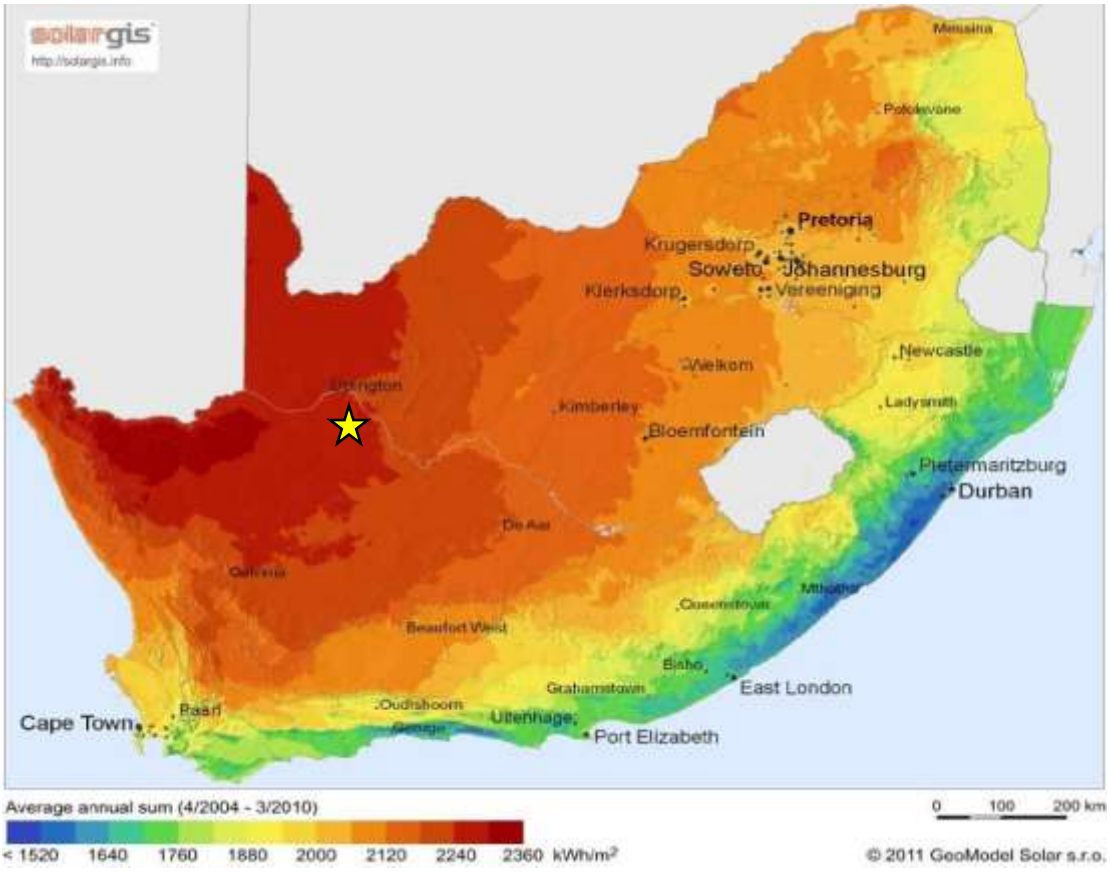


Figure 2.1: Solar irradiation map for South Africa; the proposed Ilanga CSP 5 Project position is shown by the yellow star on the map. (Source: adapted from GeoModel Solar, 2011).

From a local perspective, the site has specifically been identified by Emvelo Holdings (Pty) Ltd as being highly desirable for the development of the proposed 50MW Ilanga CSP 5 Project due to its proximity to an authorised CSP facility, 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 parcel is able to accommodate the 610ha required for the 150MW facility), and 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 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 (refer to Chapter 3). 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 //Khara Hais Local Municipality Integrated Development Plan (IDP) (2012-2017) as well as the ZF Mgcawu District Municipality IDP (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 is included in Chapter 3.

The Ilanga CSP 5 Project is proposed to be constructed outside of the Upington urban edge. Portion 3 of the Farm Matjiesrivier 41 itself has not been considered for an alternative land use such as urban development, nor is it currently extensively used for agriculture largely due to limitations associated with the soils on the site and water availability. The site is located within an area which has become a node for renewable energy projects, with the following preferred bidder projects (PB) located directly within a 30km radius from the project development site: Upington Airport Solar Energy Facility and the Ilanga 1 Facility to the north of the site (within the Karoshoek Solar Valley Development area).

The Ilanga CSP 5 Project will be located immediately adjacent to 5 authorised CSP sites (1.3, 1.4, 3, 4 & 5) and the Ilanga 1 preferred bidder project within the Karoshoek Solar Valley Development. Other authorised and proposed projects 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	12/12/20/2056	Lot 944 Karos Settlement	Within the Karoshoek	Preferred Bidder Round

Project Name	DEA Ref. No	Location	Approximate distance from the Karoshoek Solar Valley Project development site	Project Status
Power Plant			Solar Valley development site	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, Matjesriver 3/41, Karos 956 and Lot 944 Karos Settlement	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

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 key 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 within this area include complete or whole-scale change in sense of place and character of an area and unacceptable visual intrusion; loss of habitat, 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; risk to avifauna and through loss of habitat, infringement on breeding areas, or risk to collision-prone species; or loss of heritage resource; or positive and negative contribution from a socio-economic perspective; or contribution to climate change mitigation. These are discussed and assessed with Chapter 7.

The consideration of cumulative impacts tests if impacts associated with multiple developments in one area present an unacceptable risk to the environment. Of relevance to the Ilanga CSP 5 project is the proposed location within the Karoshoek Solar Valley Development.

The following can be concluded when considering the Ilanga CSP 5 Facility:

» 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.
» Low risk to avifauna through loss of habitat, infringement on breeding areas, or risk to collision-prone species 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 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 the **Chapter 7** and the detailed specialist studies (refer to **Appendices D - J**).

2.2.1. Receptiveness of the site to development of a CSP Project

Emvelo Holdings (Pty) Ltd considers this area and specifically the demarcated demarcated Portion 3 of the Farm Matjiesrivier 41, 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 systems and associated infrastructure requires up to 684 ha of land space (including 484ha for the authorised facility and 200ha for the proposed additional 50MW facility). The larger farm portion within which the site is located are approximately 5400ha in extent. The proposed development would therefore occupy approximately 12.6 % of the land surface area within the farm portion. The authorised CSP projects (Site 1) (inclusive of Site 3 (Karoshoek Site 3 CSP/ Ilanga Tower) and Site 1.4 (Karoshoek LFT 2 CSP/ Ilanga Tower) located within the same farm portion occupy 1207ha collectively, with 4350 ha remaining for future development or other land uses. This site is, therefore, considered sufficient for the installation of the Ilanga CSP 5 Project allowing for avoidance of sensitivities within the greater study area.

***Power transmission considerations*:**

» The future Eskom transmission substation on Eskom's CSP site located west of Upington, known as the Upington MTS, will have sufficient capacity for connecting the Ilanga CSP 5 Project. This distribution connection will be achieved via an on-site substation located at the project site or via a Karoshoek Solar Valley collector substation. The project site or the Karoshoek Solar Valley collector substation will connect back to back with the Upington MTS via a 132 kV line.

» Alternatively, this facility can connect to the Ilanga CSP1 substation located to the north-east of the site. This distribution connection will be achieved via an on-site substation located at the project site which will connect back to back with the Ilanga Substation using a 132 kV line.

» A power line of up to 400kV in capacity from the Karoshoek Solar Valley to Upington MTS has been authorised through a previous EIA process. This power line can loop-in and loop-out of the 400kV line linking the Upington MTS with Niewenhoop Substation. This will be achieved via a 400/132 kV substation located near the 400kV power line, and will connect back to back via 132kV lines that will connect to the Karoshoek Solar Valley collector substation.

» 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.)[4].

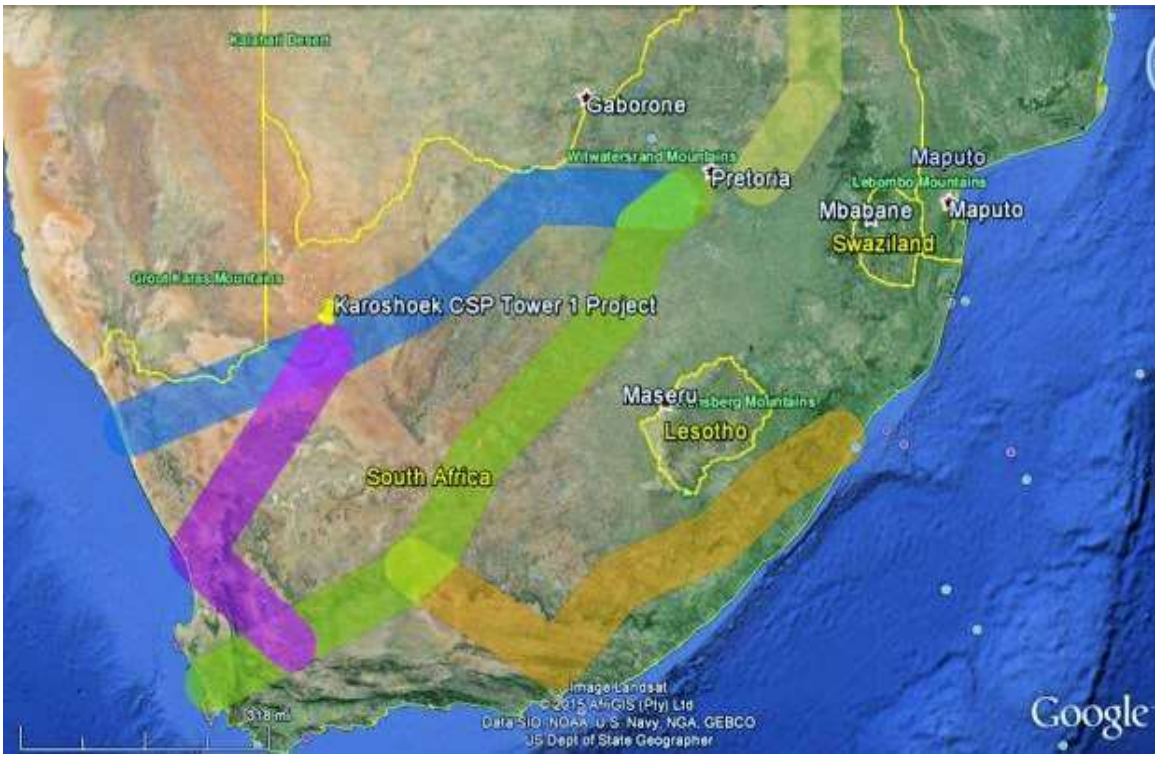


Figure 2.2: Eskom "Critical Power" Corridors as identified through the Eskom SEA. The Ilanga CSP 5 Project site is within the northern corridor as indicated on the map.

***Site access*:** The study site is accessible via the N10 between Upington to Groblershoop. Access off the N10 will be via a gravel road located on Portion 2 of the Farm Matjiesrivier 41.

Current Land use considerations: The farm portion is currently used mainly for livestock farming. Cultivation is only undertaken in close proximity to the Orange River, approximately 8km to the north of the proposed development area. No significant portion of the vegetation has been transformed or altered to a semi-natural state. A few twin tracks and gravel farm roads traverse the study site. The site is available for development of a solar facility such as that proposed.

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

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

Upington exhibits some of the best solar irradiation in South Africa and the world (refer to Figure 2.1). Global horizontal irradiation (GHI) for the Upington region varies between 2218 and 2282 kWh/m^2/annum. The GHI for the Ilanga CSP 5 Project site is in the region of approximately 2282 kWh/m^2/annum (refer to Figure 2.1). 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: There is a range of steep hills running in a north-south direction along the eastern part of the broader development site and a series of scattered hills in the central northern part of the site. The area proposed for the CSP facility is however relatively flat. The elevation on the broader site varies from 820 to 950 m above sea level (amsl).

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 5 Project is situated in close proximity to the town of Upington and smaller settlements such as Dagbreek, 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 feasibility of the project for development.

Environmental Sensitivity of the Site: As part of the EIA processes undertaken for the authorised sites within the Karoshoek Solar Valley Development, the sensitivity of the broader site was determined in order to inform the positioning of these facilities (refer to Figure 2.3). The areas within which these authorised facilities are planned do not infringe on any identified areas of high sensitivity. The siting of these facilities, and consequently that of the Ilanga CSP 5 Project is considered to be acceptable from an environmental perspective at this broad level. This is to be confirmed through this EIA process.

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 wind and PV projects[5].

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

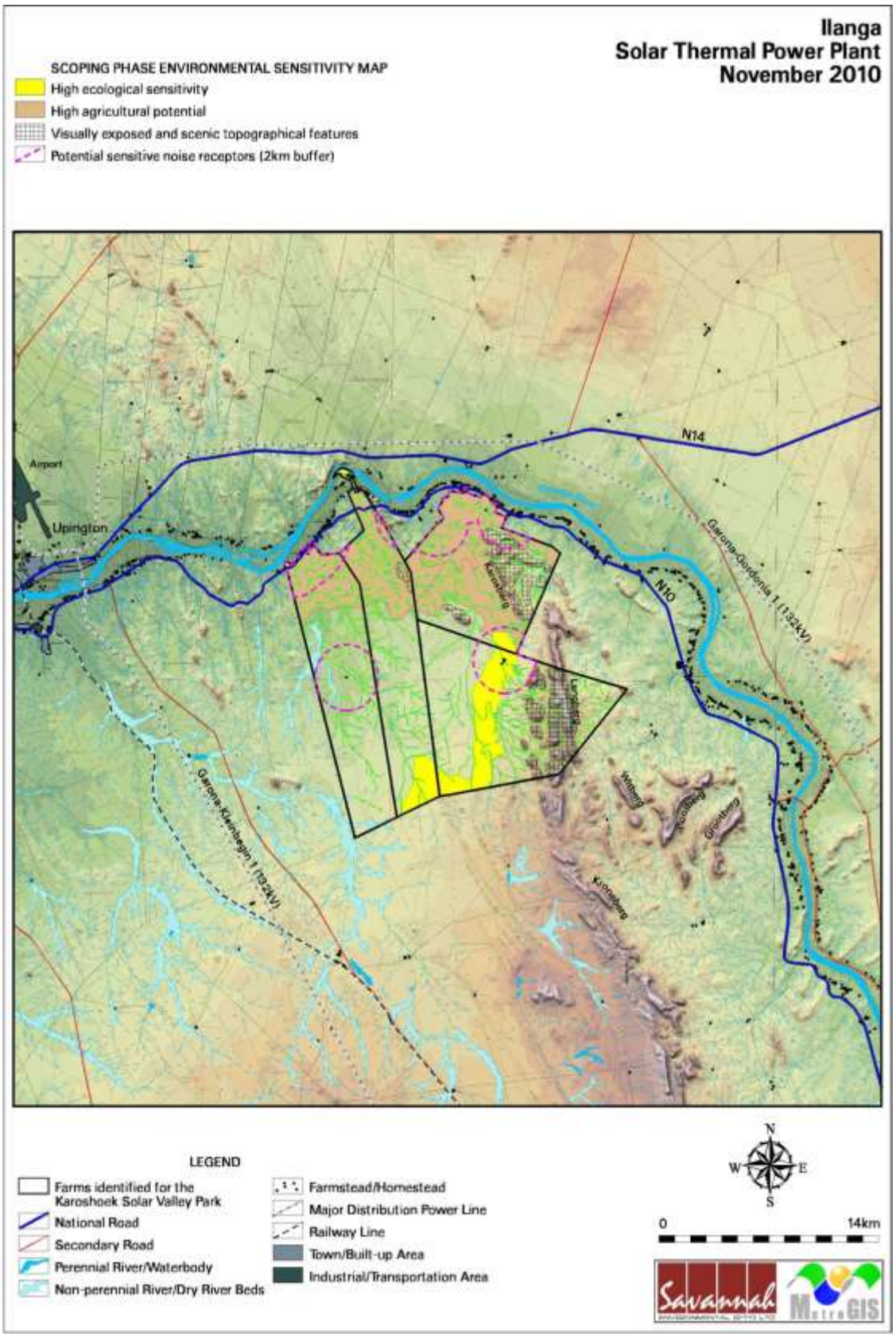


Figure 2.3: Environmental Sensitivity Map for the proposed Karoshoek Solar Valley Development east of Upington (Savannah Environmental, 2010).

Resource saving: It is estimated that the achievement of the targets in the Renewable Energy White Paper will result in water savings of approximately 16.5 million kilolitres per annum. As an already water-stressed nation, it is critical that South Africa engages in a variety of water conservation measures, particularly due to the detrimental effects of climate change on water availability. Renewable energy also translates into revenue savings, as fuel for renewable energy facilities is free while compared to the continual purchase of fuel for conventional power stations. Results of a CSIR Energy Centre study for January – June 2015 (CSIR, August 2015) have quantified the contribution from renewable energy to the national power system and the economy over the first 6 months of 2015 compared to the 12 months of 2014:

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

Exploitation of 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 resource within South Africa and competitive procurement processes, both concentrated solar power and solar PV power are now proven in South Africa as 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[6].

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).

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 the Ilanga CSP 5 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:

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

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 site.

The siting of the initial facilities within the broader Karoshoek Solar Valley Development considered various critical criteria (as discussed in Section 2.2.1), including the sensitivity of the broader site in order to inform the positioning of these facilities (refer to Figure 2.3), as well as provincial and local planning in terms of renewable energy development. The areas within which these authorised facilities are planned do not infringe on any identified areas of high sensitivity defined in this initial study. 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 for solar development. The siting of these facilities, and consequently that of the Ilanga CSP 5 Project is considered to be acceptable from an environmental perspective.

As the Ilanga CSP 5 Project is req4ired to be located immediately adjacent to the authorised Karoshoek LFT Site 1.3 (1 x 100 MW Parabolic Trough) in order to facilitate the development of a 150MW CSP facility (as required by the DoE), no feasible or reasonable site alternatives are available for consideration for this project. In addition, as the site location is constrained by other authorised facilities within the broader Karoshoek Solar Valley Development and environmentally sensitive areas (such as drainage lines on the site), no feasible local siting alternatives were identified.

2.3.2. Layout and Design Alternatives

A broader study area of approximately 5400ha is being considered, within which the development footprint for the Project of approximately 200 ha in extent would be appropriately located. The site can adequately accommodate the contracted capacity proposed 150MW CSP Project with a footprint of 700ha (proposed facility and authorised facility), as required under the DoE's REIPPPP programme. 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 and taking the location of the authorised facilities into consideration. The environmental sensitivities (ecological and heritage sensitivities)

identified during the scoping phase have informed the layout of the proposed facility (Refer to Figure 2.4). All identified sensitivities and their associated buffers were excluded from the proposed development. Therefore no layout alternatives were considered.

2.3.3. 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, as well as the proximity to authorised CSP facilities utilising the same technology.

Trough technology has been identified as the preferred technology as this project will be constructed together with the adjacent site which has been authorised for trough technology, i.e. the same technology must be used. In addition, dry cooling technology will be implemented as is the case for the authorised project. Therefore no technology alternatives have been considered for the project.

2.3.4. 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 5 Project will require 300 000m^3 - 400 000$m^3$of water per annum. During its 3 year construction phase 240 000m^3 per annum will be required. The following alternative water sources were considered:

» Piping water from the //Khara Hais 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 indicated that water could be available from the Orange River for the project (refer to letter dated 28 July 2015 contained in **Appendix F-1**). 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 for this project and is assessed within this EIA Report.

2.3.5. The 'Do-Nothing' Alternative

The 'do-nothing' alternative is the option of not constructing the proposed Ilanga CSP 5 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 5 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 2 of this Scoping 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.

The "do nothing" option is further assessed within this EIA Report.

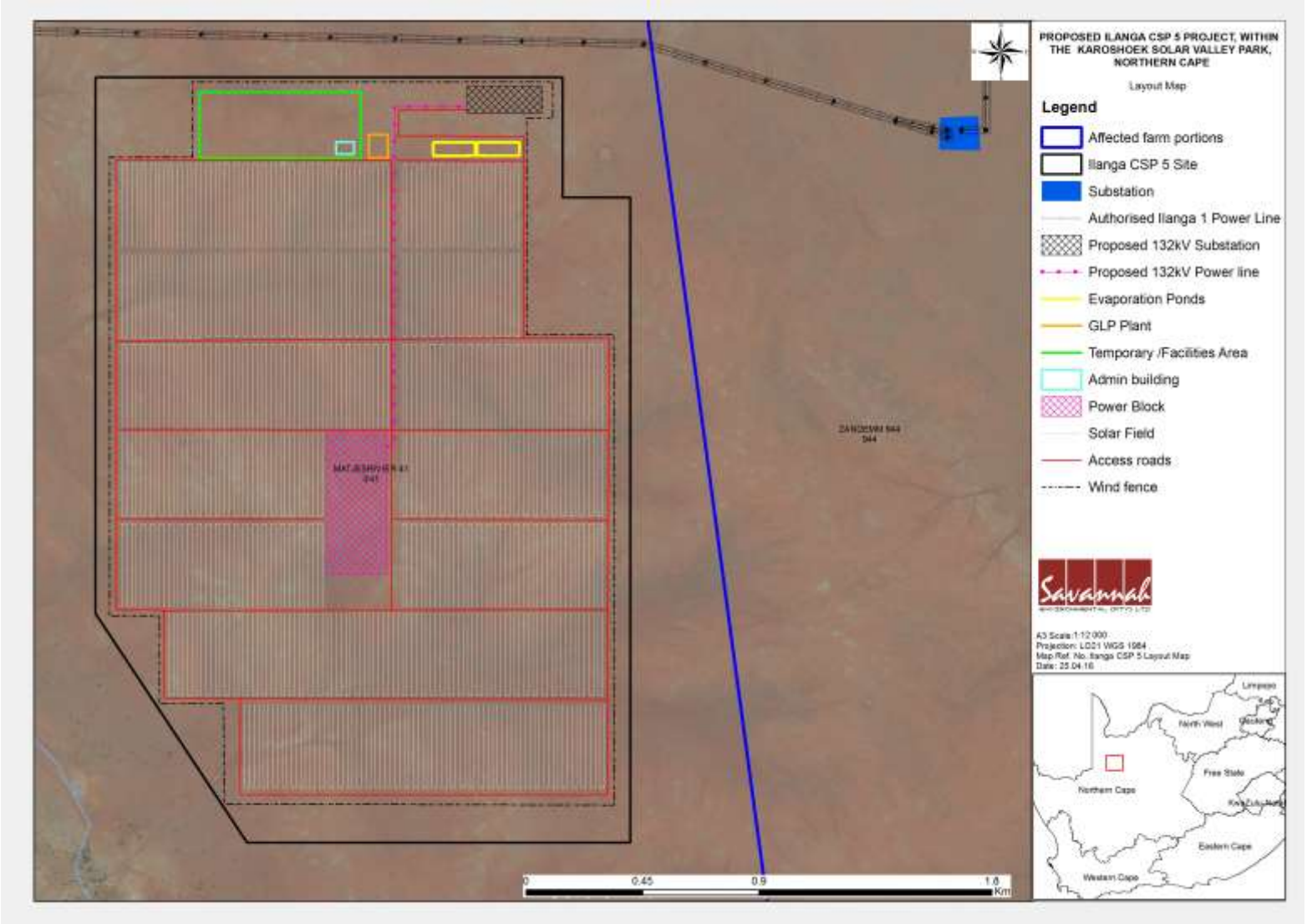


Figure 2.4 Proposed layout for the proposed Ilanga CSP 5 Facility in the Northern Cape Province

2.4. Concentrated Solar Power as a Power Generation Technology

2.4.1. What is a Parabolic Trough?

The pivotal component of this technology is the solar collector assembly (SCA) which consists of parabolic troughs (i.e. the reflectors) and cylindrical tubes (i.e. the receivers) which run in the focal line of the parabola (refer to Figure 2.4). The reflectors are made of mirrored glass panels which are supported by a truss system that gives the SCA its structural strength. Each SCA tracks the sun on a one-axis basis through an installed drive system thereby allowing for maximum generation capacity as the sun's trajectory changes on a daily and seasonal basis. The reflectors receive the incoming solar radiation and accurately concentrate it onto the receiver tube which is a highly efficient heat collection element. The heat is absorbed by the heat transfer fluid (HTF) (i.e. oil, or molten salt) which flows within the receivers and transfers the absorbed heat from the solar field to the power block of the solar facility in a closed circuit.

2.4.2. Functionality of the proposed Parabolic Trough facility

The functionality of the proposed CSP facility is briefly discussed below as six steps (refer to Figure 2.7).

» *Step 1 - t*he solar radiation is concentrated by the mirrors onto the receiver tube (refer to Figure 2.5) which contains the heat transfer fluid. The solar collectors track the sun during the progression of the day in order to maximise the solar energy yield.
» *Step 2* - the HTF is heated and circulated through the solar field via a series of metal pipes which run aboveground (refer to Figure 265).
» *Step 3* - heat exchangers transfer the thermal energy from the HTF to the water steam cycle.
» *Step 4* - cooled HTF is returned to the solar field to repeat the cycle.
» *Step 5:* the water steam cycle transfers the thermal energy to the steam turbine generator which converts the thermal energy to electric power

Figure 2.5: The top photograph illustrates the pipes conveying the heat transfer fluid and the bottom photograph illustrates the parabolic troughs together with the receiver tube (Source: Siemens AG)

Figure 2.6: The pipes lain between the troughs convey the heat transfer fluid (Source: Siemens AG)

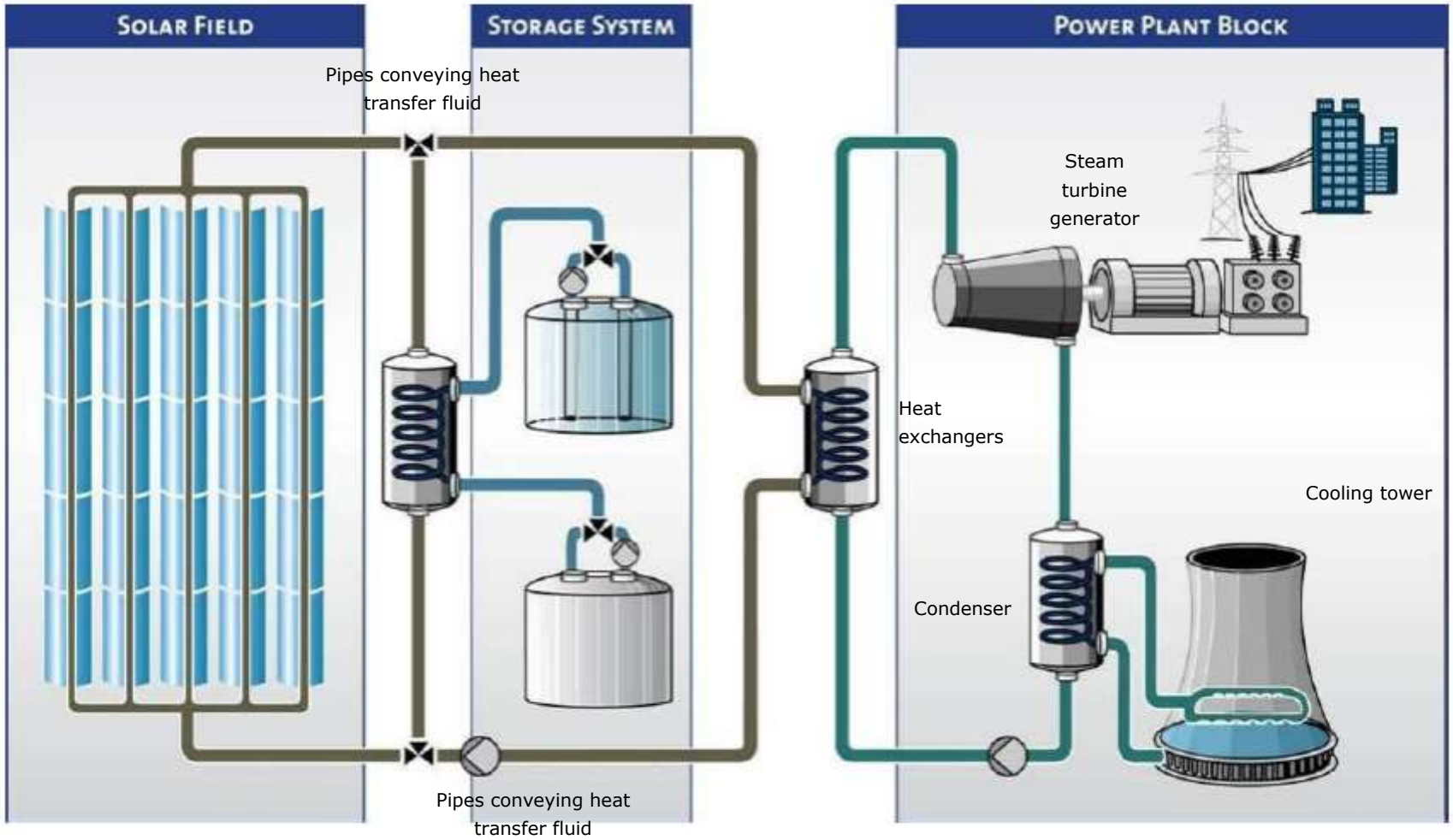


Figure 2.7: Schematic diagram of concentrating solar plant utilising parabolic trough technology with storage

» *Step 6* - dry cooling will be employed, whereby an air cooled condenser is used to condensate the exhaust steam from the steam turbine. The condensed water is then circulated back to the heat exchangers to repeat the water-steam-cycle. In terms of waste production there is no difference to a conventional power plant with dry cooling, except for the waste produced from the usage of fossil fuel.

During sunlight hours the surplus heat of the solar field is charged into the hot molten salt tank. A partial mass flow of hot HTF coming from the solar field flows through the heat exchanger and transfers its heat to the so called "cold" molten salt until the salt reaches the "hot" tank temperature. Vice versa during the night or in low irradiation periods the stored hot molten salt is discharged, to heat up the cold HTF in order to supply the heat demand of the power plant's steam generator. In case that the incident irradiation on the solar field is not sufficient to provide enough heat for the steam generator and the hot storage tank is not fully discharged the plant would be operated in hybrid mode (solar field + TES). In this way short periods of non-stable irradiation (clouds) or other significant disturbances in the solar field can be compensated and constant electrical output from the power plant is assured.

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 - the geology and topography of the development footprint will be surveyed. 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 will consider any environmental sensitivity identified during the EIA Phase investigations and will need to be confirmed in line with the Environmental Authorisation issued for the Project.

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 17 km internal tarred 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)[7] 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.

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

Construct Power Island and Substation

A steam turbine and generator will be housed within a 2-storey building (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.

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 location and number will be determined during the EIA phase.

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 5 Project[8]

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 extraction 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

[8] It should be noted that water infrastructure associated with the proposed development will be assessed under a separate basic assessment process.

Table 2.2: Estimated water consumption for one 50MW CSP Plant

Description: consumption	**Approximate annual use (m^3/year)**	**Approximate annual use (m^3/year)**
	50MW	150MW
Raw water consumption	Up to 133 000	Up to 400 000
Description: water uses	**Approximate annual use (m^3/year)**	**Approximate annual use (m^3/year)**
Mirror washing	27 000	80 000
Boiler makeup	20 000	60 000
Potable and other	3 000	9 000
Evaporation losses	29 000	85 000
Wastewater to evaporation ponds	Up to 50 000	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 weekand has the ability to operate 24/7 (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
Fossil fuel to start up		*Negative outputs:* Limited exhaust fumes / CO_2
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 240 000m^3 of water 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

Site Operation and Maintenance

It is anticipated that a full-time security, maintenance and control room staff will be required on site. Each component within the solar thermal plant will be operational except under circumstances of mechanical breakdown, unfavourable weather conditions or maintenance activities.

Non-hazardous solid wastes (maintenance-derived wastes) will be recycled to the extent practical. Those maintenance-derived wastes that cannot be recycled will be transported for disposal at an appropriate landfill.

Evaporation Ponds

Up to 5 evaporation ponds (over a total of 5ha) will be required for the facility. The purpose of the evaporation ponds is to receive the water discard stream from the generation process. The evaporation ponds will be located on the site and within the development footprint. The proposed facility will be operated as a Zero Liquid Effluent Discharge (ZLED) facility; therefore no wastewater from the evaporation ponds will be permitted to be released into the environment or any water bodies. Each pond will have a surface area of approximately 1ha and be 1.8m deep including free board. A picture of a typical evaporation pond required for a CSP Plant is shown in **Figure 2.8**.

Figure 2.8 Photograph of a typical lined evaporation pond utilised for a CSP Plant

2.5.4 Decommissioning Phase

The CSP Project is expected to have a design lifespan of approximately 20-25 years (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. The site will be rehabilitated and can be returned to the agricultural or other beneficial land-use.

Future plans for the site and infrastructure after decommissioning

At the end of the CSP facility operational life span, the developer will commence with the dismantling phase of all structures to re-establish the original condition of the site before the CSP facility installation. All equipment will be recycled. All elements which cannot be recycled like concrete mounting structures foundation (if any) will be dumped into authorized dump. Then, the restoration of the site to the original condition will be completed by removing all residual materials like concrete fragments etc. as well as removing all transporting means form the site. All these activities need to be carried out according to the local/national prescription related to the waste disposal regulation.

REGULATORY AND PLANNING CONTEXT CHAPTER 3

3.1. Strategic Electricity Planning in South Africa

The need to expand electricity generation capacity in South Africa is based on national policy and is informed by 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 CSP facilities 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 5 Project.

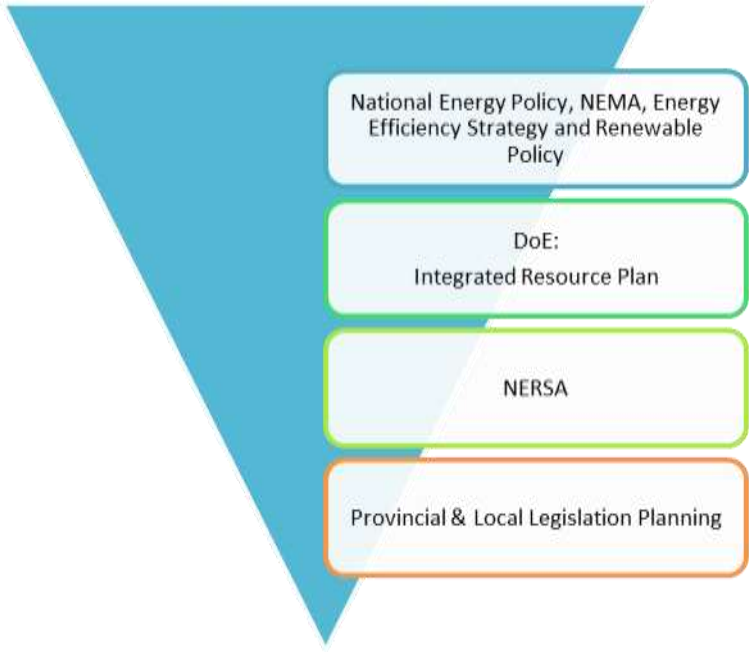


Figure 3.1: Hierarchy of electricity policy and planning documents

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 Municipality and the ZF Mgcawu 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.

3.2. National Policy and Planning

Further to the South African government's commitment in August 2011 to support the development of 3,725 MW 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 managed to secure a total of 5 237 MW of renewable energy capacity across 4 bidding windows. An announcement was made in June 2015 by the DoE to procure a further 1 800 MW of renewable energy capacity (including 450 MW from CSP technology) in an Expedited round (Round 4.5).

3.2.1 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 energy facility) 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.

3.2.2. 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.

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.

3.2.3 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.

3.2.4. 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.

3.2.5. 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 5 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.

3.2.6. 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.

3.2.7. 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.

3.2.8. 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.

3.2.9. Strategic Integrated Projects

The South African Government adopted a National Infrastructure Plan in 2012 with the objective that government aims to transform South Africa's economic landscape whilst simultaneously creating significant numbers of new jobs, and strengthening the delivery of basic services. The plan also supports the integration of African economies. Socio-economic issues identified within the National Development Plan were placed under 18 different Strategic Integrated Projects (SIPs) to address the spatial imbalances of the past by addressing the needs of the poorer provinces and enabling socio-economic development. The SIPs cover social and economic infrastructure across all nine provinces (with an emphasis on lagging regions). The SIPs include catalytic projects that can fast-track development and growth.

Amongst these is SIP 8 - *Green energy in support of the South African economy).* This SIP aims at supporting sustainable green energy initiatives on national scale through a diverse range of clean energy options as envisaged in the Integrated Resource Plan (IRP, 2010). The proposed ILANGA CSP 5 PROJECT falls within the ambit of this SIP.

3.2.10. 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 5 project 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**.

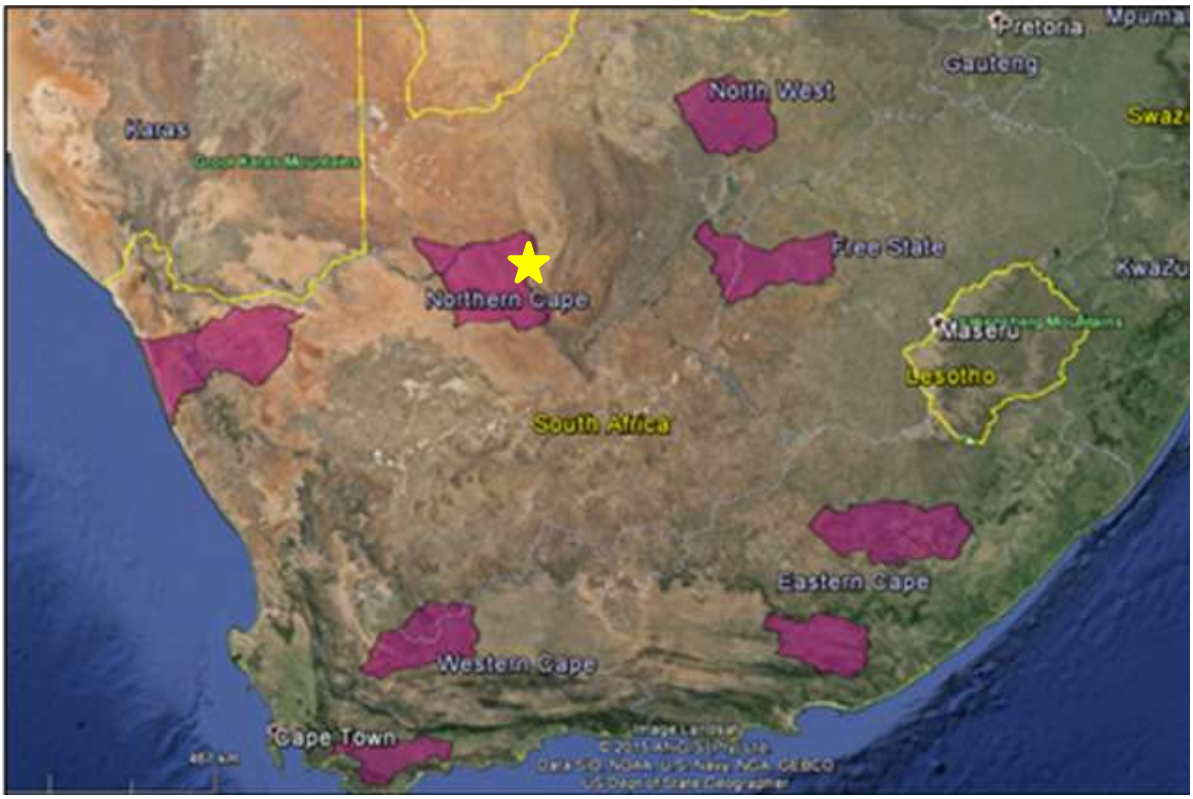


Figure 3.2: Renewable Energy Development Zones (REDZ) (CSIR 2014), Ilanga CSP 5 (shown by the yellow star) falls within REDZ 7.

3.3. Provincial and Local Level Developmental Policy

3.3.1 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.

3.3.2 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 indicated 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.

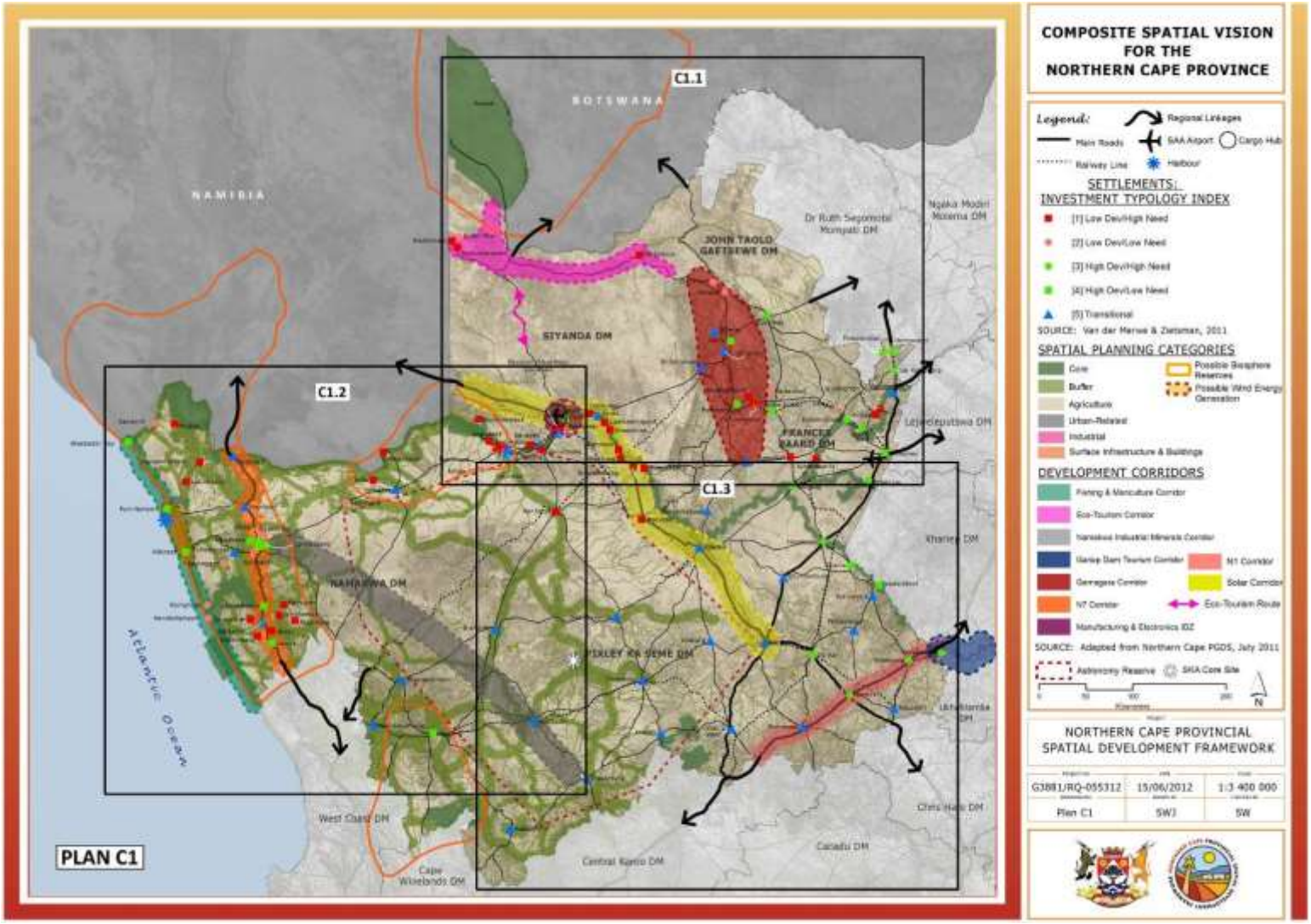


Figure 3.3: Development regions and corridors of the Northern Cape (Source: Northern Cape PSDF 2012)

3.4. 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).

3.4.1 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.

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) (2013-2014)

The Siyanda 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.

3.4.3 //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 (KPA's) 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.

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

The main access routes to //Khara Hais Municipality 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 /Khara Hais 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 //Khara Hais Municipality to consider non-agricultural development to be undertaken on 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. Relevant legislative permitting requirements

Table 3.1 overleaf provides an outline of the legislative permitting requirements applicable to the ILANGA CSP 5 Project as identified at this stage in the project process.

Table 3.1: Relevant legislative permitting requirements applicable to the proposed Ilanga CSP 5 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.	» National Department of Environmental Affairs – lead authority » NC DENC - commenting authority	The listed activities triggered by the proposed CSP 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 project holistically, and to consider the cumulative effect of a variety of impacts.	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.
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

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
			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 will be applied for 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	» Department of Water and Sanitation (as regulator of NWA)	This section will apply throughout the life cycle of the project.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	of pollution to water resources from occurring, continuing, or recurring.		
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 failed to comply with the Act.	» 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.
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	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.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	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).		
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. » 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	» 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. 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
	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.		
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.
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	Department of Agriculture, Forestry and Fisheries (DAFF)	A licence is required for any removal of protected trees (*Brachystelma*

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	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'.		*huttonii* (Rare) and *Pelargonium reniforme* subsp. *Reniforme (*Listed species that are known to occur in the area, but which were not observed on site)).
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	» 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
	substances and products. » Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc, nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared 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	» 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

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	culverts. » The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.		specified dimensional limitations (height and width).
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	» National Department of 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
	(a) the containers in which any waste is stored, are intact and not corroded or in any other way rendered unlit for the safe storage of waste; *(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 species found on site. .

Table 3.2: Standards applicable to the Ilanga CSP 5 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:

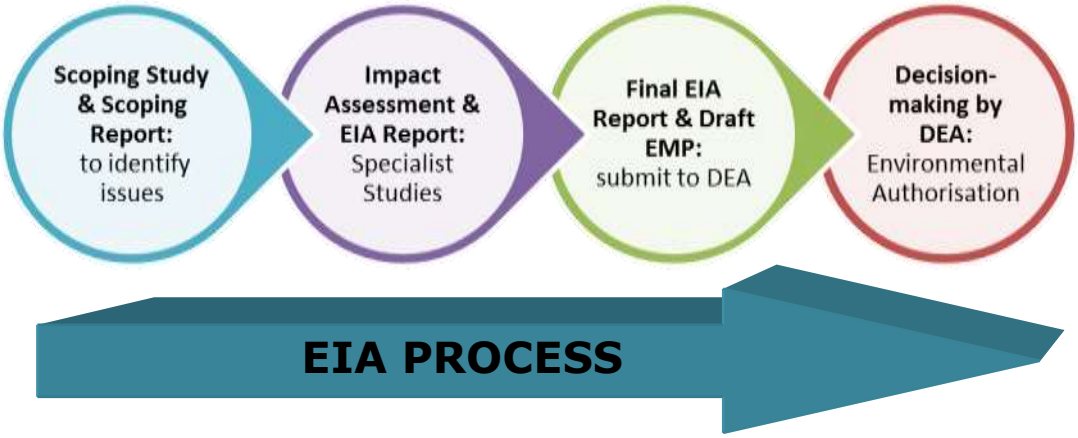


Figure 4.1: The Phases of an EIA Process

The EIA process for the proposed Ilanga CSP 5 Project is being undertaken in accordance with sections 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. The environmental studies for this proposed project were undertaken in two phases, in accordance with the EIA Regulations.

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 5 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	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 associated with the CSP facility will be constituted within or within 32 m of a non-perennial stream***
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	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 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 Facility will consist of a CSP facility utilising trough technology with a generation capacity of up to 50MW.***
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

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
		emissions, pollution or effluent. ***A water use license will be required for the discharge of wastewater to the evaporation dams.***
GN 984, 08 December 2014	4	The development of facilities or infrastructure, for the storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 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 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 vegetation of an area greater than 20 hectares.***

On the basis of the above listed activities, a Scoping and an EIA Phase is required to be undertaken for the proposed project. Accordingly, 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 affected parties and key stakeholders. Areas of sensitivity within the broader site are identified and delineated in order to identify any environmental fatal flaws, and sensitive or no go areas. Following a public review period of the draft report, this phase culminates in the submission of a final Scoping Report and Plan of Study for EIA to the DEA.
» 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 includes consideration of a proposed facility layout through detailed specialist investigations and public consultation. Following a public review period of the draft 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 DEA for review and decision-making.

4.2. Scoping Phase

A Scoping Report was released for public review from 13 November 2015 – 14 December 2015 for a 30-day comment period. Following the review period, a final scoping report was submitted to DEA in January 2016. This together with the Plan of Study for the EIA was accepted by the DEA, as the competent authority, in February 2016. In terms of this acceptance, an EIA 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 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, 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[9] 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.

[9] "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).

4.3.1. Tasks completed during the EIA Phase

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.
» 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 13 November 2015 – 14 December 2015.
» The Final Scoping Report for the proposed project was submitted in January 2016. The Scoping Report was accepted by DEA in February 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 22 April – 24 May 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 2 of the Farm Matjiesrivier (which is the shared access), in accordance with the requirements of the EIA Regulations. Further notices were placed at the Upington Public Library and at the Upington Police Station. 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 during the Scoping Phase

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 13 November 2015; and
* The Volksblad on the 20 November 2015.

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 23 April 2016; and
* The Volksblad on the 27 April 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.	November 2015
	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.	13 November 2015
	30-day review period for the Scoping Report for public comment.	13 November 2015 – 14 December 2015
	The EIA process and the availability of the Scoping Report for review was advertised in the Gemsbok and the Volksblad newspapers.	13 November 2015 20 November 2015
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.	18 April 2016
	The availability of the EIA Report and the date of the Public will be advertised in the Gemsbok and the Volksblad newspapers.	23 an 27 April 2016
	30-day review period of the EIA Report for public comment	22 Aril 2016 – 24 May 2016

	Open Day meeting to be held during the 30-day review period.	5 May 2016 2016

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

4.3.2. Assessment of Issues Identified through the EIA 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[10]	Ecology	Appendix D
Dr Rob Simmons of Bird and Bat Unlimited Environmental Consultants	Avifauna	Appendix E
Peter Kimberg of the Biodiversity company and Stuart Dunsmore of Fourth Element Consulting (Pty) Ltd	Water Resources Study	Appendix F
Jaco van der Walt of HCAC	Heritage	Appendix H
Garry Paterson of ARC: ISCW	Agricultural potential & Soils	Appendix I[11]
Jon Marshall of Afzelia Environmental Consultants & Environmental Planning and Design	Visual	Appendix J
Candice Hunter of Savannah Environmental (with external review by Neville Bews)	Social	Appendix K

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:

[10] 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.
[11] Note that this is a desk-top study.

- The lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1
- The lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2
- Medium-term (5–15 years) – assigned a score of 3
- Long term (> 15 years) - assigned a score of 4
- Permanent - assigned a score of 5

» The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
- 0 is small and will have no effect on the environment
- 2 is minor and will not result in an impact on processes
- 4 is low and will cause a slight impact on processes
- 6 is moderate and will result in processes continuing but in a modified way
- 8 is high (processes are altered to the extent that they temporarily cease)
- 10 is very high and results in complete destruction of patterns and permanent cessation of processes

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

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

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

» The degree to which the impact can be reversed

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

» The degree to which the impact can be mitigated

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

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

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

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

» **< 30 points:** Low (i.e. where this impact would not have a direct influence on the decision to develop in the area)
» **30-60 points:** Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated)
» **> 60 points:** High (i.e. where the impact must have an influence on the decision process to develop in the area)

As the developer has the responsibility to avoid or minimise impacts and plan for their management (in terms of the 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**.

4.3.3. Assumptions and Limitations

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

» All information provided by the developer and I&APs to the environmental team was correct and valid at the time it was provided.
» It is assumed that the development site identified by the developer represents a technically suitable site for the establishment of the proposed CSP Facility.
» It is assumed correct 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 – J** 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 pre-construction 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 – J**.

5.1 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 within the ZF Mgcawu (Siyanda) District and //Khara Hais Local Municipalities, of which the latter has Upington as its main town. Upington 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. 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 despite the large volumes of heavy vehicle traffic sometimes experienced on the main routes. Industrial infrastructure includes the Upington Airport[12], transmission, and distribution power lines (e.g. the Garona-

[12] 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

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 (both proposed and under development). 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.

5.2 Climatic Conditions

The Northern Cape is characterised by an arid climate with summer rainfall with a long-term average annual rainfall in the region of 175 mm, of which 81% falls between November and April. Rainfall events are erratic, both locally and seasonally and therefore cannot be relied on for agricultural practices (refer to Figure 5.1). The average evaporation is 2 375 mm per year, peaking at 11.2 mm per day in December. Temperatures vary from an average monthly maximum and minimum of 35ºC and 18.7ºC for January to 20.8ºC and 3.3°C for July respectively. Frost occurs most years on 6 days on average between mid-June and mid-August.

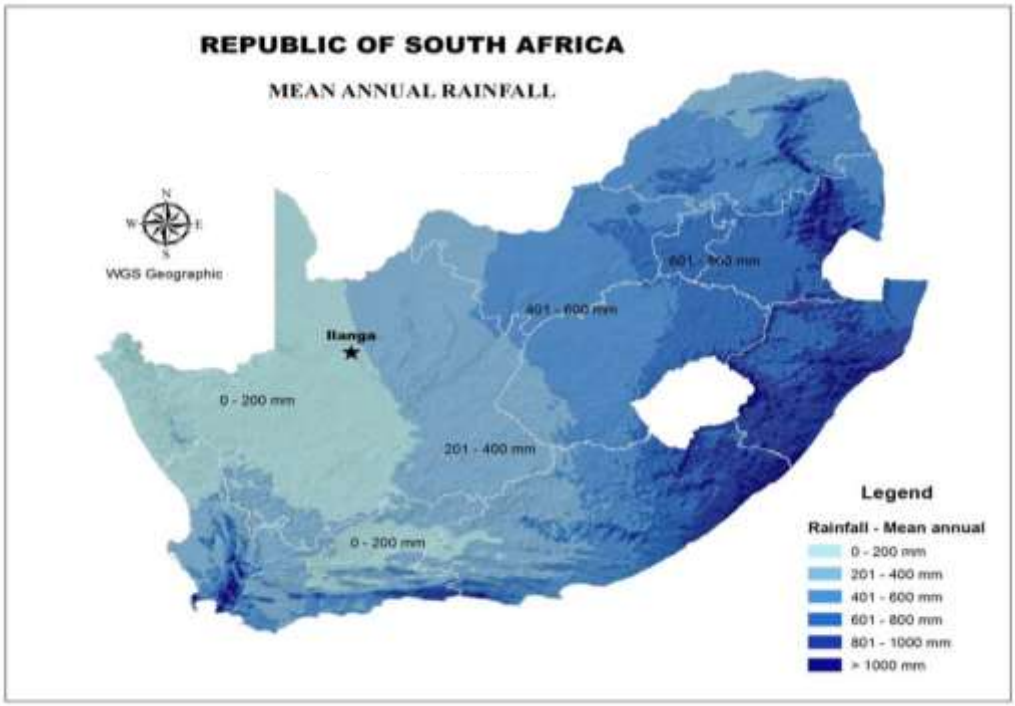


Figure 5.1: Rainfall map of South Africa indicating the survey site

Zone (IDZ) at the airport has been proposed to further enhance its strategic importance for the local, regional and provincial economy.

5.3 Topographical Characteristics

There is a range of steep hills running in a north-south direction along the eastern part of the site and a series of scattered hills in the central northern part of the site. The elevation on site varies from 820 to 950 m above sea level on the plains over a distance of 18 km, a gradient of approximately 1:140. The hills peak at 1008 m above sea level (Karosberg) to 1127 m above sea level (Boesmansyfer). The site for the proposed development is relatively flat.

The Weinert Climatic N-number for the area, which is between 40 and 50, indicates that the climate is extremely arid and mechanical weathering processes are dominant. Mean annual precipitation for this region is less than 200mm and the annual potential evaporation is in excess of 2500mm.

5.4 Biophysical Characteristics of the Study Area

5.4.1 Aquatic Profile

The project area is situated in the Northern Cape Province east of Upington. The proposed development is situated to the south of the Gariep River with a proposed abstraction point that is situated on the Gariep River approximately 25 km upstream of Upington. The project area is situated in the Lower Orange Water Management Area (WMA) (refer to **Figure 5.2**).
The CSP facility overlaps four 1:50 000 topographical grid squares, namely 2821AD, 2821BC, 2821CB and 2821DA. The proposed water abstraction point is situated in grid square 2821AD.

The project area is situated primarily in the Nama-Karoo Bioregion and the Nama Karoo Ecoregion. The project area overlaps with 4 vegetation units namely:

» Kalahari Karroid Shrubland (NKb 5);
» Bushmanland Arid Grassland (NKb 3);
» Gordonia Duneveld (SVkd 1); and
» Lower Gariep Broken Veld (NKb 1).

The main drainage line associated with the Ilanga CSP 5 facility is the Orange River which is situated to the north of the project area. A proposed water abstraction point is situated on the Orange River. 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. 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 and streams, only the Orange River is perennial and the smaller tributaries are likely only to flow for brief periods after rainfall events.

5.4.2 Hydrology

The planned abstraction point is on the Lower Orange River and is approximately 28km upstream of Upington. The Orange River is the largest catchment in South Africa (**Figure 5.4**) and at the abstraction site the catchment area is approximately 365 000 km^2, thought 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 Gariep River above the confluence with the Vaal River (**Figure 5.4**). These have the effect of reducing normal flow variability, and particularly damping small floods. As a result the 2-year flood event at Upington (680 cumec) is less than half its natural value which would have been above 1500 cumec.

The location of the abstraction point is shown in **Figures 5.5** and **5.6**. **Figure 5.5** provides an overview of the river system at this point. It is at a location where the main channel becomes increasingly more branched. Further upstream of the abstraction point the river is predominantly a single channel typically between 80 and 140m wide. There are locations where granite sills emerge to force the channel to break up but these are over relatively short distances. Below the abstraction point the morphology of the river changes substantially. The river branches into main sub-channels over large distances and major islands form.

Many of the islands within the river are formed as a result of sediment deposition behind granite and gneiss outcrops and over time these alluvial plains have drawn the attention of farmers who saw potential in the fertile lands next to a reliable water source. With the development of agriculture into a major part of the economy of the region, the efforts to control floods increased. Many parts of the floodplain and islands are now protected by flood levees which have an effect on the hydraulic behaviour of the river system. The result is deeper flows and higher velocities in the main channels during the smaller floods, and therefore a potential impact on the sediment movement within the river and on the ecology itself. Added to this the reduced opportunity for sediment deposition on the islands (except in the very large events), and the likely changing patterns of sediment loads with the regulated flows from the upstream dams, the potential effect on the instream ecology could be significant.

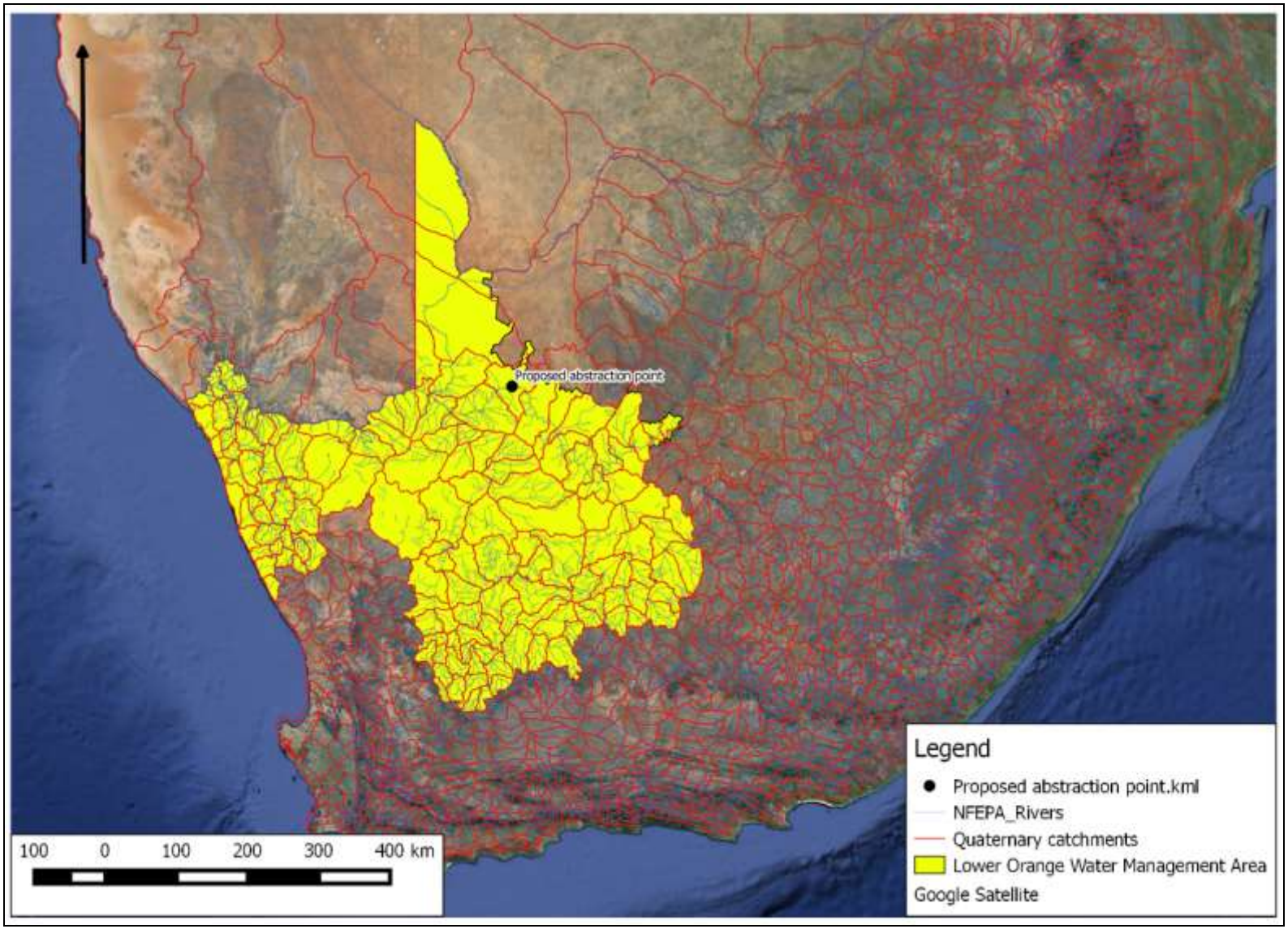


Figure 5.2: Map showing the regional location of the Karoshoek Solar Valley Development in the Northern Cape and the Lower Orange Water Management Area

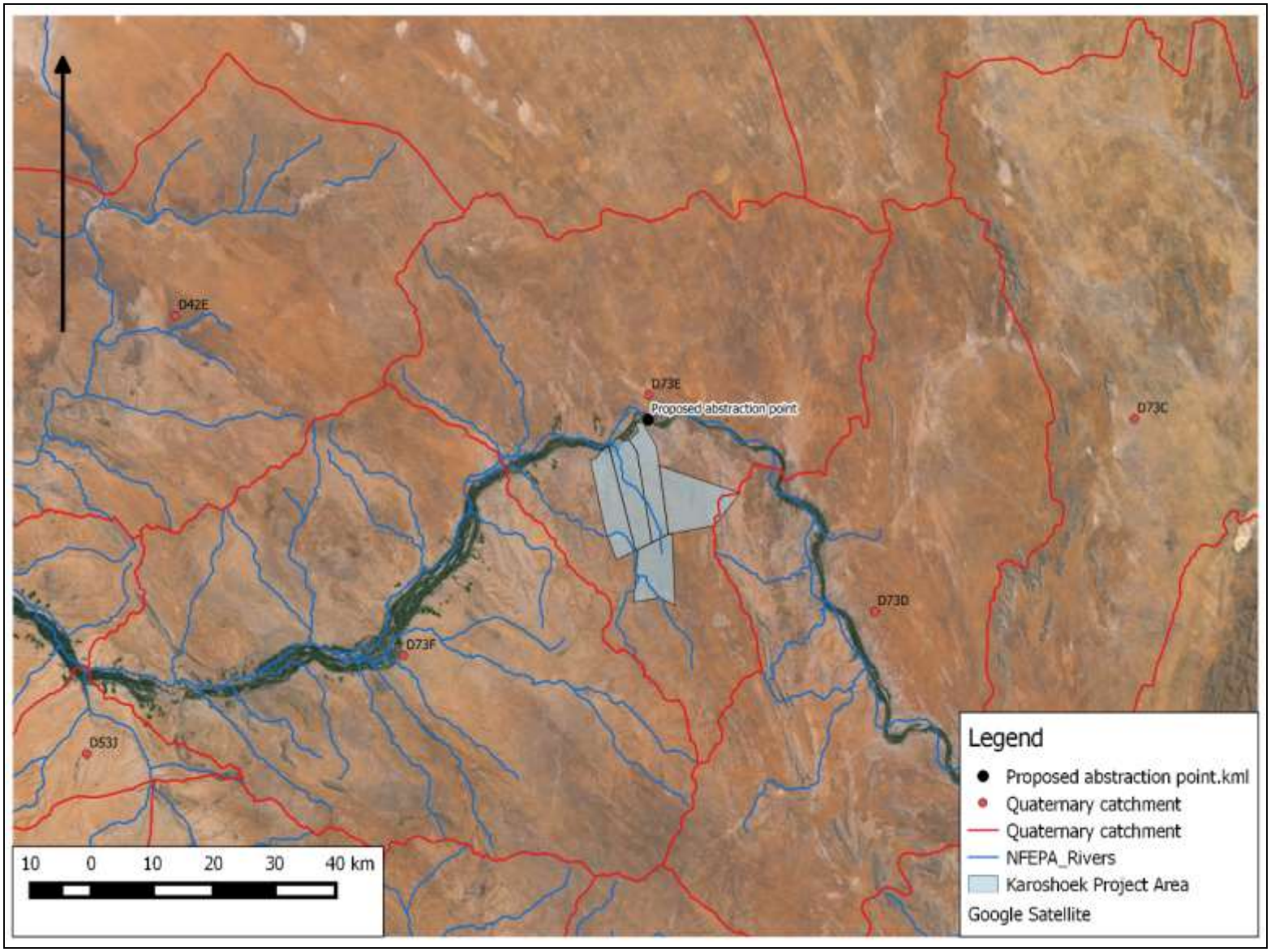


Figure 5.3: Proposed project area showing the location of the proposed abstraction point on the Gariep River

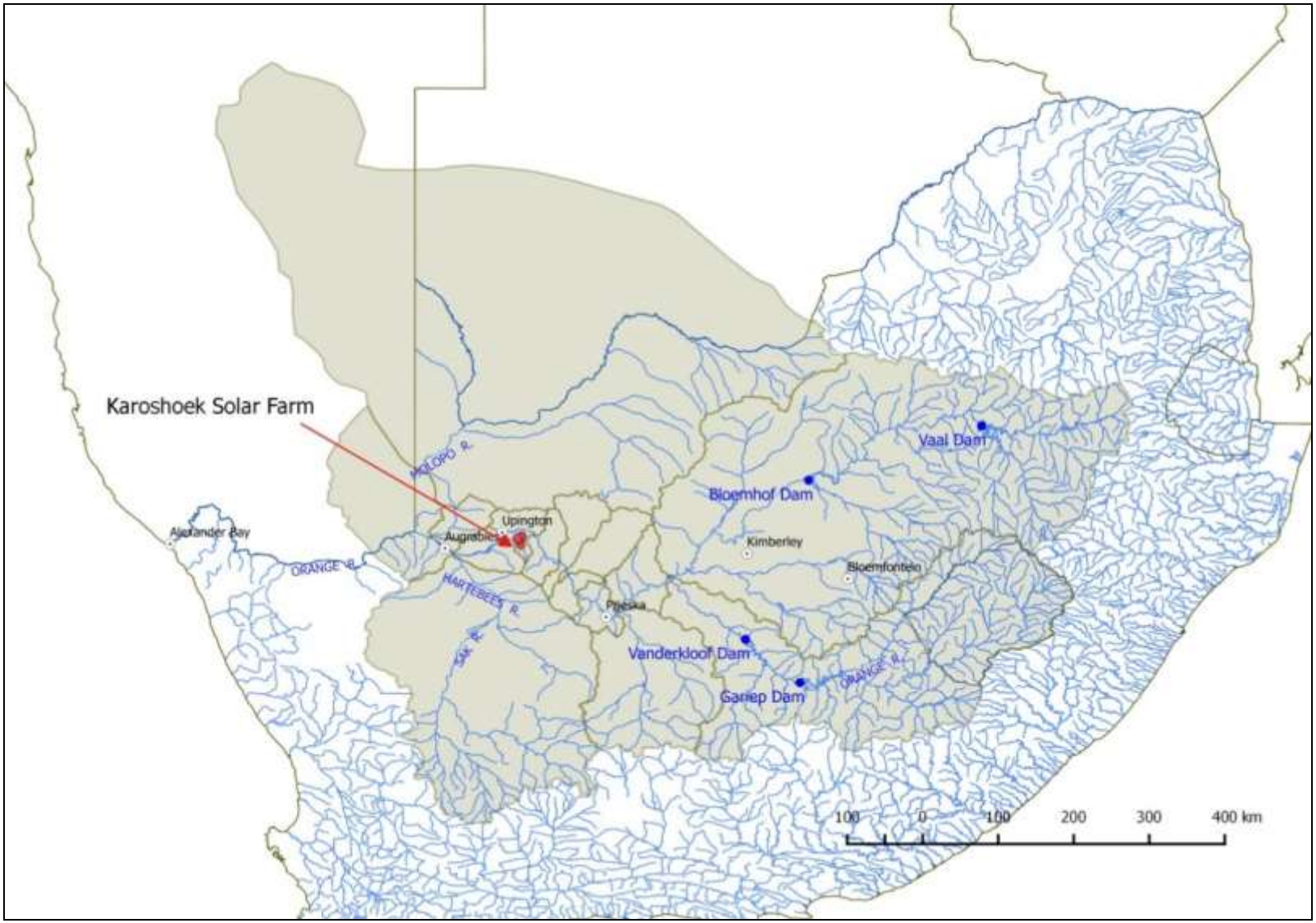


Figure 5.4: Catchment of the Lower Orange River

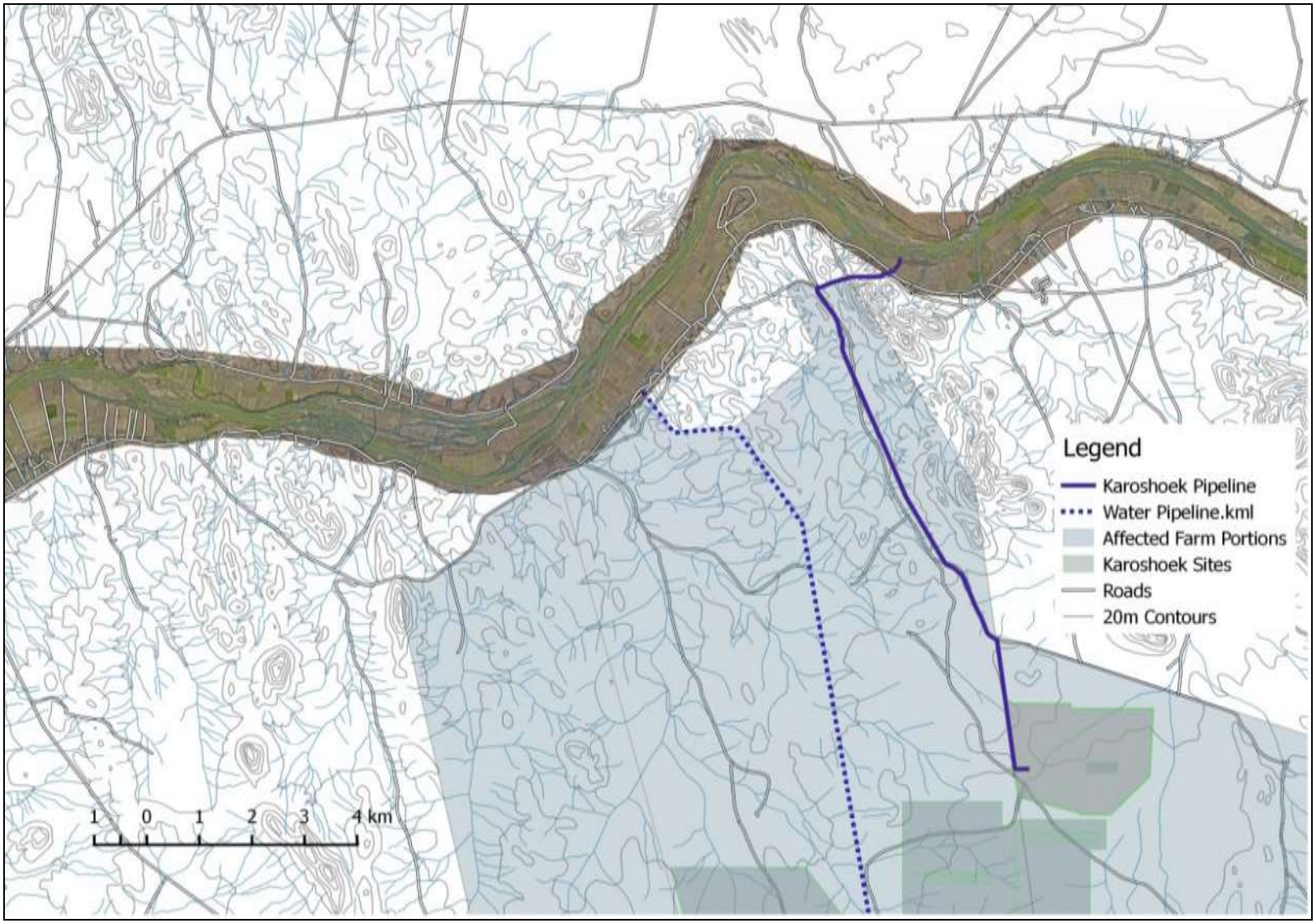


Figure 5.5: Overview of the river system at the site of the Karoshoek Solar Park with an indication of the authorised and proposed pipelines (solid and dotted blue lines)

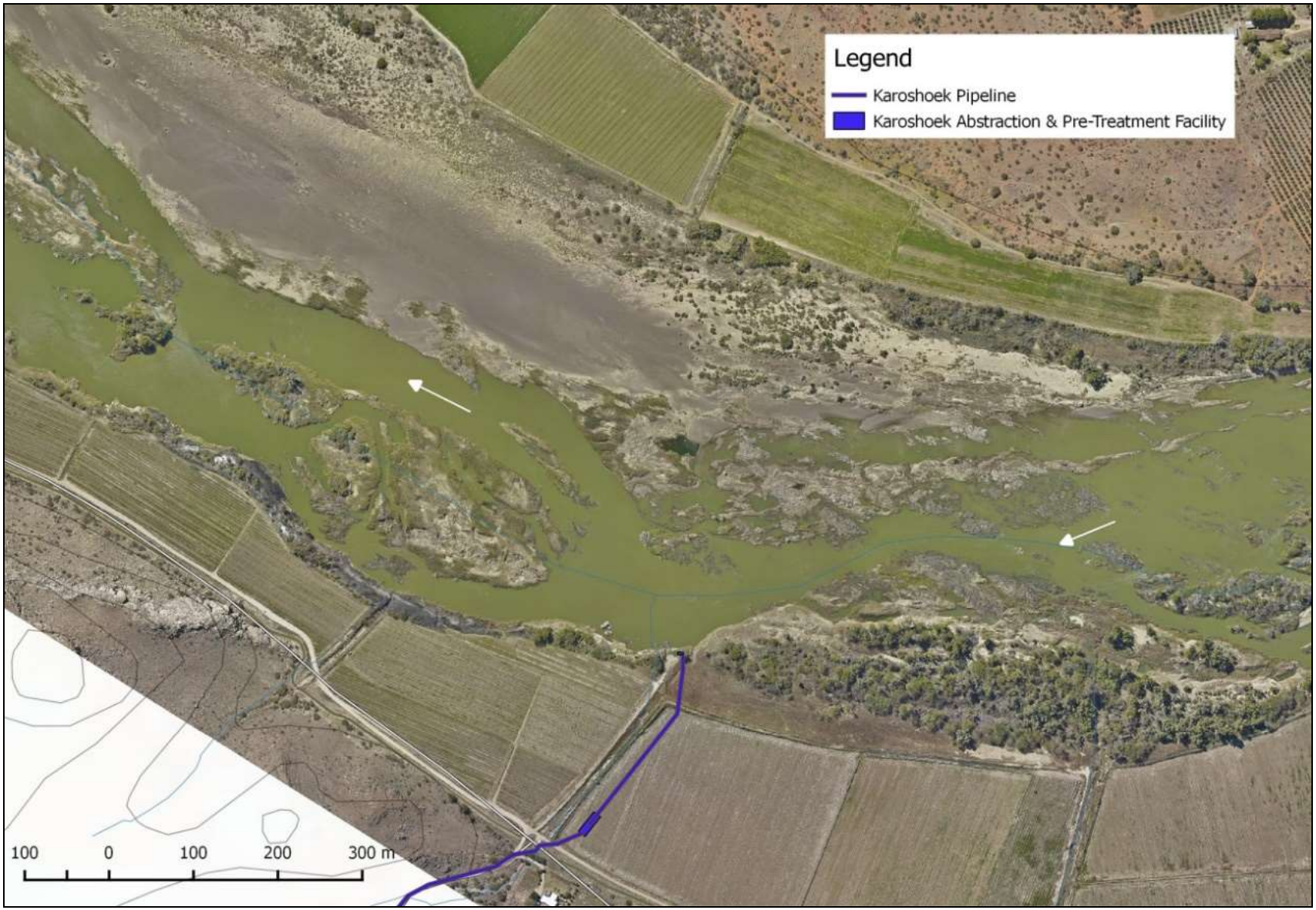


Figure 5.6: Location of one of the proposed abstraction point on the Lower Orange River

5.4.3 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[13] 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 broader study area. The sand cover is likely to be thickest in the southern lowland areas.

5.4.4 Soils and Agricultural Potential

There are a variety of land types within the study area, i.e. Ic, Ae, Af, and Ag land types. The most common land types in the study area are Ae and Ag (Land Type Survey Staff, 1987).

The A-group of land types refer to yellow and red soils without water tables belonging to one or more of the following soil forms: Inanda, Kranskop, Magwa, Hutton, Griffin, and Clovelly. The Ae land type consists of red, high base status, > 300 mm deep soils, and no dunes (MacVicar et al. 1974). These occur primarily in the northern half of the site and in a band down the western side of the chain of hills. The Af landtype, occurring in the south-central part of the site, consists of red, high base status, > 300 mm soils with dunes (MacVicar et al. 1974). There are high concentrations of dunes on site within this map unit. The Ag land type consists of red, high base status soils, < 300 mm deep (MacVicar et al. 1974). These occur primarily in the south-western quarter and in some northern parts of the site.

The soils contained within land types Ae, Af and Ag can be soils of **high agricultural potential** if irrigation water is available. The low rainfall, however, inhibits dry-land

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

crop production. The following two land types have been identified within the study area:

Land type Ag5 covers the largest area of the project site. Red and yellow well-drained sandy soil with high base status may occur in places. Deeper Hutton soil forms occur which are clearly distinct from Mispah.

Land type Af25 is found east of the site. This land type is very similar to **Ag5** with the only real difference being that it has a larger percentage of deeper soils when compared to **Ag5**.

5.4.5 Ecological Profile

Vegetation

While there are a number of vegetation types within the broad area around the site, CSP 5 is restricted to the Bushmanland Arid Grassland vegetation type (Mucina & Rutherford 2006). Bushmanland Arid Grassland is an extensive vegetation type, being the second most extensive vegetation type in South Africa occupying an area of 45 478 km^2. It extends from around Aggeneys in the east to Prieska in the west. It is associated largely with red-yellow apedal (without structure), freely drained soils, with a high base status and mostly less than 300mm deep. Due the arid nature of the unit which receives between 70 and 200 mm annual rainfall, it has not been significantly impacted by intensive agriculture and more than 99% of the original extent of the vegetation type is still intact.

Within the site, the major driver of vegetation composition is soil depth, which is generally associated with landscape position. The low hills and higher-lying plains are gravelly in nature and dominated by shrubs such Zygophyllum dregeanum, Leucosphaera bainesii, Rhigozum trichotomum, Aptosimum spinecens, Barleria rigida, Boscia foetida and Phaeoptilum spinosum with forbs and succulents such as Euphorbia gariepina, Oropetium capense, Kleinia longiflora, Blepharis mitrata with grasses such as Enneapogon scaber, Stipagrostis obtusa, S.ciliata and S.uniplumis. However, these occupy a relatively small proportion of the site and majority of the site consists of in-filled flat-bottomed valleys on deeper red sands. These areas have a higher grass cover of species such as Stipagrostis ciliata, S.uniplumis, S.amabilis and Schmidtia kalahariensis. Trees and shrubs present in these areas include Boscia foetida, Boscia albitrunca, Parkinsonia africana, Phaeoptilum spinosum, Rhigozum trichotomum and Aptosimum albomarginatum. Forbs include Geigeria ornativa, Sesamum capense and Indigofera alternans var. alternans. Overall, the affected area is considered moderate to high sensitivity largely on account of the high density of protected tree species present across most of the site. The density of Boscia albitrunca and Boscia foetida subsp. foetida across the site is estimated at around 5 trees per hectare, which translates to the potential loss of as many as 3000 Boscia

trees across the 648ha development area. This is likely to result in an offset request from DAFF, as this exceeds the guideline for offset thresholds for protected trees in the Northern Cape.

Other vegetation types which occur in the area include Kalahari Karroid Shrubland, Lower Gariep Alluvial Vegetation, Lower Gariep Broken Veld and Gordonia Duneveld. Of these, Lower Gariep Alluvial Vegetation is of significance as it is listed as Endangered as at least half this unit has been transformed for agriculture and large additional tracts have been severely affected by alien invasion. This vegetation type is however 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. In addition, Lower Gariep Broken Veld is also considered sensitive at a broad level due to a high abundance of listed and protected species associated with this unit.

Protected and Listed Plant Species

Although the diversity of listed species at the site is low, the density of protected trees is high. Species of concern observed within the site includes Boscia albitrunca which is nationally protected, Hoodia gordonii which is red-listed, and a number of provincially protected species including Aloe claviflora, Adenium oleifolium and Boscia foetida subsp. foetida. Acacia erioloba is also present in the area but was not observed within the development area. As the site is large, some individuals of these species may be present but at a low density or as small plants, as they were not observed during the site visit even though the site is flat and open.

In terms of the actual likely numbers of individuals of protected species likely to be impacted by the development, the main impact would be on Boscia albitrunca and Boscia foetida and these occur at an estimated density of 5 trees/ha giving rise to the potential loss of many as 3000 or more trees from the full 600ha development area. This is certain to raise some concern from DAFF and should this site be development, engagement with DAFF and DENC regarding the loss of the trees will need to be entered into.

Red-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).

Red-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).

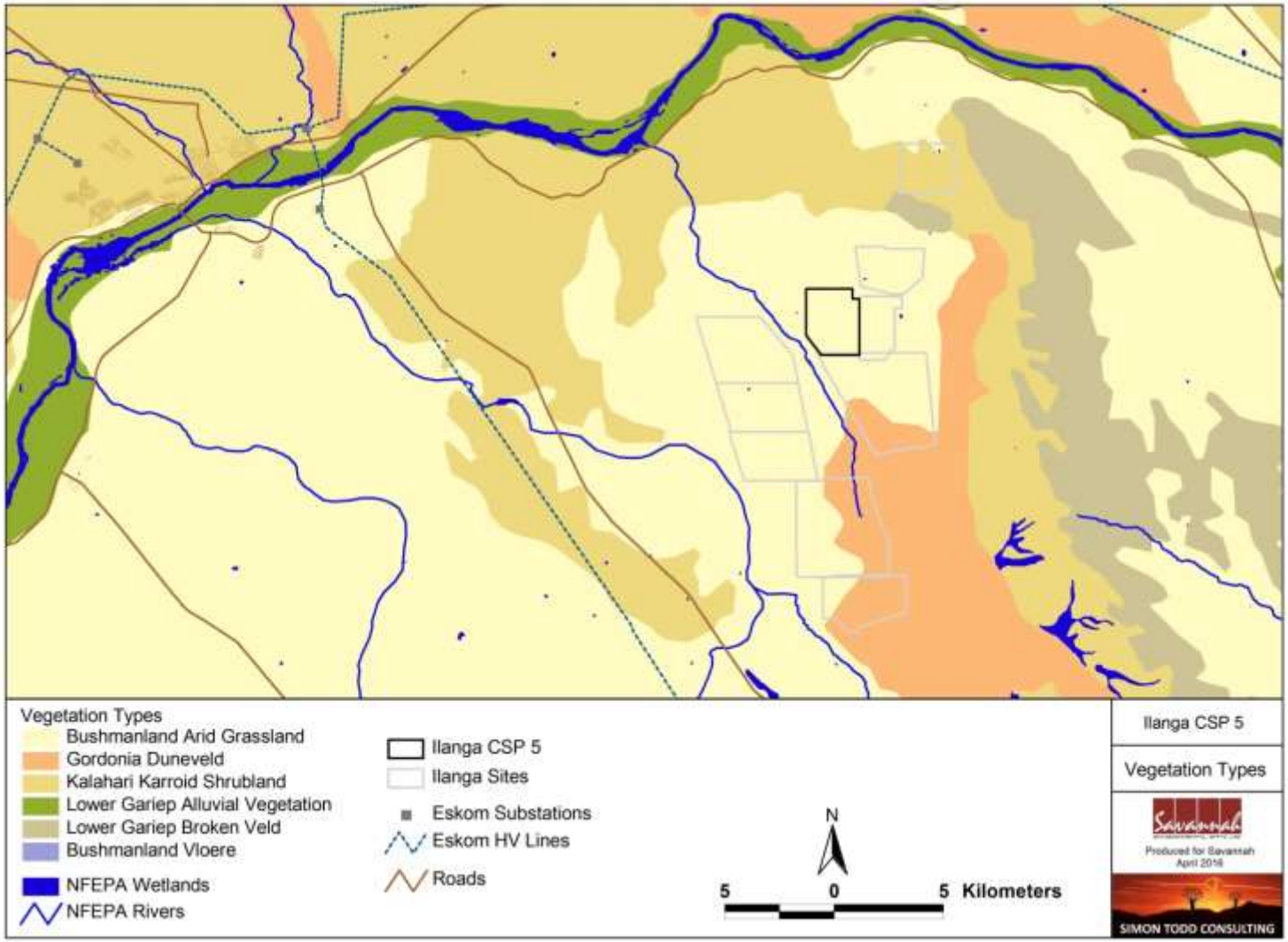


Figure 5.7: The vegetation in and around the Ilanga CSP 5 site, showing the other development areas within the Karoshoek Solar Development. The vegetation map is an extract of the National Vegetation Map as produced by Mucina and Rutherford (2006).

Table 5.1: Red-listed species which may occur within the CSP 5 site, including their IUCN status and the likelihood that they occur at the site. This does not include provincially or nationally protected species which are present at the site.

Family	Species	IUCN Status	Likelihood
ASPHODELACEAE	*Aloe dichotoma*	VU	Low
MESEMBRYANTHEMACEAE	*Dinteranthus wilmotianus*	NT	Low
AMARYLLIDACEAE	*Crinum bulbispermum*	Declining	Low
FABACEAE	*Acacia erioloba*	Declining	Confirmed
APOCYNACEAE	*Hoodia gordonii*	DDD	Confirmed
GERANIACEAE	*Pelargonium reniforme subsp. reniforme*	DDD	Low
ASTERACEAE	*Gymnostephium ciliare*	DDT	Low
ASTERACEAE	*Senecio monticola*	DDT	Low

Critical Biodiversity Areas & Broad-Scale 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 been 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. Furthermore, there was no evidence to suggest that the area is likely to be highly significant as faunal movement or migration pathway. The area is generally homogenous and given the extensive amount of intact vegetation in the area, there is likely to be little overall disruption to the broad-scale connectivity of the landscape.

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 area, 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 area, which would significantly reduce the number of the species that would be directly affected. Mammal species observed at the site and in the area include Black-backed Jackal, African Wildcat, Cape Fox, Rock Hyrax, South African Ground Squirrel, Steenbok, Springbok, Gemsbok, Cape Porcupine, Yellow Mongoose, Cape Hare, Aardvark, and Round-eared Elephant Shrew.

As the typical arid grasslands and shrublands of the site are widely available in the area, as well as at a broader scale, the impacts would be local in nature and it is not likely that the long-term viability of any populations of terrestrial mammals would be compromised by the development. Three listed terrestrial mammals may occur at the site, the Honey Badger (Endangered), Brown Hyaena (Near Threatened) and Black-footed cat (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.

Reptiles

According to the SARCA database, 40 reptile species are known from the area suggesting that the reptile diversity within the site is likely to be moderate to low. Species observed in the wider area include the Karoo Girdled Lizard, Western Rock Skink and the Namaqua Mountain Gecko which are associated with rocky outcrops, and Ground *Agama* and the Spotted Sand Lizard*,* which are fairly widespread on the plains. As there are no large rocky outcrops within the proposed development area, species associated with rocky habitats are not likely to occur in the area and would not be impacted by the development. As with mammals, the development is likely to result in some local habitat loss for reptiles but as there are not range-restricted reptiles which would occur in the affected area, the impacts are not likely to be of broader significance. The development would be likely to create some novel habitats for reptile, which would potentially benefit a limited number of species which could take advantage of the novel habitats created within the development area. This is likely to be restricted to species such as geckos and agamas, which would utilise the buildings and other vertical infrastructure of the development. This would however be a very limited number of species and is not considered an overall positive outcome.

Amphibians

The site lies within the distribution range of 10 amphibian species. The only listed species which may occur in the area is the Giant Bullfrog which is listed as Near Threatened. This species is associated with ephemeral pans and there do not appear to be any pans of sufficient size to support this species at the site. Those amphibians which require perennial water are likely to be restricted to the vicinity of the OrageRiver 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. As there are no natural perennial water sources at the site, it is likely that amphibian abundance is generally low and restricted largely to those species which are relatively independent of water such as the Karoo Toad.

Avifauna Species

The impact zone of the CSP 4 (trough) facility lies within the interface of Nama Karoo and Kalahari Shrubland. Up-to-date (SABAP2) bird atlas data combined with the

specialists data indicates that habitat in the Karoshoek Solar Valley Development footprint 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.* Given that harriers, eagle and bustards are highly collision-prone species they may interact negatively with the CSP 5 facility infrastructure. 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 CSP mirrors. In addition larks and sandgrouse will lose habitat totaling ~610 ha.

Since the degree and significance of bird impacts will depend largely on the abundance and movements of key species, the specialist measured bird densities in the site footprint and the passage rate of collision-prone birds through and over the site. The 1 km surveys revealed a higher species richness of smaller birds in the wet season (18.0 v 10.0 species km^{-1}). The Passage rate of larger collision-prone birds was medium at 0.92 birds per hour of observation and it did not differ between the seasons. Other species that may be attracted to the troughs, such as wetland birds, were not recorded but large numbers of sandgrouse were recorded commuting to water points in the wet season. Sociable Weaver are also present in large numbers and those displaced from their nests in *Acacia* and *Boscia* trees may attempt to re-nest on the CSP infrastructure.

5.5 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) which falls within the ZF Mgcawu District Municipality (ZFMDM) in the Northern Cape. The area 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.
» 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 local municipalities.
» 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. 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 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 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.

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 ZF Mgcawu 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 mangnese, diamonds and raw ash for producing cement.

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.

5.5.1 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).

Another tourist destination in Upington is Die Eiland Holiday Resort which is renowned for its palm tree avenue (200 trees) which was declared a national monument in 1982 (//Khara Hais SDF, 2008).

Some of the farms in the larger Upington area are also popular for game farming, agri-tourism and hunting. The Orange River Wine Route includes five wineries in Upington, Kakamas, Keimoes, Grootdrink, and Groblershoop respectively. This route thus provide visitors with regular wine tours and an experience of the wine industry in the larger Upington area (//Khara Hais SDF, 2008).

The //Khara Hais Municipality hosts a number of festivals throughout the year which attracts large numbers of tourists such as the Kalahari Kuierfees, the Upington Agricultural Show (Northern Cape Expo) and the Orange River Young Wine Show.

Tourism is acknowledged as an important economic sector and job creator and should be further developed within the larger area. A broad range of tourist amenities and opportunities occur, including:

» Agri-tourism opportunities providing insight into vineyard farming, processing of agricultural products, wine-making, and so forth;
» Conferencing;
» Culture tourism presented in Paballelo;
» Testing of vehicles within extreme conditions by car manufacturers in the area;
» Holiday accommodation (e.g. guest houses, bed-and-breakfast facilities, other types of over-night facilities, and hotels);
» River-based eco-opportunities;
» Game and eco-tourism opportunities as associated with various lodges outside of Upington; and
» Game and eco-tourism opportunities associated with the Spitskop Nature Reserve, Augrabies Falls National Park, as well as the Kgalagadi Transfrontier Park.

5.5.2 Land use characteristics of the broader study site

The 50MW CSP trough plant is proposed on Portion 3 of Matjiesrivier 41, approximately 30 km east of Upington within the //Khara Hais Local Municipality in the Northern Cape. Smaller settlements such as Dagbreek, Karos and Leerkrans are located near the study area. The 50W CSP through plant is proposed on Portion 3 of the Farm Matjiesrivier 41.

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 Lot 944 Karos Settlement.

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 either the Lot 944 Karos Settlement farm or Portion 3 of Farm Matjiesrivier 41.

5.5.3 Access to services

Households are entitled to a minimum level of services. The proportion of households in the study area with the minimum access to services is indicated in Table 5.2.

Table5.2: Distribution of average access to services (Source: Census 2011)

	Flush / chemical toilets connected to sewerage	**Refuse removal by local authorities**	**Access to piped (tap) water in dwelling / yard**	**Access to electricity**
Northern Cape	66.5%	66.2%	78%	85.3%
ZF Mgcawu DM	72.5%	74.1%	86.1%	86.5%
//Khara Hais LM	74.8%	89.1%	90.3%	91.1%

A large number of people in the local municipality have access to basic services. There is still room for improvement in the provision of basic services more specifically in the rural/farm areas, to expand basic services such as sanitation, refuse removal, water and electricity. The KHLM also indicates the need to improve health care facilities, management of disasters, roads, storm water, sport and recreational facilities, education and policing.

5.5.4 Traffic

There are a number of stakeholders that reside outside the direct area of influence but who may be marginally affected by the project. These include road users that use the N10, N10 and local gravel roads on a frequent basis as part of their daily or weekly movement patterns. Construction vehicles and trucks will be utilising these

roads during the construction phase, which will increase the traffic, create traffic disruptions and may increase the wear and tear on these roads.

5.5 Heritage and *Palaeontology*

Stone Age

The study area is home to all three of the known phases of the Stone Age, namely: the Early- (2.5 million – 250 000 years ago), Middle- (250 000 – 22 000 years ago) and Late Stone Age (22 000 – 200 years ago). The Late Stone Age in this area also contains sites with rock art from the San and Khoi San cultural groups. Early to Middle Stone Age sites are less common in this area, however rock-art sites and Late Stone Age sites are much better known.

During the Middle Stone Age, 200 000 years ago, modern man or Homo sapiens emerged, manufacturing a wider range of tools, with technologies more advanced than those from earlier periods. This enabled skilled hunter-gatherer bands to adapt to different environments. From this time onwards, rock shelters and caves were used for occupation and reoccupation over very long periods of time.

The Late Stone Age, considered to have started some 20 000 years ago, is associated with the predecessors of the San and Khoi Khoi. Stone Age hunter-gatherers lived well into the 19th century in some places in SA. Stone Age sites may occur all over the area where an unknown number may have been obliterated by mining activities, urbanisation, industrialisation, agriculture and other development activities during the past decades especially associated with the town of Upington.

A limited number of Rock-Art sites are located in this area, mostly due to the lack of suitable shelter sites.

Historic period

The town of Upington, originally known as Olijvenhoutsdrift, was founded in 1871 as part of a mission station by the German missionary Rev Schröder. The town was renamed in 1884 after Sir Thomas Upington, who was the Prime Minister of the Cape Colony. An irrigation canal was reportedly started by Rev Schröder in 1883, and completed in 1885. By 1884 there were already 77 irrigation farms.

Two small house structures were identified on the northern outer edge of the development site.

The Historic Era

Although the town which today is Upington only officially came to be named in 1884, its tempestuous prior history cannot be ignored. Long before white settlers reached the area, Korana Hottentots had settled at the ford in the Great River they called Gariep, the northern border of the Cape Colony. They had been ousted from their ancestral lands in the south and found a last refuge here, on the lush banks of the river. When, inevitably, eventually the white man followed, war broke out between them and the Korana, who had nowhere else to go. They were defeated and the few remaining tribes people dispersed.

Earlier, a Dutch Reformed Mission had been established under the guidance of the Reverend C. Schreuder at Olijvenhouts Drift, as the ford was called by hunters and traders because of the many wild olivewood trees growing there.

In 1879, after the second and last Korana War, Sir Thomas Upington, Attorney-General of the Cape Colony, sent 80 policemen to the Drift to maintain law and order along the river. Commanded by Captain Dyason they set up camp under the trees, but by 1885 already barracks had been built where later the police station was erected. Dyason's police was very unpopular as they impounded loose animals and generally tried to keep order, while Schreuder only wanted to run a Mission. He venomously referred to the police as ""idle ne'erdowells"" and said of Dyason, ""we beseech to be delivered from such tyranny"."

Schreuder wanted the Mission to be moved elsewhere and in a letter dated the 11th of February 1884 writes, ""It is my wish that Olyvendrift or Upington not become a town but remain a Mission Station.""

This was the first time the name Upington was officially written to denote the place known as Olijvenhouts Drift and then only out of resentment against the police sent by Thomas Upington.

Table 5.3: Archaeological and palaeontological sites of known significance on/near the study area

Landscape Type	Description	Occurrence still possible?	Likely occurrence?
1. Paleontological	Mostly fossil remains. Remains include microbial fossils such as found in Baberton Greenstones	Yes, sub-surface	Unlikely
2. Archaeological	Evidence of human occupation associated with the following phases – Early-, Middle-, Late Stone Age, Early-, Late Iron Age, Pre-Contact Sites, Post-Contact Sites	Yes	Unlikely

Landscape Type	Description	Occurrence still possible?	Likely occurrence?
3. Historic Built Environment	- Historical townscapes/streetscapes - Historical structures; i.e. older than 60 years - Formal public spaces - Formally declared urban conservation areas - Places associated with social identity/displacement	No	No
4. Historic Farmland	These possess distinctive patterns of settlement and historical features such as: - Historical farm yards - Historical farm workers villages/settlements - Irrigation furrows - Tree alignments and groupings - Historical routes and pathways - Distinctive types of planting - Distinctive architecture of cultivation e.g. planting blocks, trellising, terracing, ornamental planting.	Yes	Likely
5. Historic rural town	- Historic mission settlements - Historic townscapes	No	No
6. Pristine natural landscape	- Historical patterns of access to a natural amenity - Formally proclaimed nature reserves - Evidence of pre-colonial occupation - Scenic resources, e.g. view corridors, viewing sites, visual edges, visual linkages - Historical structures/settlements older than 60 years - Pre-colonial or historical burial sites - Geological sites of cultural significance.	Yes	Likely
7. Relic Landscape	- Past farming settlements - Past industrial sites - Places of isolation related to attitudes to medical treatment - Battle sites - Sites of displacement	No	Unlikely
8. Burial grounds and grave sites	- Pre-colonial burials (marked or unmarked, known or unknown) - Historical graves (marked or unmarked, known or unknown) - Graves of victims of conflict - Human remains (older than 100 years)	Yes,	Likely

Landscape Type	Description	Occurrence still possible?	Likely occurrence?
	- Associated burial goods (older than 100 years) - Burial architecture (older than 60 years)		
9. Associated Landscapes	- Sites associated with living heritage e.g. initiation sites, harvesting of natural resources for traditional medicinal purposes - Sites associated with displacement & contestation - Sites of political conflict/struggle - Sites associated with an historic event/person - Sites associated with public memory	No	No
10. Historical Farmyard	- Setting of the yard and its context - Composition of structures - Historical/architectural value of individual structures - Tree alignments - Views to and from - Axial relationships - System of enclosure, e.g. defining walls - Systems of water reticulation and irrigation, e.g. furrows - Sites associated with slavery and farm labour - Colonial period archaeology	Yes	Irrigation farming within the Orange River Valley.
11. Historic institutions	- Historical prisons - Hospital sites - Historical school/reformatory sites - Military bases	No	Unlikely
12. Scenic visual	- Scenic routes	No	No
13. Amenity landscape	- View sheds - View points - Views to and from - Gateway conditions - Distinctive representative landscape conditions - Scenic corridors	No	No

ASSESSMENT OF IMPACTS: ILANGA CSP 5 PROJECT AND ASSOCIATED INFRASTRUCTURE CHAPTER 6

The Ilanga CSP 5 Facility is proposed to utilise the solar parabolic trough technology with a generation capacity of up to 150MW in total (i.e. authorised 100MW facility and proposed 50MW facility), and energy storage of up to 6 hours (using molten salts technology). The trough system will be comprised of parabolic collectors (i.e. trough-shaped reflectors which focus the solar radiation onto a receiver at its focal point), a receiver tube/heat collection element (i.e. a metal absorber containing the heat transfer fluid surrounded by a glass envelope which absorbs the solar energy received from the parabolic trough), a sun-tracking system (i.e. an electronic control system and associated mechanical drive system used to focus the reflector onto the sun), and support structure (i.e. holds the parabolic trough in accurate alignment with incoming solar radiation while resisting the effects of the wind). The collected heat energy in the heat transfer fluid 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.

The consolidated 150MW Ilanga CSP 5 Project will have a development footprint of up to 700 ha, to be placed within a broader site of ~5400ha within the larger Karoshoek Solar Valley Development and will include the following associated infrastructure:

» Parabolic troughs utilising a heat transfer fluid (HTF)
» Power Plant/Power Island: power-island with steam turbine generator, auxiliary boilers, dry cooling and molten salt storage.
» Associated infrastructure: access roads, plant substation, power line, water abstraction point and supply pipeline, water storage tanks, packaged water treatment plant, lined evaporation ponds, and workshop and office buildings.

The power plant/power-island, plant substation, water storage tanks, packaged water treatment plant, lined evaporation ponds, and workshop and office buildings authorised as part of the Karoshoek LFT Site 1.4 facility will be utilised for the larger 150MW facility.

An area of ha within the study area of approximately 200 ha is proposed for the proposed 50MW project. The proposed Ilanga CSP 5 Facility is proposed to include several parabolic troughs with a generating capacity of up to 50 MW and internal access roads and will be developed together with the authorised Karoshoek LFT Site 1.4 facility.

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 Gariep River (including abstraction point, water pre-treatment and storage reservoirs).

The establishment of a CSP facility project is comprised of various phases, including pre-construction, construction, operation, and decommissioning[14]. 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 25 months.

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

» The operation of the CSP (trough) 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.

[14] The CSP 5 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.

The operation phase is expected to extend in excess of 25 years.

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

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

Environmental impacts of the proposed Ilanga CSP 5 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 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 Plant include, among others:

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

These and other environmental issues were originally identified through a scoping evaluation of the proposed CSP plant. Potentially significant impacts have now been assessed during this EIA Phase. This EIA process has involved key input from specialist consultants, the project developer, and from key stakeholders and interested and affected parties. The significance of impacts associated with a facility of this nature is project specific, and therefore impacts may vary significantly between facilities.

This chapter serves to assess the identified potentially significant environmental impacts associated with the development of the proposed Ilanga CSP 5 Facility, and to make recommendations for the management of these impacts for inclusion in the draft Environmental Management Programme (refer to **Appendix K**). This assessment s based on the layout provided by the developer (refer to **Figure 6.1**). Cumulative impacts are assessed within Chapter 7.

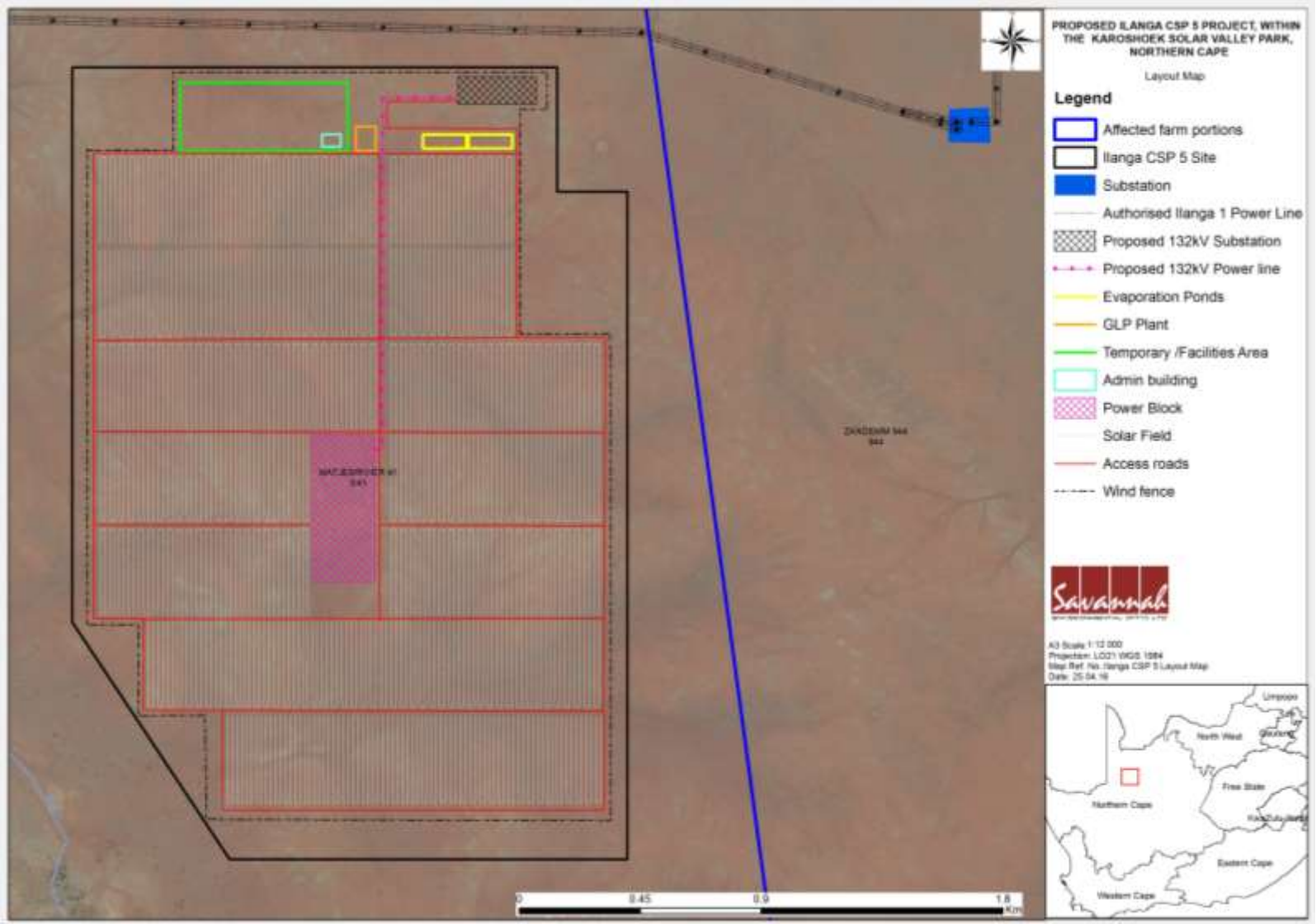


Figure 6.1: Map showing the proposed layout of the 150MW Ilanga CSP 5 Facility and associated infrastructure

6.1. Assessment of Potential Impacts on Flora and Fauna associated with the proposed 50MW 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).

6.1.1. Results of the Ecological Study

The Ilanga CSP 5 site consists largely of deeper soils associated with in-filled valleys of dense Rhigozum trichotomum and Stipagrostis with conspicuous stands of Boscia albitrunca. As many as 3000 Boscia trees would be impacted by the development, which is considered a significant loss to the local population. This exceeds the guideline loss for triggering an offset from DAFF and direct engagement with DAFF will need to be started should the developer wish to develop the site. Furthermore, the additional development sites in the Karoshoek Solar Valley would contribute significant additional loss of trees from the area and the overall cumulative impact is considered to be high in the local context. Boscia albitrunca is however widespread and the loss of the trees from the area would not be significant at the national scale.

Due to the relatively homogenous nature of the habitat for fauna, faunal diversity is likely to be moderate to 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, although the cumulative impact on the Boscia trees is considered to be a significant local impact.

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. However, the site does not consist of typical Bushmanland Arid Grassland and rather consists of densely vegetated in-filled valleys which are considered to be of above-average significance for fauna and more vulnerable to cumulative impact due to the limited extent of the affected habitat. Consequently the impact of the development on habitat loss, fragmentation and the future conservation potential of the area is considered of moderate to high overall magnitude and of local significance.

Although there are no highly sensitive features within the development footprint the abundance of protected trees is high and the overall impact of the development cannot be mitigated to a low level as a result. The loss of the

protected trees is considered to be a significant local impact but would not be highly significant at the national scale. Should the development of the site proceed, active engagement of DAFF would be required to deal with the permitting and possible offsetting required for the loss of the Boscia trees at the site. Overall, and with the suggested mitigation measures implemented, the impacts of the development are likely to be of moderate significance and no impacts of high significance are likely.

The ecological sensitivity map for the Ilanga CSP 5 facility (authorised site and proposed 50MW facility) is illustrated in **Figure 6.3**.

6.1.2. Description of Ecological Impacts

The development of the Ilanga CSP 5 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 such as the reflector arrays, roads, operations buildings etc. The site is however adjacent to and would be part of the larger CSP site 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 is of greater significance given the abundance of Boscia trees within 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 CSP trough development usually requires that the development footprint is sterilized (completely cleared), these areas would generate a lot more runoff than intact vegetation. As a result, the receiving areas would be vulnerable to erosion and regular monitoring to ensure that erosion problems are addressed would be required.

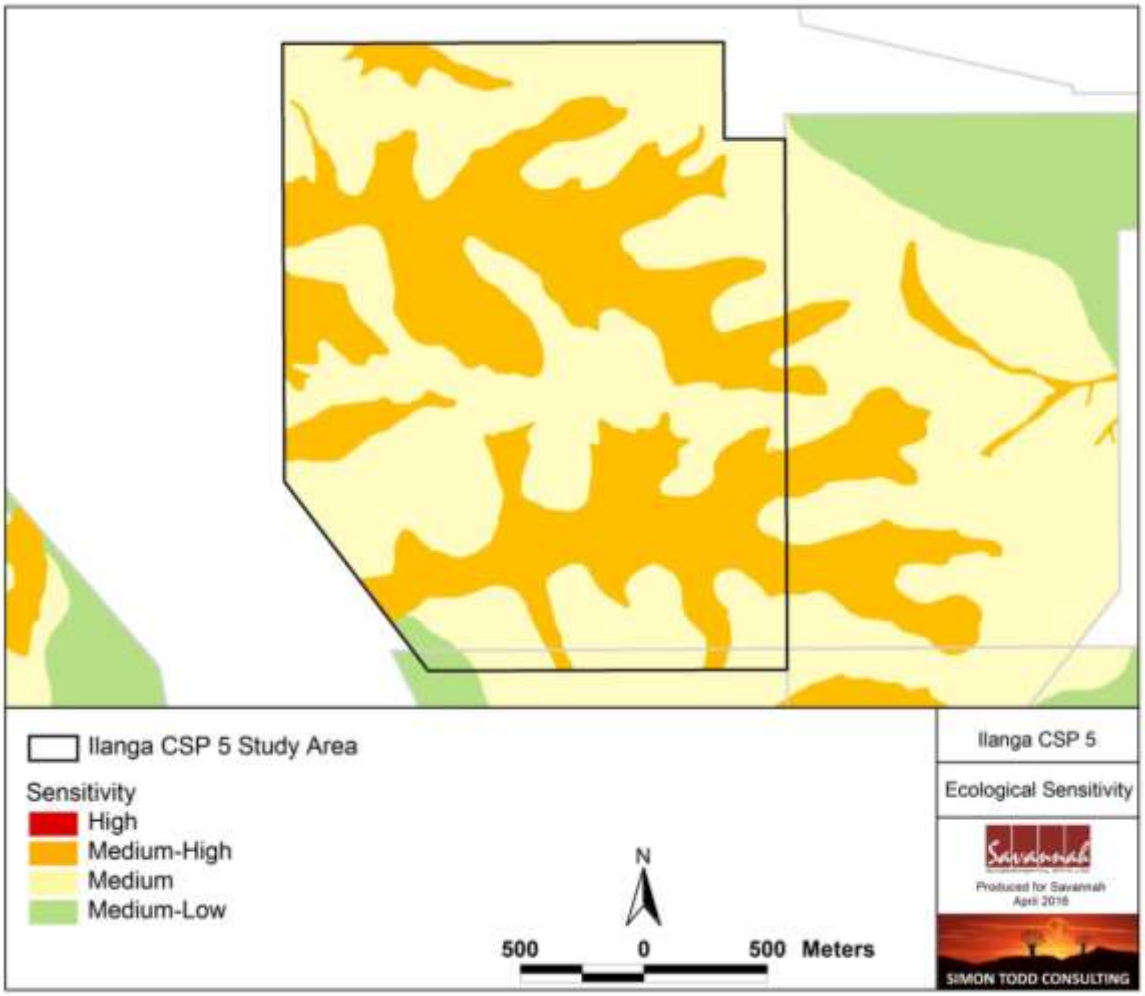


Figure 6.3: Ecological sensitivity map of the larger Ilanga CSP 5 site, illustrating that the majority of the site is considered relatively medium to medium-high sensitivity.

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.

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 might increase in response to the disturbance include Prosopis glandulosa, Salsola kali and Flaveria bidentis.

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

Planning & Construction Phase Impacts

Nature of impact: Impacts on vegetation and protected plant species will occur due to vegetation clearing and disturbance associated with the construction of the facility. The density of protected species present within the site is high with large amounts of *Boscia albitrunca* and *Boscia foetida* present within the site and as a result, the overall post-mitigation impacts are likely to be **Medium to High** due to the loss of large numbers of these trees.		
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-high (7)	Medium (5)
Probability	Certain (5)	Certain (5)
Significance	**High (60)**	**Medium (50)**
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Impacts on protected plant species cannot be well mitigation as the trees cannot be translocated or avoided and the affected trees are likely to the hundreds of years old.	
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. » Contractor's environmental officer 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 (684ha).

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), 19 (i), 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.
» No construction activity should be allowed at the site between sunset and sunrise.
» 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.

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 low. Alien species such as *Prosopis* are however present and would potentially invade the site along with other typical weedy species such as *Salsola kali* and *Flaveria bidentis.*

Relevant Listed activities:
GNR 983 Activity: 12 (xii)(a)(c), 19 (i), 28 (ii)
GNR 984 Activity: 1, 15

	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.

Operation Phase Impacts

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 CSP 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 (30km/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: The loss of unprotected vegetation types on a cumulative basis from the broad area may impact the county's future ability to meet its conservation targets.

The Bushmanland Arid Grassland vegetation type is 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	Probable (3)	Improbable (2)
Significance	**Low (27)**	**Low (16)**
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 5 site consists largely of deeper soils associated with in-filled valleys of dense *Rhigozum trichotomum* and *Stipagrostis* with conspicuous stands of *Boscia albitrunca*. As many as 3000 Boscia trees would be impacted by the development, which is considered a significant loss to the local population. This exceeds the guideline loss for triggering an offset from DAFF and direct engagement with DAFF will need to be started should the developer wish to develop the site.
» The additional development sites in the Karoshoek Solar Valley would contribute significant additional loss of trees from the area and the overall cumulative impact is considered to be high in the local context. *Boscia albitrunca* is however widespread and the loss of the trees from the area would not be significant at the national scale.
» Due to the relatively homogenous nature of the habitat for fauna, faunal diversity is likely to be moderate to 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, although the cumulative impact on the *Boscia* trees is considered to be a significant local impact.
» The site does not consist of typical Bushmanland Arid Grassland and rather consists of densely vegetated in-filled valleys which are considered to be of above-average significance for fauna and more vulnerable to cumulative impact due to the limited extent of the affected habitat. Consequently the impact of the development on habitat loss, fragmentation and the future conservation potential of the area is considered of moderate to high overall magnitude and of local significance.
» Although there are no highly sensitive features within the development footprint the abundance of protected trees is high and the overall impact of the development cannot be mitigated to a low level as a result.
» The loss of the protected trees is considered to be a significant local impact but would not be highly significant at the national scale. Should the development of the site proceed, active engagement of DAFF would be required to deal with the permitting and possible offsetting required for the loss of the *Boscia* trees at the site.

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

6.2 Assessment of Potential Impacts on Avifauna associated with the proposed 50MW Ilanga CSP 5 Facility

The expected impacts on avifauna associated with the proposed development will potentially result fatalities due to the collision with the mirrors during the operation phase and 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 E** - Avifaunal Report for more details).

6.2.1. Results of the Avifaunal Study

A total of 114 bird species were recorded on the 14 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. Of these, 8 were collision-prone as ranked by the BARESG (2014), and only 2 were red-listed (Kori Bustard and Lanner Falcon).

However, it was observed that four additional red data species in our two site visits: a Black Harrier, breeding Verreaux's Eagle, a Secretarybird, and numerous Ludwig's Bustards. Thus, 6 red-data species occur on site (Table 8.1). A further 8 collision-prone species (Table 8.1) were recorded on the Karoshoek Solar Valley development area, giving 14 collision prone/red data species in total.

Because the SABAP data were completely missing for pentads away from the Orange River we tallied every species recorded in the transects, VPs and incidental observations 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** occur on the Ilanga solar development site, **of which six are red-listed.**

Table 8.1: Threatened (**in red**) and collision-prone bird species (**in bold**) likely to occur over the proposed CSP 5 trough development 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 seen in our site visits in November 2015 and March 2016, but not previously recorded.

					Susceptible to:
Common name	**Scientific name**	**Threat status**	**Reporting Rate***	**Collision Rank****	**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 fro the BAWESG 2014 guidelines. Smaller numbers denote more collision-prone.

6.2.2. 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 preconstruction, construction and operational phases of the development site. By combining all records of the

collision-prone red data species we can map the most sensitive areas for birds within CSP 5. The highest sensitive areas are shown in **Figure 6.4** and represent sites where up to 8 red data bustards were recorded or hundreds of birds came to drink at the pan. The bustards lay eggs in July-September here (Allan 2005), suggesting the birds seen in November were breeders. One medium-low sensitive area was also revealed where 60 sandgrouse traversed or landed in March (**Figure 6.4**).

Habitat Loss – Destruction, Disturbance and Displacement

The construction and maintenance of CSP technology causes mainly permanent habitat destruction under the parabolic mirrors. 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 and construction and the final footprint size, for key species, 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. On this basis, 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 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.

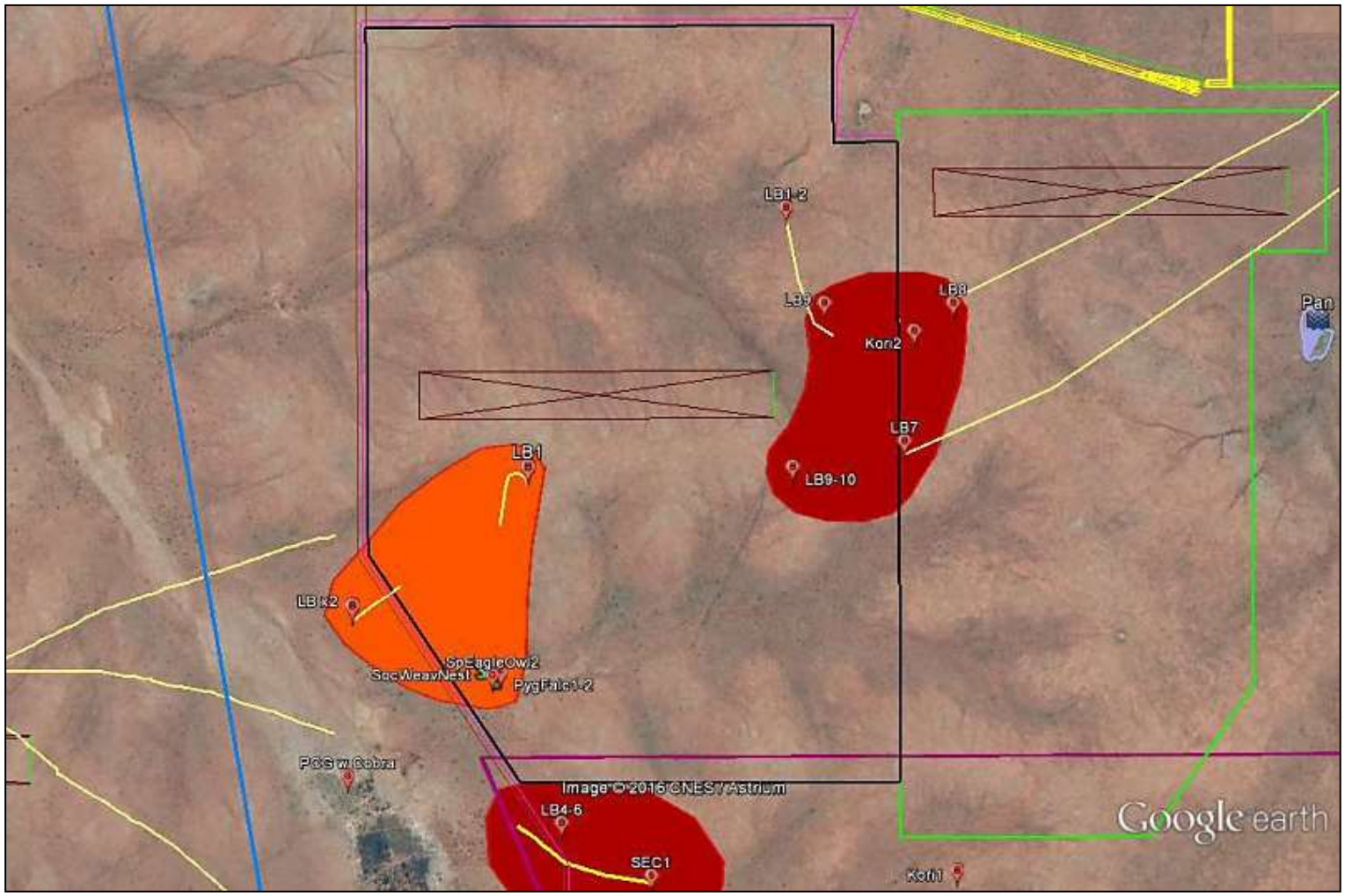


Figure 6.4: Sensitivity map of the collision-prone red data species on Karoshoek solar development CSP 5. On site, two areas of medium-high (orange) and high sensitivity (red) occurred. Off site, a high sensitivity area with 2 Ludwig's Bustards and a Secretarybird (=Sec1) was apparent on the southern border. The high sensitivity area on site (right) indicates where 7 threatened Ludwig's Bustard and 1 Kori Bustard were recorded in November 2015 (LB=Ludwig's Bustard, Kori = Kori Bustard). The medium high sensitivity area (orange polygon, left) encompasses 3 Ludwig's Bustards a Spotted Eagle Owl, a pair of Pygmy Falcons, each associated with a Sociable Weaver nest

Collision – with Reticulation Lines and CSP Troughs

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, 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 troughs 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).

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

The impacts assessed below apply to the proposed layout and associated infrastructure for the Ilanga CSP 5 Facility.

Construction Phase

Nature of Impact: Mostly negative due to avoidance of area due to destruction of suitable habitat in, or displacement from area by human activity during construction around the **CSP 5 site** for the Red-listed bird groups identified as at risk above. (**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	8 (Bust) high 3 (Rapt) medium-low 1(WetB) medium (Korh) low	5 (Bust) medium-high 2(Rapt) low 1(WetB) low 1 (Korh) low
Probability	5 (Bust) high 3 (Rapt)medium- low 1 (WetB) medium-low 3 (Korh) low	4 (Bust) medium high 2 (Rapt) low 1(WetB) low 2 (Korh) low
Significance (E+D+M)P	**65 (Bust) high** **21 (Rapt) medium-low** **6 (WetB) low** **21 (Korh) low**	**40 (Bust) medium** **16 (Rapt) low** **6 (WetB) low** **12 (Korh) low**

Status (+ve or –ve)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of species?	Yes, two red data species of bustard will lose foraging and possible breeding areas and will disappear from the site.	
Can impacts be mitigated?	Yes, through avoidance of the highest sensitivity areas of the bustards, refer to Figure 6.4.	

Mitigation:

There are only two mitigations for displacement or avoidance of the CSP troughs by red data birds:

» move them 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. An environmental management programme will assess the efficacy of the mitigations to reduce avoidance sandgrouse, or the aerial swallows/swifts impacting panels. Further research and mitigation can then be suggested and tested as the need arises.

Operation Phase

Nature of impact: Mostly negative due to direct impact mortality from impacting the mirrored surfaces in the **CSP 5** for the Red-listed bird groups identified as at risk above. We don't expect any collisions to occur pre-construction.
(**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	1	1
Duration	4	4
Magnitude	3 (Bust) low 3 (Rapt) low 5 (WetB) medium 2 (Korh) low	2 (Bust) low 2 (Rapt) low 3 (WetB) low 1 (Korh) low
Probability	2 (Bust) low 2 (Rapt) low 5 (WetB) medium 2 (Korh) low	1(Bust) low 1(Rapt) low 3(WetB) low 1 (Korh) low
Significance (E+D+M)P	**16(Bust)low** **16 (Rapt) low** **50 (WetB) medium** **14 (Korh) low**	**7 (Bust)low** **7(Rapt)low** **24 (WetB)low** **6 (Korh) low**
Status (+ve or –ve)	Negative	Neutral
Reversibility	Medium	(mitigations untested)
Irreplaceable loss of species?	No, few red data species occur on site. It depends entirely whether wetland species (or other African species) are attracted to and collide with the mirrors.	
Can impacts be	Probably yes: the use of bird scaring strategies on the site will	

mitigated?	probably deter species from interacting negatively.

Mitigation for impacts for the CSP troughs

» There are two classes of mitigation for the CSP troughs: (i) move them away from highly sensitive bird area (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 panels. Further research and mitigation can then be suggested and tested as the need arises.

6.2.4 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 5 Facility can be reduced to low, or avoided. The CSP 5 Facility can be developed and impacts on avifauna managed by taking the following into consideration:

» A threatened bustard and some wetland birds may be impacted. The significance for displacement and avoidance will be medium–low this red data species.
» Mitigation measures include avoiding the medium sensitivity areas identified.
» For the wetland birds, korhaans and raptors the significance is lower because they are less collision-prone and less threatened.
» Sandgrouse, which were very numerous on site, are unlikely to react to mirrored surfaces as they do not land on water.
» A structured and systematic construction and post-construction assessment, as laid out in the Environmental Management Programme (above) by trained ornithologists will determine the impacts and provide appropriate mitigations.
» Little research in South Africa is presently available to determine the impact of CSP trough and tower technology on the South African avian community. Therefore, a full 12-months of post-construction monitoring at this site by trained ornithologists (able to distinguish Ludwig's from Kori Bustards) is strongly recommended.
» It is 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 recommended that innovative bird deterrent techniques are used, such as the Torri lines mentioned in the avian Scoping Report (Simmons and Martins 2015).
» If these recommendations can be followed and prove effective, it is expected that the Ilanga CSP 5 development can proceed with the least impact to the avifauna of the area.

6.3. Assessment of Potential Impacts on Water Resources associated with the proposed 50MW Ilanga CSP 5 Facility

6.3.1. 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 25 km 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.

6.3.2. 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.

6.3.3. 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.

Assessment of Severity, Consequence and Likelihood of Potential Impacts prior to implementation of mitigation

Impact	Habitat (Geomorph + Vegetation)	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating

Relevant Listed activities: GNR 983 Activity: 12 (xii)(a)(c), 19 (i), 28 (ii) GNR 984 Activity: 1, 6, 15													
Changes in biotic communities due to changed habitat structure		2	**2.0**	1	1	**4.0**	5	2	1	3	**11**	44	**L**
Changes in aquatic habitats	2		**2.0**	1	1	**4.0**	5	2	1	2	**10**	40	**L**
Loss of sensitive aquatic biota including fish species of conservation concern		2	**2.0**	1	1	**4.0**	5	2	1	3	**11**	44	**L**

Assessment of Significance and Significance Ratings Associated with the Potential Impacts

Impact	**Prior to mitigation**	
	Significance[15]	**Risk Rating**
Changes in biotic communities due to changed habitat structure	44	**L**
Changes in aquatic habitats	40	**L**
Loss of sensitive aquatic biota including fish species of conservation concern	44	**L**

Mitigation measures that should be considered for the proposed facilities and water abstractions are as follows:

» Structures should be put in place to reuse process water thereby reducing the requirement for continual water abstraction.

6.3.4. 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; and
» Potential impacts on aquatic ecosystems are primarily associated with the abstraction of water for the proposed Ilanga CSP 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.

[15] Refer to Table 6 of the Water Resources Specialist Report for an indication of the ratings scoring

- 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;
- Risks associated with the abstraction of water from the Orange River were rated as low prior to implementation of mitigation measures.
- It is concluded by the specialist that the project be favourably considered.

6.4. Impacts Related to the Storage and Handling of Dangerous Goods associated with the proposed 50MW Ilanga CSP 5 Facility

During the construction and operation phase, the Ilanga CSP 5 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. "Dangerous goods" are defined in the Listing Notices as:

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

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

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

The construction and operation of the Ilanga CSP 5 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 30 but not exceeding 80m³ (cubic metres). These chemicals 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.

The proposed project will require the construction of facilities or infrastructures for the storage of the dangerous goods. The construction phase will require the handling and storage of materials including HTF, hydraulic oil, fuel, cement and fly ash (for use in concrete batching plant) with an estimated volume of 50-70 m^3 at any one time. The operation phase will require the handling and storage of lube oil and diesel with an estimated volume of 30m^3.

The combined volumes of dangerous good stored or handled on the site at any one time are:

» Construction phase: approximately 50-70 m^3
» Operations phase: approximately 30 m^3

6.4.2. .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: 12 (xii)(a)(c), 19 (i), 28 (ii) GNR 984 Activity: 1, 4, 15		
	Without mitigation	**With mitigation**
Extent	Local (5)	Local (5)
Duration	Short (2)	Short (1)
Magnitude	High (8)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (45)**	**Low (20)**
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

6.5. Assessment of Potential Visual Impacts associated with the proposed 50MW Ilanga CSP 5 Facility

The 50MW Ilanga CSP 5 Facility has a development footprint ~200 ha occupied by the development infrastructure. Negative impacts on visual receptors are expected during construction activities, or when the facility is in place. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix J** - Visual Report for more details).

6.5.1. Results of the Visual Assessment

Visibility of the proposed development

Figure 6.5 indicates the ZTV of the proposed development of Ilanga CSP 5 (considering the full extent of the site – i.e. the authorised facility as well as the proposed new development area). **Figure 6.6** indicates the ZTV of the authorised area of development of the Ilanga CSP2 (i.e. that of the Karoshoek LFT Site 1.4 facility). From reference to these maps and the ZTVs identified in the VIA undertaken for the Karoshoek Solar Valley Development (MetroGIS, 2012) it is clear that the proposed extension of the site will not affect additional areas of the landscape than those considered in the VIA for the original application.

Key Viewpoints

Figure 6.5 provides a view from viewpoint VP1 on the N10 which is the closest area from which the development is likely to be visible from (indicated on ZTV mapping). The proposed development is indicated as possibly being visible from two sections of this road, the other being approximately 4.5km further east, however, from the site visit, views from the second point are unlikely. It was adjudged that the selected viewpoint as indicated as VP1 will be the area from which the greatest impact is likely.

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. 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. The closest possible viewpoint accessible to the public from which the development might be viewed is just over 10.5km from the site and located on the N10 to the north west of the development.

Figure 6.7 indicates a view from this viewpoint onto which the extent of the proposed development has been indicated. From the site visit this was considered to be the viewpoint from which the greatest extent of the development will be visible. It is obvious from the image that minor ridgelines and vegetation combine to screen a large proportion of the proposed development.

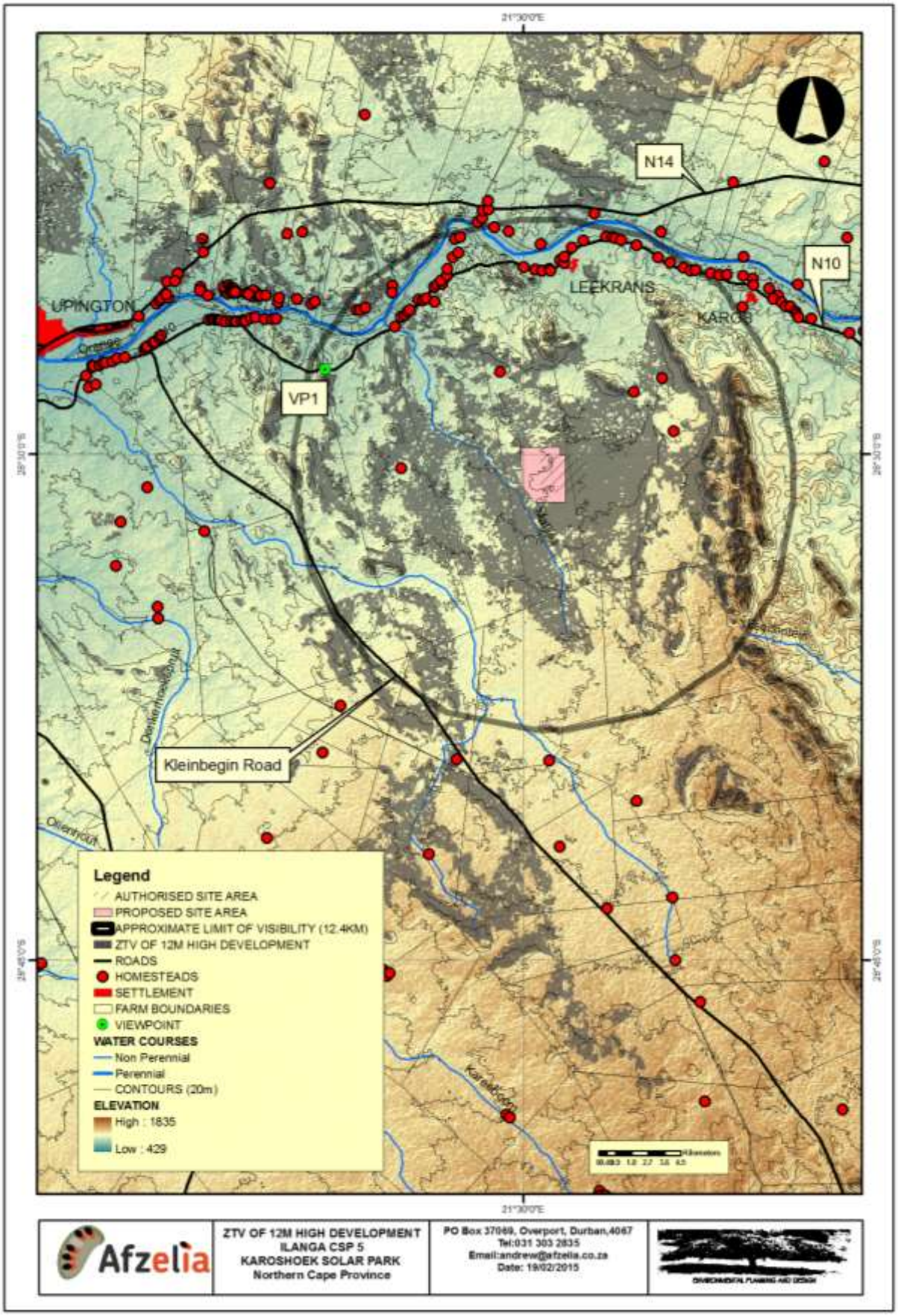


Figure 6.5: ZTV of 12 m high development on proposed larger Ilanga CSP 5 site

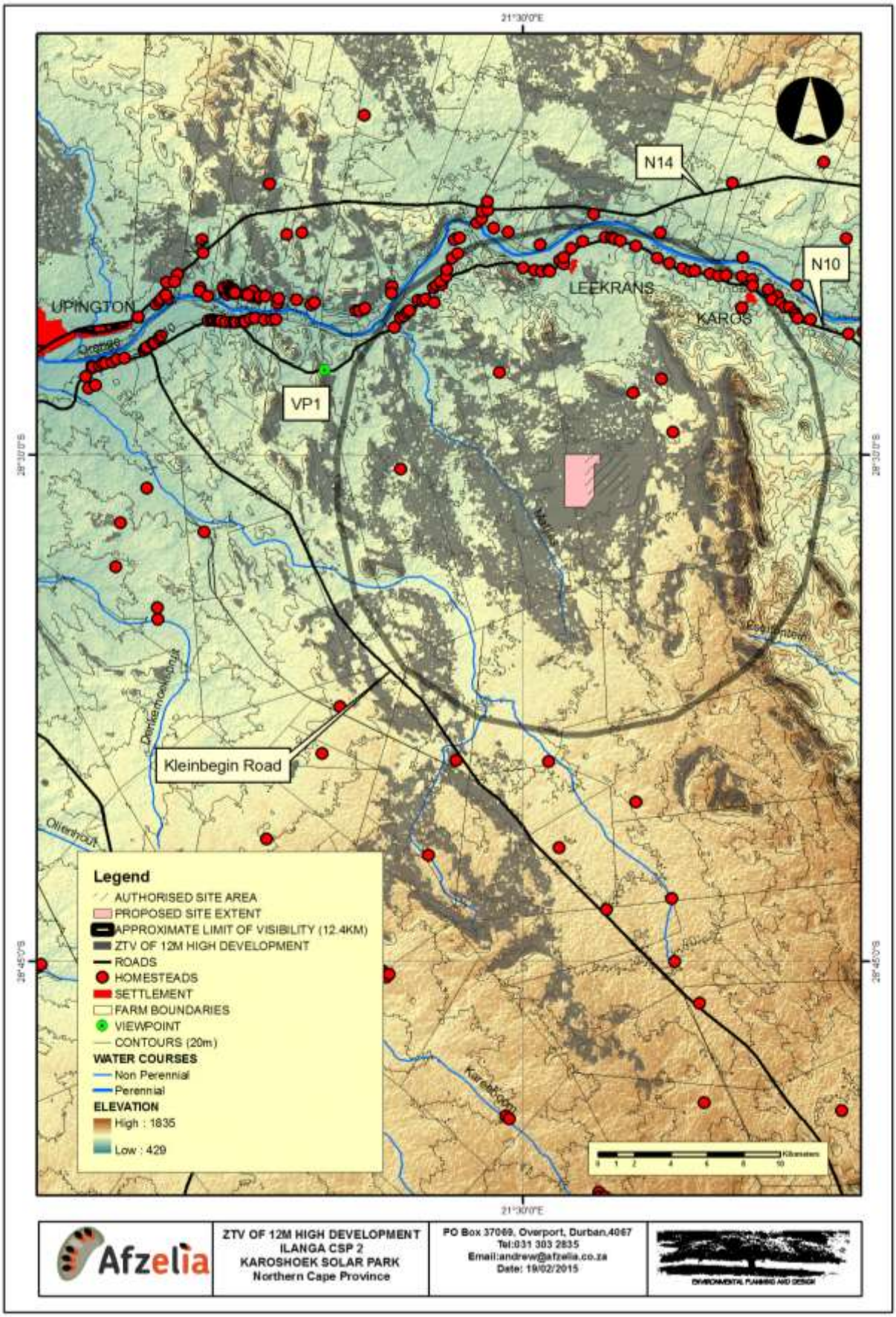


Figure 6.6: ZTV of 12 m high development on authorised Karoshoek PT Site 2 facility

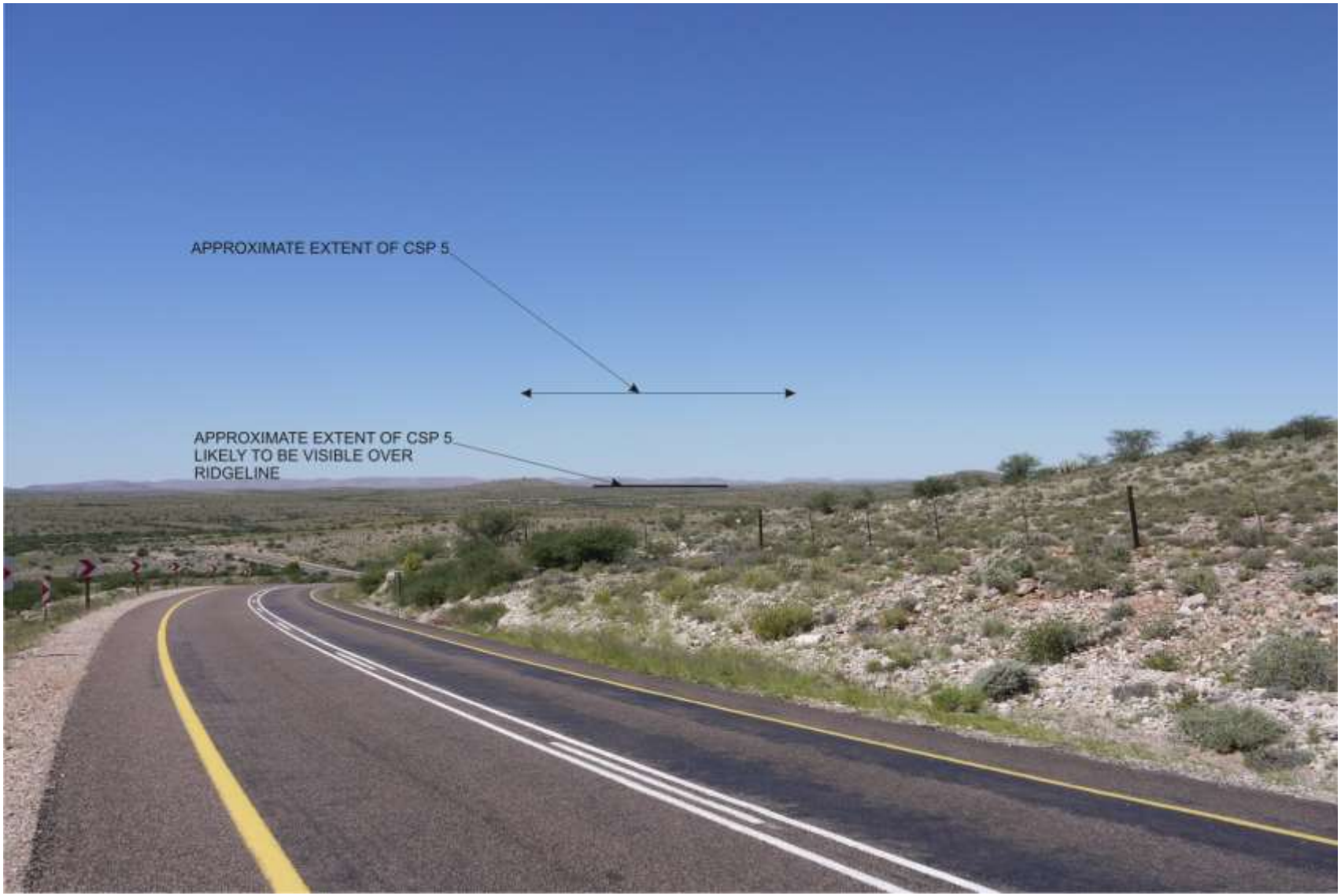


Figure 6.7: Extent of development likely to be visible from VP1 (N10)

6.5.2. Description of Visual Impacts

Potential visual impacts on sensitive receptors that have been identified through scoping and the site visit include:

» The visibility of the facility to, and potential visual impact on homesteads that have been identified as potentially being impacted;
» The visibility of the facility to, and potential visual impact on users of roads in close proximity;
» The visibility of the facility to, and potential visual impact on sensitive receptors;
» Visual impacts associated with construction of the proposed project;
» Possible impact of glint and glare; and
» The possible impact of lighting associated with night time operation, and security lights.

6.5.3. 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 extension of the authorised development could be visible from and therefore affect the character of the rural landscape surrounding it over an area of approximately 20 km measured east to west and 17 km measured north to south (approximately 340 km^2).

Views into the site from local roads and homesteads are relatively limited and where possible the proposed development will largely be seen in elevation or from a slightly higher elevation. The minimum distance between receptors and the proposed development is greater than 5km. This means that whilst the character of the landscape surrounding the proposed development will undoubtedly change. This change is unlikely to be highly obvious to receptors.

Also given that the rural landscape character is likely to be changed to a similar extent by the currently authorised development and given that there are already similar facilities under construction in the area and that there do not appear to be any affected protected areas or sensitive uses, this character change is unlikely to be significant and is assessed as low (post mitigation) with a local impact.

Relevant Listed activities:
GNR 983 Activity: 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 and immediate surroundings, **(2)**
Duration	Long term, **(4)**	Long term, **(4)**

Magnitude	Low, **(4)**	Minor, **(2)**
Probability	Highly probable **(4)**	Probable, **(3)**
Significance	Medium, **(40)**	Low, **(24)**
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**	**N/A**

Mitigation / Management:

Planning:

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

Operation:

» Reinstate any areas of vegetation that have been disturbed during construction;
» Remove all temporary works;
» Monitor rehabilitated areas post-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 is maintained and protected as far as possible both within and surrounding the development area, 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 homesteads.

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.

The Orange River Corridor has the largest concentration of homesteads within the study area. Ilanga CSP 5 is approximately 10km away from the Orange River Corridor and a range of small hills separates the site from this area. This means that possible receptors in this area will be unaffected.

Five agricultural homesteads have been identified within the approximate visual limit of CSP 5. All of the homesteads are definitely in low area and will be screened from the development by landform.

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 due to authorised development, this change is unlikely to be exacerbated by the proposed extension to CSP 5.

Relevant Listed activities:
GNR 983 Activity: 12 (xii)(a)(c), 19 (i), 28 (ii)
GNR 984 Activity: 1,4, 15

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings (2)	(2)
Duration	Long term (4)	(4)
Magnitude	Small to minor (2)	Small (0)
Probability	Probable (3)	Improbable (2)
Significance	**Low (24)**	**Low (12)**
Status	The character of the rural landscape will be modified. It is possible that a proportion of receptors, particularly those that may benefit from this or similar projects in the area, will view the development as a positive addition to the local landscape. For those people that are attracted to the area for its natural attributes, 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	No irreplaceable loss.

	of view as irreplaceable.	
Can impacts be mitigated?	Mitigation is may not be necessary.	

Mitigation / Management:

Planning:

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

Operation:

» Reinstate any areas of vegetation that have been disturbed during construction;
» Remove all temporary works;
» Monitor rehabilitated areas post-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;
» Return all affected areas to productive agricultural use; and
» 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 the local Kleinbegin road to the west and the N10 to the north and N14 to the north.

The N10 and N14 are located on the northern side of a range of small hills that separate the Orange River Corridor from the proposed Karoshoek Solar Valley development area. This means that views from these roads into the development area are limited to an isolated, small section of the N10 which is approximately 10.5km from the site.

The assessment also indicates that proposed extension of Ilanga CSP 5 could be visible from a short section of the local Kleinbegin road, approximately 11.3km to the west of the site. This is a gravel road that has infrequent traffic and is used mainly by the local agricultural community.

Given the distance and the relatively flat topography, it is highly unlikely that reflection form the facility will make the development obvious from these sections of road.

The site visit has confirmed that minor ridgelines and undulations in the valley floor will play a significant role in screening views of the development from the identified roads. Where the development will be visible it will be seen largely in elevation and the landform is likely to provide partial screening.

Because of the above, it is highly unlikely that the proposed expansion of the Parabolic Trough development within Ilanga CSP 5 will significantly increase the impact associated with the currently authorised site.

Relevant Listed activities:
GNR 983 Activity: 12 (xii)(a)(c), 19 (i), 28 (ii)
GNR 984 Activity: 1,4, 15

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings, (2)	(2)
Duration	Long term, (4)	(4)
Magnitude	Low (4)	Minor, (2)
Probability	Probable, (3)	Improbable, (2)
Significance	**Medium, (30)**	**Low, (16)**
Status	negative	negative
Irreplaceable loss	The proposed development can be dismantled. There will therefore be no irreplaceable loss. However, given the long-term nature of the project, it is likely that a proportion of stakeholders will consider the loss of natural character as irreplaceable.	**No irreplaceable loss.**
Can impacts be mitigated	Yes	Yes

Mitigation:

Planning:

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

Operation:

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

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site;
» Return all affected areas to productive agricultural use; and
» 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.

The assessment indicates that sensitive visual receptors are likely to largely include roads and homesteads as evaluated in a) and b) above.

From the site visit and knowledge of the area there do not appear to be any other receptors within the approximate limit of visibility that are likely to be sensitive to changes of view associated with the proposed 50MW Ilanga CSP 5.

Relevant Listed activities:
GNR 983 Activity: 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	Small (0)	Small (0)
Probability	Very improbable (1)	Very improbable (1)
Significance	**Low (7)**	**Low (7)**
Status	Negative	Negative
Irreplaceable loss	No irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	Yes	NA

Mitigation:
Planning:
» Plan levels to minimise earthworks to ensure that levels are not elevated; and
» Plan to maintain the height of structures as low as possible.

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: Visual impacts associated with construction of the proposed project
Construction will be comprised of:
» Clearance of site;
» Construction of associated infrastructure;
» laying of concrete bases for parabolic troughs and power plant;
» Erection and fixing of parabolic troughs and power plant; and
» Laying of cable runs and connections.

This work is relatively minor and is likely to be completed in 2 to 3 years.

As the site 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 parabolic trough supports, parabolic trough fixing and power plant 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 final development and delivery trucks using local roads.

It is also possible that waste-blow could be problematic.

From the assessment of impacts of the final development as experienced by local receptors, it is obvious that the site and proposed development is unlikely to be obvious. Waste blow, delivery vehicles on local roads and dust could make the development obvious during construction. All of these issues will apply to the originally proposed development however, the proposed additional extent of development is unlikely to change the risk of these issues making the development obvious in the landscape.

Relevant Listed activities:
GNR 983 Activity: 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	Very short duration, (1)	(1)
Magnitude	Minor (2)	Small (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	NA

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.

Nature of impact: Impacts of glint and glare can vary from permanent eye injury, persistence of vision that could make driving on local roads dangerous to low level nuisance.

This assessment focuses on the likelihood of glint and glare making the proposed development obvious in the landscape. It does not assess the likelihood of injury or danger / nuisance to motorists.

Typically, the main risk of glint and glare associated with linear collectors such as parabolic troughs occur from:

» Specular reflections from the mirrors when they are moving from stowed to tracking;
» Specular reflections off the ends of the trough or mirrors when the sun has a low elevation angle (e.g., reflections from the north end of a north-south field when the sun is low in the southern horizon); and
» Diffuse and specular reflections from receiver tubes.

In the southern hemisphere typically these impacts are most likely to occur to the east, west and south of a facility during early morning and late afternoon when the sun is relatively low.

It also has to be understood that the angle of reflection matches the angle of incidence, which means that even when the sun is low, reflections unless diffuse will affect receptors above the level of the facility. In a perfectly flat landscape therefore glint and glare are generally directed over the heads of surrounding receptors. Also, the further that a receptor is located away from the facility then the lower the likelihood is of a receptor being impacted.

In order for there to be a problem it is necessary for the facility to be visible to receivers.

Given the distance and the possible screening effect of vegetation and minor land form, it is highly unlikely that either glint or glare associated with the proposed expansion of the extent of Parabolic Trough development on Ilanga CSP 5 will be significant.

Relevant Listed activities:
GNR 983 Activity: 28 (ii)
GNR 984 Activity: 1

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings (2)	Site and immediate surroundings (2)
Duration	Long term (4)	Long term (4)
Magnitude	Small (0)	Small (0)
Probability	Very improbable (1)	Very improbable (1)
Significance	**Low (6)**	**Low (6)**
Status	Negative	Negative
Irreplaceable loss	There will be no irreplaceable loss.	There will be no irreplaceable loss.
Can impacts be mitigated?	Yes.	N/A

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.

Residual Risks:

» No residual risk has been identified.

Nature of impact: Industrialisation of a natural landscape as seen at night.

This could include the lighting up of the power plant at night which would make it obvious within what is currently a dark rural area at night.

It is likely that operational lighting will be required at buildings and security lighting may be required within the trough field.

It must be understood that authorised projects within the greater Karoshoek Valley are extensive and pose a 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 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 an additional 200 ha of the plant is likely to be noticeable. If however only low level lighting around buildings is required then the additional proposed capacity expansion of Ilanga CSP 5 is likely to have negligible impact on the night time landscape.

Relevant Listed activities:
GNR 983 Activity: 28 (ii)
GNR 984 Activity: 1

	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)	Improbable (2)
Significance	**Low (24)**	**Low (10)**
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.

6.5.4. 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 5 Facility can be developed and impacts on visual resources managed by taking the following into consideration:

» The affected landscape has a degree of visual absorption capacity due to occasional head height shrubs particularly in valley lines as well as the minor ridgelines that bisect the valley floor.
» The project will almost always be viewed from a similar level as the development meaning that it will largely be seen in elevation. This will mean that overviews of the full extent of development will not be possible from public access areas.
» Mitigation should be focused on maintaining natural vegetation which will provide a degree of screening and ensuring that development levels are not elevated above the natural landform.

The assessment indicates that the development of the additional area on Ilanga CSP 5 is likely to have minimal additional visual impact over and above that associated with the authorised site.

6.6. Assessment of Potential Impacts on Archaeological Heritage associated with the proposed 50MW Ilanga CSP 5 Facility

The proposed Ilanga CSP 5 Facility was assessed at a desktop level informed by fieldwork and previous surveys of the area (Van Schalkwyk, 2011, Gaigher, 2012, van der Walt, 2014). 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).

6.6.1. Results of the Archaeological Heritage survey

The CSP Facility site was covered in a previous HIA completed by Stefan Gaigher (2012) who recorded no sites within the development footprint of CSP 4 facility. Studies by van der Walt (2014) and van Schalkwyk (2011) were also conducted for the larger Karoshoek Solar Valley Development. Sites recorded by these studies are given the abbreviation JvS for the van Schalkwyk (2011) study, SG for the Gaigher (2012) study and JW for the van der Walt 2014 study in Table 6.2.

For the broader study area a number of sites (**Figure 6.2**) were recorded during the previous HIAs for the different project components. No sites were recorded for the area impacted on by the proposed CSP 4 footprint.

Table 6.2: Identified heritage features with co-ordinates

Site Number	Recorded by:	Type Site	Cultural Markers	Coordinate (accuracy 4 -8 meters)
Site 1	vd Walt (2014) and van Schalkwyk (2011)	Late Stone Age	Seasonal pans with flakes	S28.49389 E21.51799
SG 1	Gaigher (2012)	Stone Age	Scattered MSA/LSA flakes	S28.40118 E21.48513
SG 2	Gaigher (2012)	Historical	Porcelain	S28.40118 E21.48513
SG 3	Gaigher (2012)	Cemetery	Headstones etc.	S28.45036 E21.31508
SG 4	Gaigher (2012)	Cemetery	Headstones etc.	S28.43233 E21.29913
SG 5	Gaigher (2012)	Late Stone Age	Flakes	S28.46904° E21.41985°
SG 6	Gaigher (2012)	Middle Stone Age	Flakes	S28.50682° E21.52352°
SG 7	Gaigher (2012	Later Stone Age	Flakes	S28.50373° E21.47926°
JvS 1	van Schalkwyk (2011)	Late Stone Age	Flakes and cores	S28.49227 E21.51588
JvS 3	van Schalkwyk (2011)	Late Stone Age	Flakes and cores	S28.49464 E21.52133
JvS 4	van Schalkwyk (2011)	Late Stone Age	Flakes and cores	S28.49395 E21.52172
JvS 5	van Schalkwyk (2011)	Late Stone Age	Flakes and cores	S28.49341 E21.52184

Site Number	Recorded by:	Type Site	Cultural Markers	Coordinate (accuracy 4 -8 meters)
JvS 6	van Schalkwyk (2011)	Late Stone Age	Flakes and cores	S28.49263 E21.52279
JvS 7	van Schalkwyk (2011)	Recent	Clay brick dwellings	S28.48176 E21.54503
JvS 8	van Schalkwyk (2011)	Recent	Clay brick dwellings	S28.48010 E21.54974

Scatters of isolated stone tools 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. These low density scatters are of low significance and it is recommended that the scatters are recorded, which has been done in this report. No further mitigation is required. However several Stone Age sites do occur in the larger area. These sites consist of a Later Stone Age (LSA) artefact scatter around depressions that contain seasonal water (JW1) and stream bed margins that were utilised in the past (JvS 4). These sites are given a Generally Protected A (GP.A) field rating.

LSA artefacts (mostly on the locally available CCS) and isolated MSA artefacts on a green coarse grained quartzite are noted scattered over the landscape. Sand cover is thick on some portions of the study area while other sections have higher archaeological visibility.

Very few heritage resources are on record close to the study area and none of them will be directly impacted on by the proposed development (**Figure 6.2**).

6.6.2. Description of the Heritage Impacts

The broader study area in which the Ilanga CSP 5 Facility is located has been subjected to various heritage and archaeological assessments (Gaigher 2012, van Schalkwyk 2011 and van der Walt 2014). These studies provide a good baseline of the archaeology expected within the footprint of Ilanga CSP 5 site.

From these studies, 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 do occur in the larger area. The sites consist of a Later Stone Age (LSA) artefact scatter around depressions that contain seasonal water and stream bed margins that was utilised in the past.

The proposed Ilanga CSP 5 Facility was assessed at a desktop level informed by fieldwork and previous surveys of the area (Van Schalkwyk, 2011, Gaigher, 2012, van der Walt, 2014). Although a Stone Age site was recorded as occurring within the development area, the impacts to heritage resources by the proposed development are not considered to be highly significant as the site is not of heritage significance. 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.

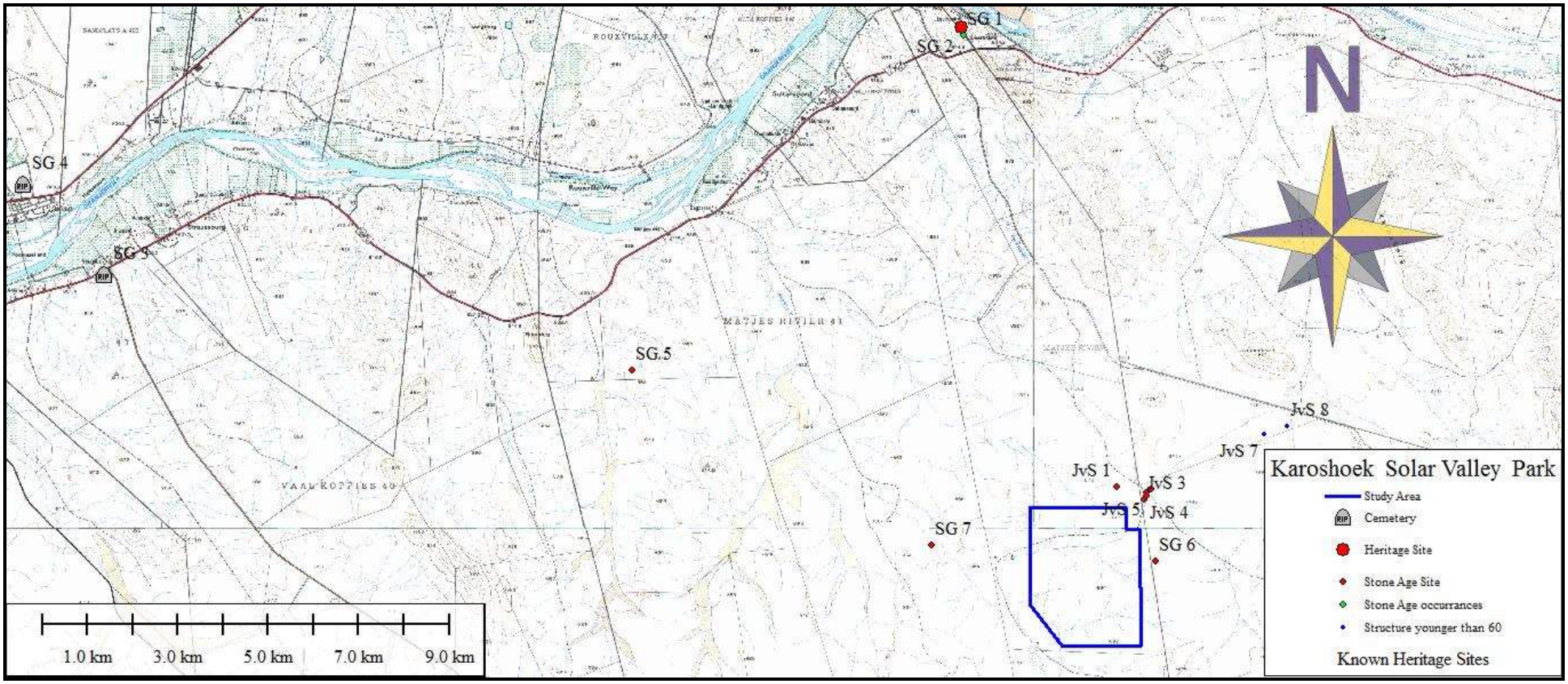


Figure 6.8: Site distribution map.

Figure6.9: Google image of the larger Ilanga CSP 5 Facility study area.

Figure 6.10: General Site conditions

Figure 6.11: Site conditions in the Ilanga CSP 5 study area.

Figure 2.12: Range of raw materials used and isolated MSA and LSA flakes.

6.6.3. Impact tables summarising the significance of impacts on heritage resources (with and without mitigation)

Nature of impact: 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.		
	Without mitigation	**With mitigation (Preservation/**

		excavation of site)
Extent	Local (2)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (3)
Probability	Not probable (2)	Not Probable (2)
Significance	**22 (Low)**	**20 (Low)**
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.		
Residual Impacts: In any archaeological contexts the impacts are once-off permanent destructive events.		

6.6.4. 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 CSP Facility can be developed and impacts on heritage features managed by taking the following into consideration:

» It is recommended that the impact area should be subjected to a walk down prior to construction and if any sites are identified that are of significance these sites can be preserved or mitigated.
» 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.
» It should be ensured that the recorded features are protected from damage during the construction phase of the project and that no historical artefacts are collected and removed from the sites or its surroundings. More fortifications can be expected in the southern portion of the study area and any deviation to the current footprint must be assessed by the archaeologist.

If these recommendations are adhered to, specialist is of the opinion that from an archaeological point of view the project is viable as potential impacts to heritage resources by the proposed development could be mitigated prior to construction.

6.7. Assessment of Potential Socio-Economic Impacts

A social impact assessment was conducted for the proposed Ilanga CSP 5 Facility. 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).

6.7.1 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.

6.7.2. 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 12-14 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. It is estimated that during the construction phase (for the period of approximately 12-14 months) approximately ~250-350 employment opportunities will be generated for the 50MW Ilanga CSP 5 project. 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 estimated wage bill for the construction for the 50MW trough plant is estimated to be in the region of R35-50 million (2016 rand value).

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 between 12% and 20% of residents 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 proponent has indicated that approximately 40% (primarily low-skilled and semi-skilled workers) of the labour force will be sourced from the local area which is more than the stipulated requirements under the REIPPP Programme. The DoE specifies that the REIPPP 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.

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. The proponent has indicated that approximately ~100-140 low-

skilled and semi-skilled opportunities are likely to be available to the local labour force. 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 those who have been sourced out of town will be transported to and from site for the duration of the construction phase from their place of residence. 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.

The construction capital expenditure that will be spent on local goods and services associated with the establishment of the solar energy facility is estimated to be in the region of R1 billion (2016 rand value). 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.

Influx of jobseekers:

The proposed development will create a range of employment possibilities and thus this could attract jobseekers. An influx of people looking for economic opportunities could result in pressure on economic and social infrastructure on the local population (rise in social conflicts and change in social dynamics). Influx of jobseekers into the area, could lead to a temporary increase in the level of crime, cause social disruption and put pressure on basic services. Influx of jobseekers could potentially create conflict between locals and outsiders mainly due to difference in racial, cultural and ethnic compositions. The high unemployment rates and expectations of job creation is already a potential source of competition among locals and could be exacerbated through outsiders coming into the area resulting in conflict. A further negative impact that could result due to an inflow of jobseekers is that local unemployment levels could rise due to an oversupply of an available workforce, particularly with respect to semi and unskilled workers.

The towns and settlements located the closest to the study area (i.e. Upington, Dagbreek, Karos and Leerkrans) is seen as a sensitive social receptor and jobseekers coming into the area could put pressure on social infrastructure; create social problems, tensions and conflicts. The impact associated with in-migration of jobseeker includes pressure on local services and infrastructure. This includes municipal services such as sanitation, electricity, water, waste management, health facilities, transportation and availability of housing. Informal settlements may develop near towns to accommodate jobseekers. It is very difficult to control the influx of people into an area, especially in a country where there's high levels of unemployment. An influx of jobseekers to an area often results in an increase in prostitution activities and temporary sexual relations with locals; this could result in the spreading of HIV/Aids and STDs and unwanted pregnancies. The proposed solar development disrupting societies largely depends on the level of local employment achievable and clearly stipulating a local employment regime to limit outsiders coming into the area. Employment opportunities can be sourced from the surrounding local towns and settlements first, i.e. Upington, Dagbreek, Karos and

Leerkrans, if availability of labour is limited then extend search to the KHLM and ZFMDM. The KHLM population (93 494 people) could fulfil the majority of the lower and semi-skilled employment opportunities that emerge from the proposed development.

Impacts on daily living and movement patterns (traffic impacts):

With the additional 50MW CSP trough facility, that is to form part of the already authorised site, the number of construction vehicles and heavy vehicles will increase slightly. This could slightly increase 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 20km long and traverses the adjacent farm Matjiesrivier 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. A slight increase in 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. A slight 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 use and is primarily only utilised by the local farmers to access the farm. The adjacent landowner of Farm Matjiesrivier 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 the contract expires. The contract may be extended, depending on process of the developers (Emvelo Holdings (Pty) Limited purchasing the farm. If the development becomes a preferred bidder the landowner has indicated that the farming activities will discontinue. Therefore the traffic disruptions won't impact any of the farming activities on the impacted sites.

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. 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 study area is currently utilised for livestock farming.

The impacted and adjacent farm owners utilise their farms for livestock farming. There are also minor game farming activities on nearby farms as well as the Ilanga solar project under development on the adjacent property. The influx of construction workers and people coming into the area does increase the risk of stock theft and poaching.

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.

A slight 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 immediate local area is sparsely populated with few homesteads near the proposed site and the area is primarily utilised for livestock farming.

The movement of heavy construction vehicles along the existing gravel access has the potential to generate dust pollution. The nuisance impacts from the construction activities of the 50MW CSP facility are expected to be negative however have a low significance.

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 ~12-25 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 washing troughs routinely (in the evening) and 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.

Development of clean, renewable energy infrastructure:

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 (i.e. authorised facility and additional 50MW proposed) 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 from the KHLM and the Ward Councillor for Ward 14. 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 assessment (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 to significantly contribute towards local economic growth, SED and ED.

Visual impact and 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 area around Upington has been identified by the Department of Environmental Affairs as a REDZ 7. These zones have been put forward in order to focus development and inform planning. In addition, the provincial government has identified a Solar Corridor within this area within which solar development is planned in terms of the Provincial SDF.

The adjacent landowners are farmers that utilise the adjacent land for livestock / game farming activities. According to the VIA, the development of the proposed additional 50MW capacity of Ilanga CSP 5 within the Karoshoek Solar Valley Development will not significantly alter the visual impact associated with the development of parabolic trough facility on the already authorized site. The visibility of proposed extended capacity of Ilanga CSP 5 will fall within the extent of impact associated with currently authorised site. As receptors are some distance from the facility (minimum 5km) and because partial views of the facility are only likely to be possible, the additional impact associated with the proposed additional capacity is unlikely to significantly add to visual impacts. The anticipated impact from the additional 50MW CSP facility 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 ~200ha for the 50MW facility). 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 additional 50MW facility will be constructed over an area of approximately ~200ha. 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 grazing activities will still take place on the other portions of the farm that aren't occupied by the solar energy facility. 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 (~15-25), 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.

6.7.3. 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 12-14 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: 12 (xii)(a)(c), 19 (i), 28 (ii) GNR 984 Activity: 1, 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:

» If possible, efforts should be made to employ local contractors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria.
» It is recommended that local employment policy is adopted to maximise the opportunities made available to the local labour force (sourced from nearest towns/settlements).
» The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.
» Where feasible, 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: 28 (ii)
GNR 984 Activity: 1, 15

	Without enhancement	**With enhancement**
Extent	Local- Regional (4)	Local- Regional (4)
Duration	Short term (2)	Short term (2)
Magnitude	Minor (2)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Medium (30)**
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 jobseekers.

Relevant Listed activities:
GNR 983 Activity: 28 (ii)
GNR 984 Activity: 1, 15

	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:

» It is recommended that local employment policy is adopted to maximize the opportunities made available to the local labour force.

» 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; Upington, Dagbreek, Karos and Leerkrans, and if this is not possible, then the broader focus areas should be considered for sourcing workers such as KHLM and 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.

» Establish 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: Impacts from an increase in traffic disruptions and movement patterns during the construction phase.

Relevant Listed activities:
GNR 983 Activity: 28 (ii)
GNR 984 Activity: 1, 15

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (24)**	**Low (12)**
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: 28 (ii) GNR 984 Activity: 1, 15		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Improbable (2)	Very improbable (1)
Significance	**Low (27)**	**Low (14)**
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 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: 28 (ii) GNR 984 Activity: 1, 15		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Small (1)
Probability	Probable (3)	Probable (3)
Significance	**Low (15)**	**Low (12)**
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.		

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	Minor (2)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Medium (40)**
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 (KGLM) with social responsibility plans must be undertaken.		
Residual impacts Improvements in local communities through socio-economic development and enterprise development		

Nature: Visual impacts and sense of place impacts associated with the operation phase of the solar energy facility and associated infrastructure		
Relevant Listed activities: GNR 984 Activity: 1		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (20)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	

Mitigation 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 984 Activity: 1		
	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 anticipated		
Residual impacts: None, as farmland can be returned to grazing after decommissioning and rehabilitation.		

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		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (2)
Duration	Short term (1)	Short Term (1)
Magnitude	Low (4)	Minor (2)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Low (28)**	**Low (20)**
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.	

6.7.4. Implications for Project Implementation

The proposed Ilanga CSP 5 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 following recommended mitigation measures and management actions:

» 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 to record all complaints and queries relating to the project and the action taken to resolve the issue.
» 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, damage to existing roads and fences and/ 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.

6.8. 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 5 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 5 Facility (which is limited to the development footprint of 200ha). 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 5 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 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 5 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 5 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 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 5 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 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 5 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[16] and current knowledge of projects being proposed in the area. In the case of the proposed Ilanga CSP 5 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.

Table 7.1: Other projects/ developments within 30km from the Ilanga CSP 5 Project site

Project Name	DEA Ref. No	Location	Approximate distance from the Ilanga CSP 5 site	Project Status
Ilanga Solar Thermal Power Plant-Ilanga CSP1 (1 x 100 MW Parabolic Trough)	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, Matjesriver 3/41, Karos 956 and Lot 944 Karos Settlement	All within the Karoshoek Solar Valley development site	Received Authorisation
25MW Solar Energy Facility, North-East Of Upington,	12/12/20/2169	Remaining Extent of the Farm 418	20km north	Received Authorisation

[16] Available online at https://dea.maps.arcgis.com/

Project Name	DEA Ref. No	Location	Approximate distance from the Ilanga CSP 5 site	Project Status
NC Province				
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

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 – J**.

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.

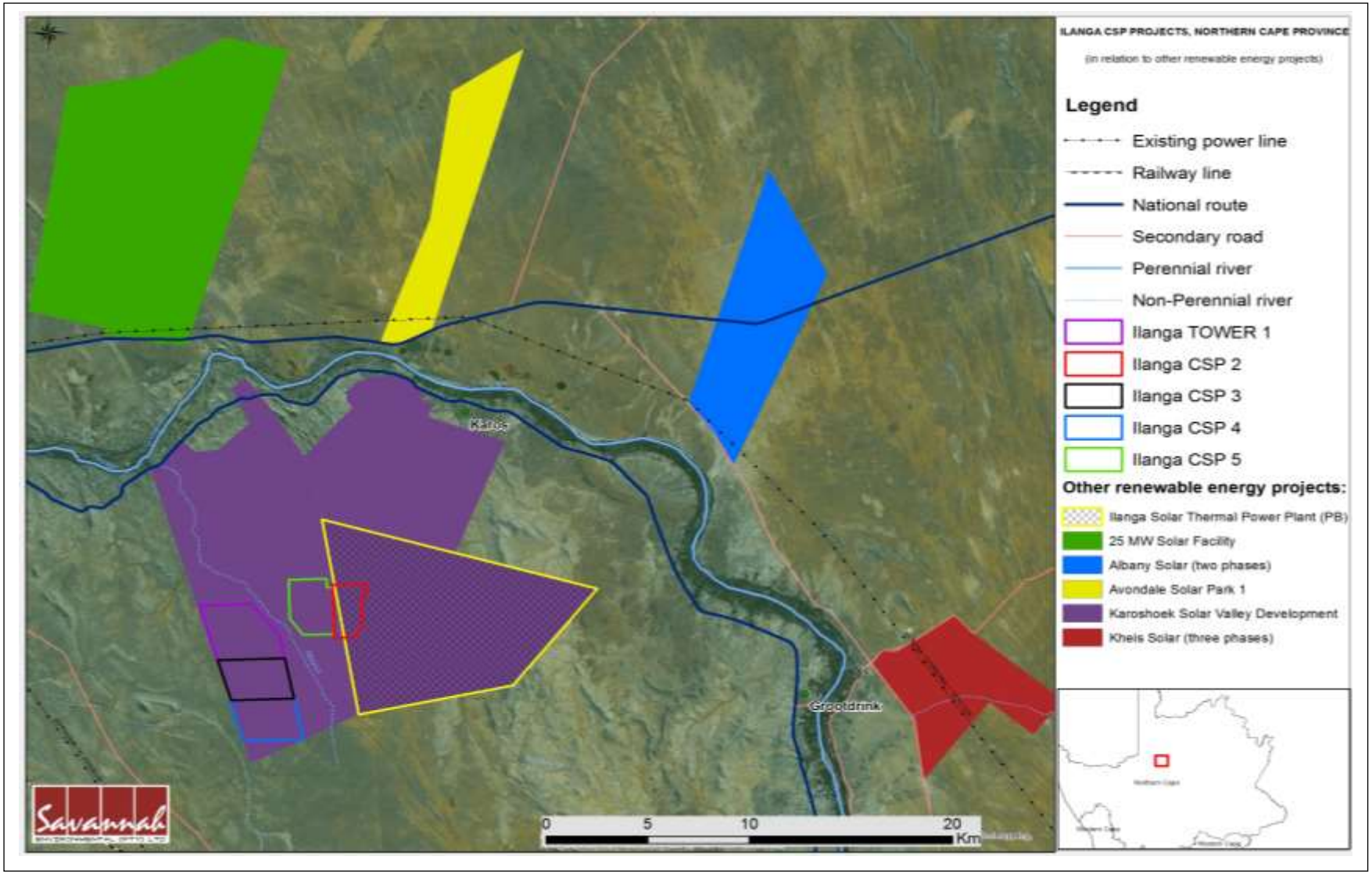


Figure 7.1: Solar energy projects surrounding the Ilanga CSP 5 Facility (these projects areas were identified using the Department of Environmental Affairs Geographic Information System digital data developed by the CSIR. It must be noted that this secondary product has not yet been verified by DEA)

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 5 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.

7.2 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 the footprints of the 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 low 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.

Nature of impact: 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. This may however change and the current site is located within an area that is deemed to be of above-average significance for faunal connectivity. 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 movement corridors are not blocked off and 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 (6)	Low (5)
Probability	Probable (3)	Probable (4)
Significance	**Medium (48)**	**Low (44)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Under the current layout there is little that can be done to effectively mitigate this impact as it is the presence of the facility and the loss of the intact vegetation within the footprint that generates the impact.	

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.

7.2.1. 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.

7.3 Cumulative Impacts on Avifauna

Cumulative impacts are defined as "Impacts that result from incremental changes caused by other 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 Valley Development area, mainly by other solar farms and associated infrastructure. This will happen via the same factors identified here viz: collision, avoidance and displacement.

There are fourteen proposed or approved solar farms of various sizes within 30 km of Karoshoek Solar Development. 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, or disturbed or displaced by human activity;
» the numbers of bird killed by collision with the structures on site;
» the number of birds killed by collision with infrastructure leading away from the site; and
» the number of birds killed by flying through the solar flux of the CSP tower sites.

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, and no less than 20% of the flow is required as an ecological reserve to maintain ecological functioning of the river. Further off-take amounting to a possible 640 000 m^3 (i.e. that associated with 8 CSP sites x 80 000 m^2 proposed within the area), particularly at low flow (November-December) may force some wetland species to seek other water sources. This becomes an issue for the CSPs and the bank of mirrored surfaces that will be in the environment surrounding the river environs. If the Lake Effect as anticipated by Kagen et al. (2014) attracts such water-seeking wetland birds then the large off-take of water from the Orange River may exacerbate this effect. The following is expected:

» a seasonal influx of wetland birds to the CSPs in the dry season and an increase in mortality; and
» greater mortality with time as more and more solar developments take more and more water away at such times.

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 surface area of the mirrored surfaces of each CSP;
» the reduction in flow of the Orange River causing more birds to seek other water sources; and
» the number of solar farms within 30 km of the Karoshoek site.

Because 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 type of impacts.

Nature of impact: Cumulative impacts on avifauna in the area. For the CSP itself the mortality and displacement impact on birds is poorly known, but many solar farms are now being constructed in the Kalahari/Karoo region and more will occur in the future: thus more research and monitoring of the combined impacts is required		
	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.		

7.3.1. 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.

7.4 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 5 project with the additional Ilanga CSP parabolic trough projects on which similar expansions are proposed. From comparison with the Cumulative ZTV indicated within the Original VIA it is obvious that a similar area is likely to be affected than was originally anticipated. The ZTV for 12m high development on these sites is focused within a band approximately 15km measured east to west and 25km measured north to south (approximately 360km^2). 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.

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 50MW associated with Ilanga CSP 5 is unlikely to significantly extend the impact of the adjacent authorised site. It is therefore unlikely to result in an increase in cumulative impacts associated with authorised development within the Karoshoek Valley.
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.

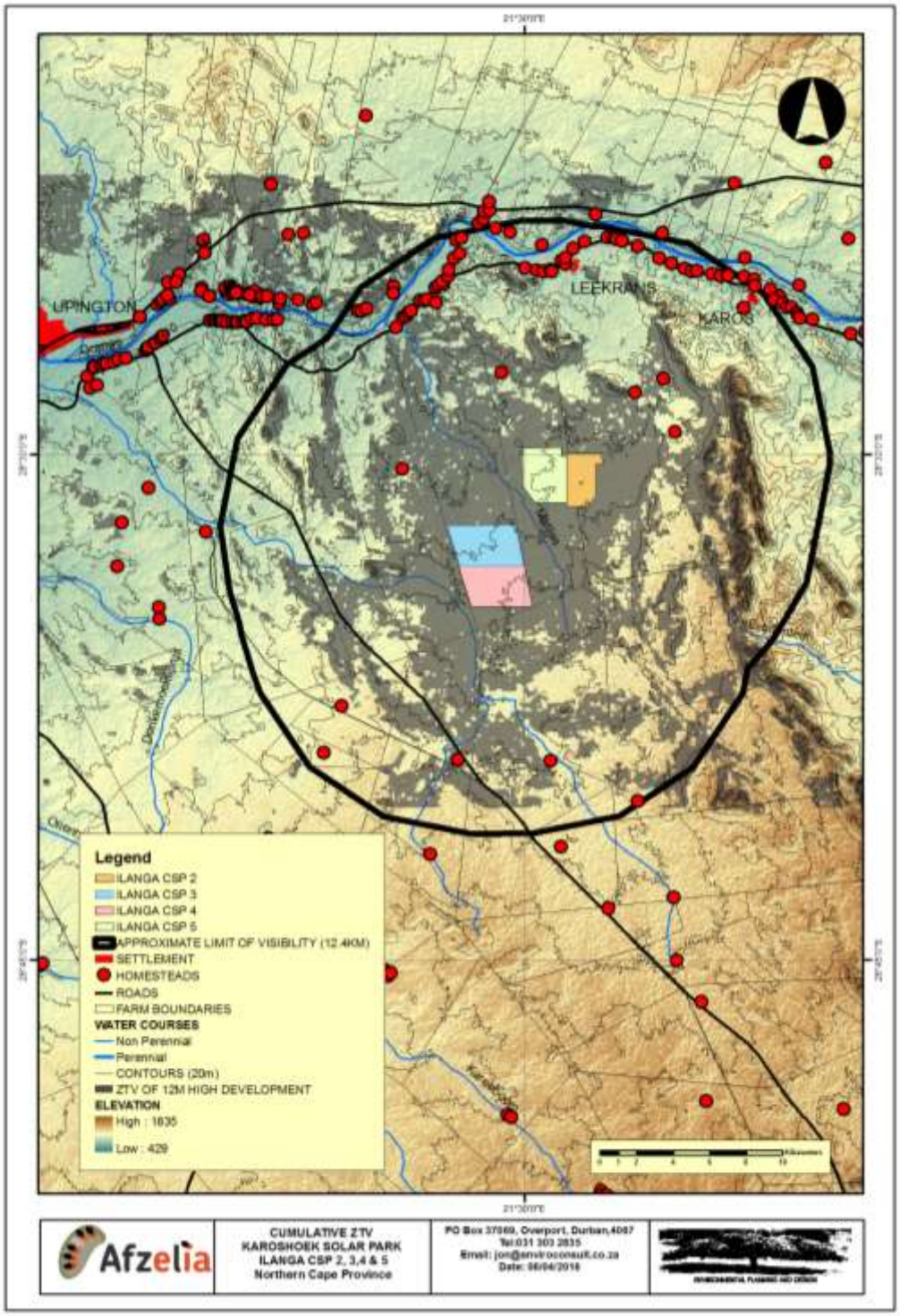


Figure 7.2: Cumulative ZTV of CSP Trough Projects within the Karoshoek Solar Valley Site

Nature of impact: Industrialisation of a natural landscape as seen from local homesteads.

The Orange River Corridor has the largest concentration of homesteads within the study area. Ilanga CSP 5 is approximately 11.4km away from the Orange River Corridor and a range of small hills separates the site from this area. This means that possible receptors in this area will be unaffected.

Six agricultural homesteads have been identified both within the approximate visual limit and within the valley floor surrounding the proposed development CSP2. All of the homesteads are definitely in low areas and are likely to be screened from the development by landform.

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 due to authorised development, this change is unlikely to be exacerbated by the proposed extension to CSP 5.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Small (0)	Small (0)
Probability	Very improbable (1)	Very improbable (1)
Significance	**Low (5)**	**Low (5)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	NA

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; and
» Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operation:

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

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site;
» Return all affected areas to productive agricultural use; and
» Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Nature of impact*:* Proposed Solar projects within the Karoshoek Solar Valley Development and surrounding areas will add industrial elements to an otherwise natural landscape. Industrialisation of a natural landscape as seen from the local Kleinbegin road to the west and the N10 to the north and N14 to the north.

The assessment has shown that:

» Ilanga CSP 5 including the proposed additional capacity is highly unlikely to be obvious from the N10 or the N14.
» It is likely that the proposed extension areas could be visible from short sections of this road. However, given the distance, it is unlikely that the development will be obvious in the landscape.
» It is highly unlikely that the proposed expansion of Parabolic Trough development within Ilanga CSP 5 will significantly increase the impact associated with the currently authorised site.

The proposed 50MW Ilanga CSP 5 plant will therefore not add significantly to the cumulative impact of solar projects within the Karoshoek Solar Valley Development and surrounding area.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Small (0)	Small (0)
Probability	Improbable (2)	Very Improbable (1)
Significance	**Low (10)**	**Low (5)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	NA

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; and
» Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operation:

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

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site; and
» Return all affected areas to productive agricultural use;
» Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Nature of impact: The visibility of the facility to, and potential visual impact on sensitive receptors

From the site visit and knowledge of the area there do not appear to be any other receptors within the approximate limit of visibility that are likely to be sensitive to changes of view associated with the proposed extension of Ilanga CSP 5.

The proposed development is therefore highly unlikely to increase the cumulative impact associated with other authorised projects in the area.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Small (0)	Small (0)
Probability	Very improbable (1)	Very improbable (1)
Significance	**Low (7)**	**Low (7)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	NA

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; and
» Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operation:

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

Decommissioning:

» Remove infrastructure not required for the post-decommissioning use of the site; and
» Return all affected areas to productive agricultural use.
» Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Nature of impact: Visual impacts associated with construction of the proposed project.

There are numerous solar projects authorised and planned for the Karoshoek Valley and in the surrounding areas. It is possible that a number of construction projects could occur at any one time. This could create the impression that extensive areas of natural landscape

are subject to development. Dust and plant may be visible; however, it is not likely to be highly obvious.

Construction will be comprised of:
» Clearance of site;
» Construction of associated infrastructure;
» laying of concrete bases for parabolic troughs and power plant;
» Erection and fixing of parabolic troughs and power plant; and
» Laying of cable runs and connections.

This work is limited in extent, and each project is likely to be completed in 24-36 months.

Construction work associated with Ilanga CSP 5 is unlikely to be highly visible however the following impacts could make it obvious to receptors;
» Additional delivery trucks on local roads;
» Additional dust rising from an extended site area; and
» Additional waste blow affecting surrounding areas.

These issues could exacerbate the general impact of construction should other facilities be constructed at the same time as the Ilanga CSP 5 project.

	Without mitigation	**With mitigation**
Extent	Site and surrounds (2)	Local (1)
Duration	Very short term (1)	Very short term (1)
Magnitude	Minor (2)	Small (0)
Probability	Probable (3)	Possible (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	NA

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.

Nature of impact: The cumulative impact of the project on glint and glare associated with solar projects in the area.

The assessment indicates that the proposed 50MW Ilanga CSP 5 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 of impact: 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 Ilanga CSP 5 facility will 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 project will add negligible additional impact to the authorised project.

In the former case, the proposed extension 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	Low (4)	Small (0)
Probability	Definite (5)	Improbable (2)
Significance	**Medium (50)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	NA

Mitigation:
» Use of motion sensors to turn on security lights when needed.
» Use of infrared security systems.
» Preventing light spill through careful design.

7.5.1. Implications for Project Implementation

Cumulative impacts on landscape quality and sensitive visual receptors 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 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 5 project 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 site)**
Extent	Local (2)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (3)
Probability	Not probable (2)	Not Probable (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.

7.5.1. 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 area. 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.

7.6 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. The cumulative impacts of the project are related to the construction and operation phases. The proposed additional 50MW CSP trough facility for Ilanga CSP 5 project is located within less than 10km from other renewable energy facilities (refer to **Table 7.1**). This is considered to be in line with Provincial and National Planning for solar energy development (in terms of the NC SDF and the REDZ). The potential for significant cumulative impacts is however likely to be high. This could result in positive permanent impacts on the economy, business development, employment and education in the area and the province. It may also result in some negative impacts such as influx of jobseekers and change the landscape and areas sense of place. However the cumulative impacts for the proposed 50MW CSP trough facility for Ilanga CSP 5 project have been assessed to be acceptable (as detailed below).

Nature of impact: Cumulative impacts from employment, skills and business opportunities - An increase in employment opportunities, skills development, SED and business opportunities with the establishment of more than one solar energy facility

The proposed Ilanga CSP 5 project and the establishment of other solar energy facilities in the area has the potential to result in significant positive cumulative impacts, specifically with the creation of a number of socio-economic opportunities for the Province, which in turn, will result in a positive social benefit. The positive cumulative impacts include creation of employment, skills development and training opportunities, and downstream business opportunities. Benefits to the local, regional and national economy through employment and procurement of services could be substantial should many renewable energy facilities proceed. This benefit will increase significantly should critical mass be reached that allows

local companies to develop the necessary skills to support construction and maintenance activities and that allows for components of the renewable energy facilities to be manufactured in South Africa. Furthermore at municipal level, the cumulative impact could be positive and could incentivize operation and maintenance companies to centralise and expand their activities towards education and training more closely to the projects. Cumulative impacts on local entrepreneurs will be positive and assist in developing their businesses further. Also 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. The additional impact associated with the proposed additional 50MW CSP capacity is likely to have minor positive impact on the local economy.

	Cumulative Impact with 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.

Nature of impact: Negative impacts and change to the local economy with an in-migration of labourers, businesses and jobseekers to the area during construction and operation.

The development of large-scale solar projects in the local area will likely draw a large number of labour, businesses and jobseekers to the area. If the required labour force cannot be sourced locally or the local labour pool is inadequate for the solar energy projects, outside labour will likely move to the area to fill the gap. The area may experience an influx of new residents who may move to the area looking for job opportunities; which will have effects on the existing population during the construction periods that could entail problems of housing, sanitation, water usage and solid waste disposal. Employment for a solar energy facility peaks during construction and significantly declines during operation; since solar energy facilities need relatively few workers while in operation, solar facilities will not

create long-term boomtowns. Though there may be an influx of workers during construction, these workers are largely temporary. Rapid population growth is a common experience in rural towns near new large development projects. Towns with larger populations (greater than 1 000 individuals) and with developed services will likely experience greater rates of population growth than areas without developed services. In relation to the area, the towns that are sensitive receptors will be Upington and the smaller settlements nearby. With the influx of new individuals, secondary industries in the town may also begin to grow, more individuals will move to the area to fill these secondary positions. The impact of this on services and resources is likely to impact the current communities and increase the pressure on local municipalities to meet the basic needs of these potential new communities. The poor communities are likely to be the most vulnerable to loss of service provision and suffer the negative impact of large scale in-migration. There is potential for the influx of migrants to significantly change the local receiving environment and this is likely to have a permanent impact in the region. If more than one solar energy facility is under construction at any one time, then the impacts from in-migration of people is likely to have more of a negative impact on the local area. It is very difficult to control an influx of people into an area, especially in a country where unemployment rates are high.

	Cumulative Impact with 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.

Nature of impact: Visual impacts and change in the sense of place impacts associated with the establishment of more than one solar energy facility in the area

The visual impact of solar energy facilities (PV and CSP) is likely to change the immediate landscape of the area. The cumulative impact of other solar energy projects in the area

could alter the nature of the visual landscape. The potential impact of solar facilities on the landscape is an issue that does need to be taken into consideration, specifically given the growing number of solar energy facility applications in the Northern Cape Province. There are a number of proposed solar energy facilities in the nearby area, which will have a significant impact on the areas sense of place. With regards to the area, more solar energy facilities could be proposed in the future. The Environmental Authorities in the Province should therefore be aware of the potential cumulative impacts when evaluating applications.

According to the VIA, the area around Upington has been identified by the Department of Environmental Affairs as a REDZ 7. These zones have been put forward in order to focus development and inform planning. In addition, the provincial government has identified a Solar Corridor within this area within which solar development is planned in terms of the Provincial SDF. In the Upington area this has resulted in numerous solar energy project applications. This focus is likely to transform the general landscape character of the area. The development of the proposed 50MW Ilanga CSP 5 facility within the Karoshoek Solar Valley Development will not significantly alter the visual impact associated with the development of parabolic trough facilities on already authorised sites. The visibility of proposed extended capacity of Ilanga CSP 5 will fall within the extent of impact associated with currently authorised sites. As receptors are some distance from the facility (minimum 5km) and because partial views of the facility are only likely to be possible, the additional impact associated with the proposed additional capacity is unlikely to significantly add to cumulative visual impacts.

	Cumulative Impact with Proposed Project	**Cumulative Impact without Proposed Project**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (36)**	**Medium (30)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	No	
Mitigation Implement mitigation measures and recommendations proposed by the visual specialist as part of the VIA.		

7.6.1. 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.

7.7 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[17].

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[18]. 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.

[17] Greenhouse Gas Inventory for South Africa: 2000-2010

[18] http://ecowatch.com/2015/03/23/renewables-mitigate-climate-change/

7.8 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 5 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 7.3 provides a summary of the expected cumulative impacts associated with the proposed project on the identified site.

Table 7.3: Summary of cumulative impact significance for Ilanga CSP 5 Facility

Specialist assessment	Cumulative Impact Significance (Pre-Mitigation)	Cumulative Impact Significance (Post Mitigation)
Ecology	Moderate	Minor
Avifauna	Moderate	Minor
Visual Impact	Minor	Minor
Heritage Impact	Minor	Minor
Socio-Economic	Moderate (+ve) and Moderate (-ve)	Moderate (+ve) and Moderate (-ve)

Considering the findings of the specialist assessments undertaken for the project, the cumulative impacts for the proposed Ilanga CSP 5 Facility 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 the Ilanga CSP 5 Facility:

- 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.
- Low risk to avifauna through loss of habitat, infringement on breeding areas, or risk to collision-prone species 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 Holding (Pty) Ltd, an independent power developer of concentrating solar power (CSP) plants in South Africa, is proposing to develop an additional Concentrated Solar Power (CSP) Facility and associated infrastructure adjacent to the authorised CSP site Karoshoek LFT (1 x 100 MW Parabolic Trough) on Site 1.4, DEA Ref No.: 14/12/16/3/3/2/299) within the Karoshoek Solar Valley Development. The site is located approximately 30 km east of Upington within the //Khara Hais Local Municipality in the Northern Cape (refer to Figure 1.1). The proposed project is to be known as the **Ilanga CSP 5** Project. The **Ilanga CSP 5** Project is proposed to generate up to 50MW in capacity and will be constructed adjacent to the authorised site 1.4 within an area of approximately 200ha in extent within the broader property.

The purpose of the additional CSP facility to be investigated is to facilitate the increase in capacity of the authorised Karoshoek PT Site 5 facility to 150MW in order to meet the generating capacity thresholds specified by the Department of Energy (DoE) in its Expedited Bid Window of the Renewable Energy Independent Power Producers Procurement (REIPPP) Programme (Tender No: DOE/003/13/14 – as amended from time to time).

Solar power generating facilities use the energy from the sun to generate electricity. Concentrating Solar Power (CSP) collects the incoming solar radiation and concentrates it (focusing or combining it), on a single point, thereby increasing the potential electricity generation. The authorised CSP Site 1.4 (Karoshoek LFT 2) will consist of parabolic trough technology with a heat transfer fluid (HTF) with a generating capacity of 100MW consisting of the following infrastructure:

» Parabolic troughs utilising a heat transfer fluid (HTF).
» Power Plant/Power Island: power island with steam turbine generator, auxiliary boilers, dry cooling and molten salt storage.
» Associated infrastructure: access roads, plant substation, power line, water abstraction point and supply pipeline, water storage tanks, packaged water treatment plant, lined evaporation ponds, and workshop and office buildings.

The proposed Ilanga CSP 5 Project is proposed to include several parabolic troughs with a generating capacity of up to 50 MW and internal access roads and will be developed together with the authorised Karoshoek Site 1.4 CSP/ Ilanga LFT 2. A summary of the details and dimensions of the planned infrastructure associated with the Ilanga CSP 5 50MW Project is provided in Table 8.1.

Table 8.1: Details of the proposed Ilanga CSP 5 Project

Component	Description/ Dimensions
Location of the site	Portion 3 of the Farm Matjiesrivier 41
Municipal Jurisdiction	//Khara Hais Local Municipality which falls within the jurisdiction of the Mgcawu District (Siyanda) Municipality
Ward number	14
SG Code	C03600000000004100003
Nearest Town	Upington
Site Co-ordinates (centre of site)	Lat: 28°30'35.32"SLong: 21°30'34.43"E
Contracted capacity of facility	50MW
Details of the Parabolic troughs	Parabolic troughs (6m high) solar field with a development footprint up to 200 ha.
Full extent of CSP Facility	684 ha
Extent of broader site	5400
Internal access roads	6m wide, 21 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.
Services required	» Water will be sourced from the Orange 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.

The EIA process for the proposed Ilanga CSP 5 Facility 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 5 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.

8.1. Alternatives Considered for the Ilanga CSP 5 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.

8.1.1. 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 avifaunal 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 avifaunal 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 5400ha site.
The siting of the initial facilities within the broader Karoshoek Solar Valley Development considered various critical criteria, including the sensitivity of the

broader site in order to inform the positioning of these facilities, as well as provincial and local planning in terms of renewable energy development. The areas within which these authorised facilities are planned do not infringe on any identified areas of high sensitivity defined in this initial study. 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 for solar development. The siting of these facilities, and consequently that of the proposed Ilanga CSP 5 Project is considered to be acceptable from an environmental perspective.

As the Ilanga CSP 5 Project is required to be located immediately adjacent to the authorised Karoshoek LFT 2 Site 1.4 (1 x 100 MW Parabolic Trough) in order to facilitate the development of a 150MW CSP facility (as required by the DoE), no feasible or reasonable site alternatives are available for consideration for this project. In addition, as the site location is constrained by other authorised facilities within the broader Karoshoek Solar Valley Development and environmentally sensitive areas (such as drainage lines on the site), no feasible local siting alternatives were identified.

8.1.2. Layout and Design Alternatives

A broader study area of approximately 5400ha is being considered, within which the development footprint for the Project of approximately 200 ha in extent would be appropriately located. The site can adequately accommodate the contracted capacity of the proposed 150MW CSP Project with a combined footprint of 684 ha (proposed facility and authorised facility), as required under the DoE's REIPPPP programme. 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 and taking the location of the authorised facilities into consideration. The environmental sensitivities (ecological 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. Therefore no layout alternatives were considered.

8.1.3. 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 in the study area and potential for power generation, as well as the proximity to authorised CSP facilities utilising the same technology.

Trough technology has been identified as the preferred technology as this project will be constructed together with the adjacent site which has been authorised for trough technology, i.e. the same technology must be used. In addition, dry cooling

technology will be implemented as is the case for the authorised project. Therefore no technology alternatives have been considered for the project.

8.1.4. 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 5 Project will require 300 000m^3 - 400 000$m^3$of water per annum. During its 3 year construction phase 240 000m^3 per annum will be required. The following alternative water sources were considered:

» Piping water from the //Khara Hais Local Municipality;
» Abstraction from groundwater resources; or
» Abstraction from the Gariep River (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 indicated that water could be available from the Gariep River for the project (refer to letter dated 28 July 2015 contained in **Appendix F-1**). Therefore the abstraction of water from the Gariep 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 Gariep River is therefore considered as the only feasible alternative.

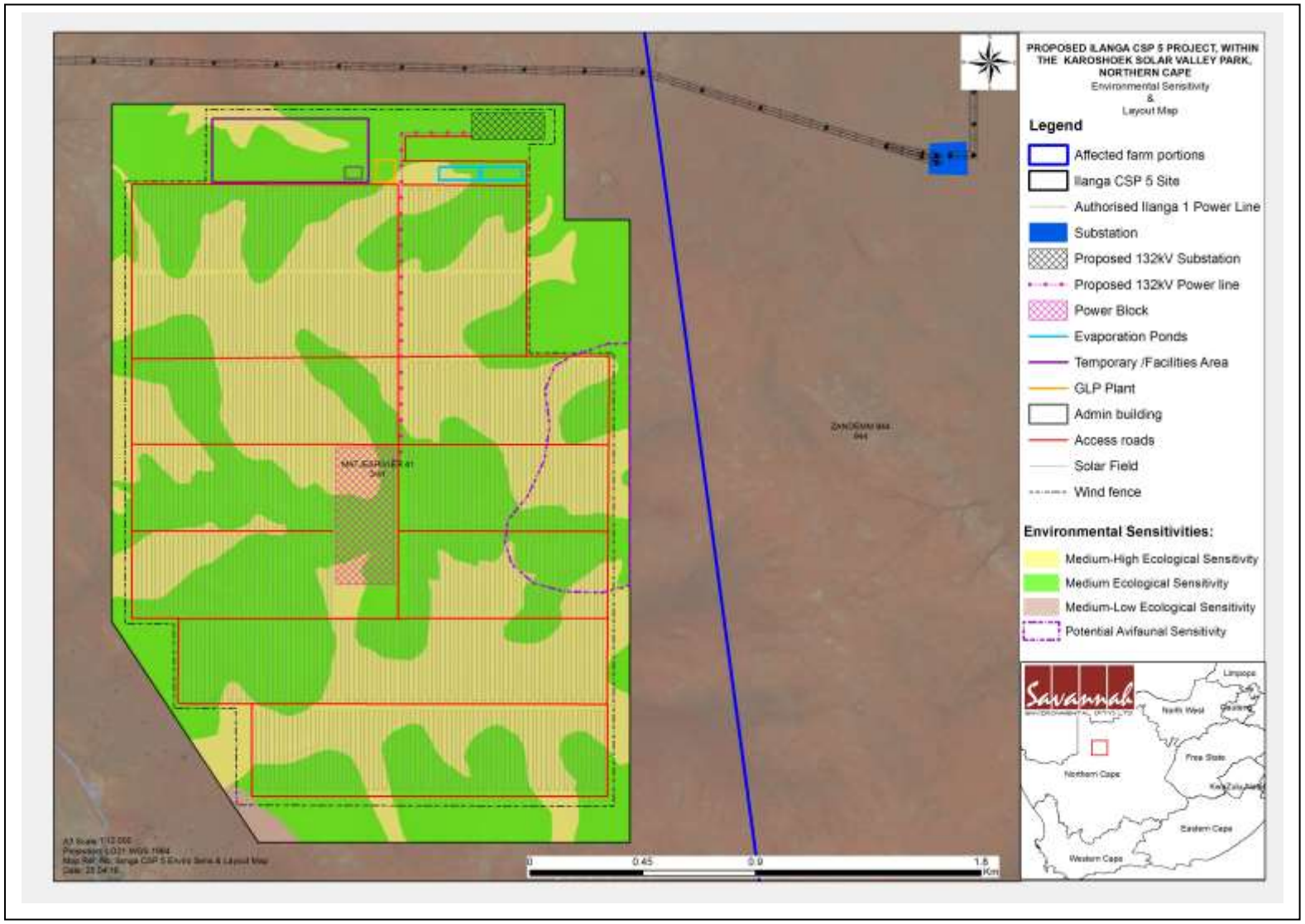


Figure 8.1: Combined Layout and Environmental Sensitivity Map for the Ilanga CSP 5 Facility and the authorised Karoshoek LFT Site 1.4 (full 150MW) showing areas of high sensitivity within the proposed layouts (A3 map included in **Appendix N)**. (The layout considereds that best practice will be implemented and mitigation measures have been implemented.)

8.2. Evaluation of the Proposed Project

The preceding chapters of this report together with the specialist studies contained within **Appendices D – J** provide a detailed assessment of the environmental impacts on the social and biophysical environment as a result of the proposed project. This chapter concludes the EIA Report by providing a summary of the conclusions of the assessment of the proposed site for the Ilanga CSP 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 (for the 150MW facility) provided by Emvelo Holdings (Pty) Ltd. The development footprint for the proposed Project (Ilanga CSP 5) of approximately 200 ha in extent would be appropriately located. The site can adequately accommodate the proposed larger 150MW CSP Project with a footprint of 684ha (proposed facility and authorised facility. 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 and taking the location of the authorised facilities into consideration. 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). All identified sensitivities were excluded from the proposed development were feasible.

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.
» Impacts on avifauna.
» Impacts on water resources.
» Visual impacts.
» Impacts on the social environment.
» Cumulative impacts.

8.2.1. Local site-specific impacts

The Ilanga CSP 5 site consists largely of deeper soils associated with in-filled valleys of dense Rhigozum trichotomum and Stipagrostis with conspicuous stands of Boscia albitrunca. As many as 3000 Boscia trees would be impacted by the development,

which is considered a significant loss to the local population. This exceeds the guideline loss for triggering an offset from DAFF and direct engagement with DAFF will need to be started should the developer wish to develop the site. Furthermore, the additional development sites in the Karoshoek Solar Valley would contribute significant additional loss of trees from the area and the overall cumulative impact is considered to be high in the local context. Boscia albitrunca is however widespread and the loss of the trees from the area would not be significant at the national scale.

Due to the relatively homogenous nature of the habitat for fauna, faunal diversity is likely to be moderate to 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, although the cumulative impact on the Boscia trees is considered to be a significant local impact.

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. However, the site does not consist of typical Bushmanland Arid Grassland and rather consists of densely vegetated in-filled valleys which are considered to be of above-average significance for fauna and more vulnerable to cumulative impact due to the limited extent of the affected habitat. Consequently the impact of the development on habitat loss, fragmentation and the future conservation potential of the area is considered of moderate to high overall magnitude and of local significance.

Although there are no highly sensitive features within the development footprint the abundance of protected trees is high and the overall impact of the development cannot be mitigated to a low level as a result. The loss of the protected trees is considered to be a significant local impact but would not be highly significant at the national scale. Should the development of the site proceed, active engagement of DAFF would be required to deal with the permitting and possible offsetting required for the loss of the Boscia trees at the site. Overall, and with the suggested mitigation measures implemented, the impacts of the development are likely to be of moderate significance and no impacts of high significance are likely.

8.2.2. Impacts on Avifauna

Potential impacts on avifauna as a result of the proposed project include disturbance during construction and operation, loss of habitat and potential for collision with the troughs and associated infrastructure. From the monitoring undertaken on the site, a total of 114 bird species were recorded on the 14 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. Of these, 8 were collision-prone as ranked by the BARESG (2014), and only 2 were red-listed (Kori Bustard and Lanner Falcon).

However, it was observed that four additional red data species in our two site visits: a Black Harrier, breeding Verreaux's Eagle, a Secretarybird, and numerous Ludwig's Bustards. Thus, 6 red-data species occur on site. A further 8 collision-prone species were recorded on the Karoshoek Solar Valley development area, giving 14 collision prone/red data species in total.

Because the SABAP data were completely missing for pentads away from the Orange River we tallied every species recorded in the transects, VPs and incidental observations 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** occur on the Ilanga solar development site, **of which six are red-listed.**

With the implementation of mitigation measures by the developer, contractors, and operational staff, the severity of avifaunal impacts of the Ilanga CSP 5 Facility can be reduced to low, or avoided. The CSP 5 Facility can be developed and impacts on avifauna managed by taking the following into consideration:

» A threatened bustard and some wetland birds may be impacted. The significance for displacement and avoidance will be medium–low this red data species.
» Mitigation measures include avoiding the medium sensitivity areas identified.
» For the wetland birds, korhaans and raptors the significance is lower because they are less collision-prone and less threatened.
» Sandgrouse, which were very numerous on site, are unlikely to react to mirrored surfaces as they do not land on water.
» A structured and systematic construction and post-construction assessment, as laid out in the Environmental Management Programme (above) by trained ornithologists will determine the impacts and provide appropriate mitigations.
» Little research in South Africa is presently available to determine the impact of CSP trough and tower technology on the South African avian community. Therefore, a full 12-months of post-construction monitoring at this site by trained ornithologists (able to distinguish Ludwig's from Kori Bustards) is strongly recommended.
» It is 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 recommended that innovative bird deterrent techniques are used, such as the Torri lines mentioned in the avian Scoping Report (Simmons and Martins 2015).

» If these recommendations can be followed and prove effective, it is expected that the Ilanga CSP 5 development can proceed with the least impact to the avifauna of the area.

8.2.3. 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. However, the majority of impacts can be reduced to low significance with the implementation of appropriate mitigation measures, and the proposed development should, therefore, have limited impact on the overall status of the riparian systems within the region. Impacts on the Orange River system due to water abstraction, and site-specific impacts on in-stream biota are difficult to quantify due to the highly regulated nature of the system.

The only significant risk to the project is the water use license not being granted by the Department of Water and Sanitation. Although dry cooling will be practiced which will reduce water requirements, the Orange River system is under pressure in terms of water requirements.

8.2.4. Visual impacts

Potential visual impacts on sensitive receptors that have been identified through scoping and the site visit include:

» The visibility of the facility to, and potential visual impact on homesteads that have been identified as potentially being impacted;
» The visibility of the facility to, and potential visual impact on users of roads in close proximity;
» The visibility of the facility to, and potential visual impact on sensitive receptors;
» Visual impacts associated with construction of the proposed project;
» Possible impact of glint and glare; and
» The possible impact of lighting associated with night time operation, and security lights.

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 5 Facility can be developed and impacts on visual resources managed by taking the following into consideration:

» The affected landscape has a degree of visual absorption capacity due to occasional head height shrubs particularly in valley lines as well as the minor ridgelines that bisect the valley floor.
» The project will almost always be viewed from a similar level as the development meaning that it will largely be seen in elevation. This will mean that overviews of the full extent of development will not be possible from public access areas.
» Mitigation should be focused on maintaining natural vegetation which will provide a degree of screening and ensuring that development levels are not elevated above the natural landform.

The assessment indicates that the development of the additional area on Ilanga CSP 5 is likely to have minimal additional visual impact over and above that associated with the authorised site.

8.2.5. 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.

8.2.6. 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 5 project in the proposed location when considered together with other similar developments. The following can be concluded considering the Ilanga CSP 5 Facility:

- 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.
- Low risk to avifauna through loss of habitat, infringement on breeding areas, or risk to collision-prone species 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 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 the **Chapter 7** and the detailed specialist studies (refer to **Appendices D - J**).

8.3. Summary of All Impacts

Table 8.2 to 8.4 indicates the significance ratings for the potential biophysical, ecological, visual and social impacts identified and assessed through the EIA process in terms of the preliminary layout.

As indicated in Chapter 4, the significance weightings for potential impact have been rated 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).

Table 8.2: Summary of pre-mitigation and post mitigation impacts of the bio-physical and socio-economic environment during the **planning and construction phase** of the project

Environmental Aspect	Impact	Pre-mitigation Significance	Post Mitigation Significance
Ecology (Flora and Fauna)	Impacts on vegetation and protected plant species	**High (60)**	**Medium (50)**
	Disturbance, transformation and loss of habitat will have a negative effect on resident fauna	**Medium (36)**	**Low (28)**
	Increased Alien Plant Invasion Risk	**Medium (40)**	**Low (21)**
Avifauna	Habitat Loss – Destruction, Disturbance and Displacement	**High (65) (Bust)** **Medium-low (21) (Rapt)** **Low (6) (WetB)** **Low (21) (Korh)**	**Medium (40) (Bust)** **Low (16) (Rapt)** **Low (6) (WetB)** **Low (12) (Korh)**
Heritage	Disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects.	**Medium(26)**	**Low (24)**
Social	Creation of employment and business opportunities	**Medium (36)(+)**	**Medium (44)(+)**
	Added pressure on economic and social infrastructure and increase in social conflicts during construction as a result of in-migration of jobseekers.	**Low (24)**	**Low (18)**
	Impact on daily living and movement patterns - Impacts from an increase in traffic disruptions and movement patterns during the construction phase.	**Medium (24)**	**Low (12)**
	Temporary increase in safety and security concerns associated with the influx of people during the construction phase.	**Low (27) (-)**	**Low (14) (-)**
	Nuisance impacts in terms of a temporary increase in noise and dust	**Low (15) (-)**	**Low (12) (-)**

Table 8.3: Summary of pre-mitigation and post mitigation impacts of the bio-physical and socio-economic environment during the **operation phase** of the project

Environmental Aspect	Impact	Pre-mitigation Significance	Post Mitigation Significance
Ecology (Flora and Fauna)	The operation and presence of the facility may lead to disturbance or persecution of fauna.	**Medium (30)**	**Low (16)**
	The loss of landscape connectivity.	**Medium (40)**	**Medium (36)**
Avifauna	Fatalities due to collision with mirrored surfaces	**Mow (16) (Bust)** **Low (16) (Rapt)** **Medium (50) (WetB)** **Low (14) (Korh)**	**Low (7) (Bust)** **Low (7) (Rapt)** **Low (24) (WetB)** **Low (6) (Korh)**
Water Resource	Changes in biotic communities due to changed habitat structure;	**Low()**	**Low ()**
	Loss of aquatic habitat	**Low()**	**Low ()**
	Loss of sensitive species	**Low()**	**Low ()**
Visual Impact	Industrialisation of general landscape character.	**Medium (40)**	**Low (24)**
	Industrialisation of a natural landscape as seen from local homesteads.	**Low (24)**	**Low (12)**
	Industrialisation of a natural landscape as seen from the local Kleinbegin road to the west and the N10 to the north.	**Medium (30)**	**Low (16)**
	Industrialisation of a natural landscape as seen from sensitive uses.	**Low (7)**	**Low (7)**
	Visual impacts associated with construction of the proposed project.	**Low (15)**	**Low (4)**

Environmental Aspect	Impact	Pre-mitigation Significance	Post Mitigation Significance
	Impacts of glint and glare can vary from permanent eye injury, persistence of vision that could make driving on local roads dangerous to low level nuisance	**Low (6)**	**Low (6)**
	Industrialisation of a natural landscape as seen at night.	**Low (24)**	**Low (10)**
Social	Creation of employment opportunities and skills development opportunities during the operation phase for the country and local economy	**Medium (32) (+)**	**Medium (40) (+)**
	Development of clean, renewable energy infrastructure	**Medium (40) (+)**	**High (40) (+)**
	Benefits to the local area from SED/ ED programmes and community trust from REIPPPP social responsibilities	**Low (30) (+)**	**Medium (48) (+)**
	Impacts associated with loss of farmland available for livestock grazing due to occupation of land by the CSP facility	**Low (28) (+ and -)**	**Low (28) (-)**

Table 8.4: Summary of pre-mitigation and post mitigation impacts of the bio-physical and socio-economic environment during the **decommissioning phase** of the project

Environmental Aspect	Impact	Pre-mitigation Significance	Post Mitigation Significance
Ecology (Flora and Fauna)	Disturbance or persecution of fauna during the decommissioning phase	**Medium (21) –**	**Low (15)**
	Alien plants are likely to invade the site as a result of disturbance created during decommissioning.	**Medium (30)**	**Low (21)**
	Increased erosion risk during decommissioning	**Low (28)**	**Low (15)**
Social	Social impacts associated with retrenchment including loss of jobs and source of income	**Low (28) (-)**	**Low (20) (-)**

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 relatively dense shrubland dominated by Rhigozum trichotomum considered to be medium to high sensitivity on account of the abundance of protected trees within these areas. Although there are no areas within the site that are considered no go or of very high sensitivity, the high density of protected trees within the site and the overall cumulative impact on these species is a significant issue for the development of the site. Overall, the site is not considered highly suitable for development given the preponderance of lowland areas with dense vegetation cover and dense Boscia populations.

» ***Avifauna***: The proposed CSP 5 plant in the Karoshoek Solar Valley Development, near Upington, is one of many such renewable energy initiatives being proposed for this high-flux solar radiation region of South Africa. The avifauna of the area may be affected by the infrastructure of the Solar Power (CSP) plant and our analysis of the number of collision-prone birds on CSP 5 suggests that:
  - A threatened bustard and some wetland birds may be impacted. The significance for displacement and avoidance will be medium–low this red data species;
  - mitigation measures include avoiding the medium sensitivity areas identified;
  - for the wetland birds, korhaans and raptors the significance is lower because they are less collision-prone and less threatened;
  - sandgrouse, which were very numerous on site, are unlikely to react to mirrored surfaces as they do not land on water;
  - a structured and systematic construction and post-construction assessment, as laid out in the Environmental Management Programme (above) by trained ornithologists will determine the impacts and provide appropriate mitigations.

Precious little 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 we 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, we believe that the CSP 5 development can be allowed to proceed with the least impact to the avifauna of the area.

As is evident in **Figure 8.1**, some areas of moderate and high sensitivity will be impacted by the proposed layout. These areas are however limited and impacts on these areas are not expected to result in impacts at a broader scale which could compromise habitat availability or species abundance. The layout as proposed is therefore considered to be acceptable.

8.5. Environmental Costs of the Project versus Benefits of the Project

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 5 Facility (which is limited to the development footprint of 200ha). 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 12.6% 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 positive implications of establishing the Ilanga CSP 5 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 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.

8.6. 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).

The viability of establishing a CSP trough facility with an additional generating capacity of 50MW on a site within the Karoshoek Solar Valley Development on Lot 944 Karos Settlement and Portion 3 of the Farm Matjiesrivier 41, located approximately 30 km east of Upington within the //Khara Hais Local Municipality in the Northern Cape has been established by Emvelo Holdings (Pty) Ltd. The positive

implications of establishing a CSP Plant on the identified site within the Northern Cape include:

» 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. 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. 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.

» The **avifauna** of the area may be affected by the infrastructure of the CSP plant. However, the significance will be medium 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 **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 are expected to be of limited to the site and mainly of low significance.
» 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**.

8.7. 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 5 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:

» As far as possible, the design and layout of the CSP Plant should consider and accommodate areas of high environmental sensitivity.
» 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 **J** to be implemented.
» The draft Environmental Management Programme (EMPr) as contained within **Appendix K** 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 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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