



ARCUS

**Avifaunal Scoping Report for the Proposed
Metsimatala CSP Facility**

On behalf of

Enviroworks

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Figure 1- Project Site Location, Vegetation, Rivers and SABAP Squares

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SPECIALISTS' DECLARATION OF INDEPENDENCE AND QUALIFICATIONS

Arcus is independent and have no business, financial or personal interest in the activity, application or appeal in respect of which it was appointed, other than fair remuneration for work carried out. There are no circumstances that compromise the objectivity of their specialists performing such work. Andrew Pearson is an Avifauna Specialist at Arcus and has a Four Year BSc in Conservation Ecology, certificates in Environmental Law, as well as eight **years' experience as an environmental management professional**. The findings, results, observations, conclusions and recommendations **given in this report are based on this author's best scientific and professional knowledge as well as available information**. Andrew conducted survey work and provided inputs with regard to the analysis and interpretations of the avifauna data as an Avifauna Specialist. The Natural Scientific Professions Act of 2003 aims to **"Provide for the establishment of the South African Council of Natural Scientific Professions (SACNSP) and for the registration of professional, candidate and certified natural scientists; and to provide for matters connected therewith."** Andrew is a professional member of the SACNSP, as detailed below:

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Andrew Pearson (18 March 2016)

1 INTRODUCTION

Metsimatala CSP Solar Energy (Pty) Ltd (**'the Developer'**) intends to construct a 150 megawatt (MW) Concentrated Solar Power (CSP) facility to capture and convert solar radiation into electricity on the Remaining Extent as well as Portions 4 and 5 of the Farm Groenwater No. 453 in the Northern Cape Province (**'the project'**). The project will also include a new overhead 132 kV powerline to connect the CSP facility to the Eskom grid.

The Environmental Assessment Practitioner appointed by the developer is Enviroworks, who have appointed Arcus Consultancy Services Ltd (**'Arcus'**) to provide avifaunal specialist input in the form of an Avifaunal Impact Assessment Scoping Report, an Avifaunal Impact Assessment Report, as well as conduct pre-construction avifaunal monitoring for the project.

The application process for Environmental Authorisation (EA) is divided into two components namely:

- A Basic Assessment (BA) for the construction and operational phases of a new 132 KV powerline which will originate at the substation of the proposed facility and will **connect into Eskom's national power grid at the existing Eskom Manganore Substation ('the Grid Connection')**.
- A full Scoping and Environmental Impact Assessment (EIA) process for the construction and operational phases of the CSP facility and associated infrastructure (**'the CSP facility'**).

1.1 Purpose and Aims

The purpose and aims of this scoping report are to provide:

- A confirmation of the terms of reference adopted for the avifaunal study;
- Description of the monitoring programme as part of the Impact Assessment;
- High level findings of the monitoring programme undertaken thus far;
- A description of the avifaunal baseline, including a description of avifaunal microhabitats available on site;
- A description of potential predicted impacts to avifauna as well as a preliminary significance rating and impact assessment; and
- A plan of study for the EIA phase.

1.2 The Project Description and Location

The proposed 150 MW CSP facility will be established on the Farm Groenwater No 453 which is approximately 11 894.77 ha in total size and located directly adjacent to the west of the informal settlement of Metsimatala. The property is within the Tsantsabane Local Municipality and is owned by the Groenwater Communal Property Association (CPA) members and is situated approximately 22 km north-east of the town of Postmasburg and 17 km north-east of the town of Lime Acres in the Northern Cape Province.

The CSP site covers an area of approximately 493 ha. The boundaries of the proposed CSP site is illustrated in Figure 1. Within the site, two CSP technology options are being considered. Technology Alternative 1 would utilise CSP trough technology, while Technology Alternative 2 would utilise CSP central receiver tower technology.

The Grid Connection site consists of two alternative line routings, both running from the substation on the proposed CSP site, to the existing Eskom Manganore Substation (Figure 1). Route Alternative 1 is approximately 31.4 km in length and Route Alternative 2 is approximately 26 km in length.

The project will also include the re-routing of approximately 3.3 km of the existing 132 kV Overhead Transmission Line (OHTL) that currently crosses the CSP site, around the east and northern boundaries of the CSP site. This new routing will be approximately 4.6 km in length.

1.3 Terms of reference

The following terms of reference were utilised for the preparation of this scoping report:

- High level description of the receiving environment (habitat) from an avifaunal perspective, based primarily on analysis of desk-top resources;
- Identification of high risk species, particularly Red Data species that might be impacted by the proposed project;
- Description and preliminary assessment of potential impacts on avifauna, utilising the supplied methodology and criteria (Appendix 2);
- Provision of potential mitigation measures to reduce envisaged impacts;
- Identification of any additional avifaunal issues;
- Recommendations and a plan of study for the EIA.

2 METHODOLOGY

2.1 Description of the receiving environment (Defining the baseline)

The baseline avifauna environment for the project was defined utilising a desk based study and informed by avifaunal monitoring conducted to date. The avifaunal monitoring programme was designed to be in line with the draft Birds and Solar Energy Best Practice Guidelines, compiled by Bird Life South Africa, and recently released for public comment. Two surveys have been conducted to date¹. This information is deemed sufficient for the scoping phase study and was examined to determine the potential location and abundance of avifauna which may be sensitive to development, and to understand their conservation status and sensitivity.

2.1.1 Sources of information

- Bird distribution data of the Southern African Bird Atlas Project (SABAP-1, Harrison *et al.*, 1997) and Southern African Bird Atlas Project 2 (SABAP-2) obtained from the Avian Demography Unit of the University of Cape Town;
- Co-ordinated Water-bird Count (CWAC) project (Taylor *et al.*, 1999);
- The Important Bird Areas of southern Africa (IBA) project (Barnes, 1998);
- Publically available satellite imagery;
- Specialist Avifaunal Impact Assessment for the Proposed Humansrus Solar Thermal Energy Power Plant (EWT, 2011); and
- Results of two surveys conducted for the pre-construction avifaunal monitoring programme.

2.1.2 Limitations and Assumptions

- The SABAP-1 data covers the period 1986-1997. Bird distribution patterns fluctuate continuously according to availability of food and nesting substrate. (For a full discussion of potential inaccuracies in SABAP data, see Harrison *et al.*, 1997).

¹ It is noted that this monitoring programme was designed for a Parabolic Trough CSP facility. Should Technology alternative 2 be used (i.e CSP central receiver tower), the proposed programme would need to be revised. Please see section 5 for further details.

2.2 Identification of Potential Impacts

After collation of the baseline data from the source of information listed above the potential impacts of the project on avifauna (and particularly on focal species) were identified, for the construction, operation, and decommissioning phases.

Generally, the key potential impact types on avifauna from CSP projects and associated infrastructure include: burning; collision; electrocution; disturbance and displacement; habitat destruction; water pollution; and excessive use of water.

3 BASELINE ENVIRONMENT

3.1 Southern African Bird Atlas Project 1 (Harrison *et al.* 1997)

The SABAP1 data was collected over an 11 year period between 1986 and 1997 and remains the best long term data set on bird distribution and abundance available in South Africa at present. This data was collected in quarter degree squares, with the proposed CSP facility falling into square 2823AD (Figure 1). Table 1 indicates the reporting rate for all raptors and priority species recorded by the SABAP1 data within this square, as well as giving a total number of species recorded in the square. The SABAP1 project recorded a total of 168 species.

Table 1: Raptors and Priority Species (Retief *et al.* 2011, updated 2014) Recorded by SABAP1 in the Quarter Degree Square (QDS) Covering the Project Site (Harrison *et al.* 1997).

Species	Regional Red Data Status (Taylor <i>et al.</i> 2015)	Report rate (%) ** QDS 2823AD
Total species		168
Number of cards submitted		77
Barn Owl		4
Black-chested Snake-Eagle*		1
Black Harrier*	<i>Endangered</i>	1
Black Korhaan (Northern)*		34
Black Stork*	<i>Vulnerable</i>	5
Black-shouldered Kite*		69
Blue Crane*	<i>Near-threatened</i>	6
Common Buzzard*		1
Gabar Goshawk		6
Greater Flamingo*	<i>Near-threatened</i>	5
Greater Kestrel*		12
Kori Bustard*	<i>Near-threatened</i>	1
Lesser Kestrel*		13

Species	Regional Red Data Status (Taylor <i>et al.</i> 2015)	Report rate (%) ** QDS 2823AD
Pale Chanting Goshawk*		39
Rock Kestrel		79
Secretarybird*	<i>Vulnerable</i>	9
Spotted Eagle Owl*		1
Tawny Eagle*	<i>Endangered</i>	1
Verreaux's Eagle*	<i>Vulnerable</i>	55
White-backed Vulture*	<i>Critically Endangered</i>	17
Booted Eagle*		4
Martial Eagle*	<i>Endangered</i>	6

* Priority species (Retief *et al.* 2011, updated 2014). **Report rates are essentially percentages of the number of times a species was recorded in the square, divided by the number of times that square was counted. It is important to note that these species were recorded in the entire quarter degree square in each case and may not actually have been recorded on the proposed project site.

3.2 Southern African Bird Atlas Project 2

This project is part of an ongoing study by the Animal Demography Unit (ADU), a research unit based at the University of Cape Town (UCT). SABAP2 records data in pentads, which are roughly 8 km x 8 km squares, and smaller than the quarter degree squares used in SABAP1. Only one count (card²) is available for the pentad that the CSP facility lies in (2815_2315). Data were examined for this pentad combined with the neighbouring pentad to the south (2820_2315) (202 species of birds were recorded in the pentads inside the quarter degree square covering the project site, and 51 species were recorded in the single count of the pentad that covers the project site (2815_2315).

Table 2), as well as the combined data for all 9 pentads within the quarter degree square that covers the project site (2823AD) (Table 3). Due to the inherent mobility of birds, species recorded in these pentads may be present on the project site (i.e. on the CSP site and the Grid Connection site).

While SABAP2 coverage of the CSP site is poor with only a single card² submitted, some of the pentads within the quarter degree square investigated have very good coverage, with one pentad having 156 cards submitted.

202 species of birds were recorded in the pentads inside the quarter degree square covering the project site, and 51 species were recorded in the single count of the pentad that covers the project site (2815_2315).

Table 2: Raptors and Priority Species (Retief *et al.* 2011) Recorded in the SABAP2 Pentad Squares Covering the Project Site and the immediate south of the project site

Species	2815_2315 (1 card)	2820_2315 (2 cards)
Total Species	51	52
Northern Black Korhaan*	x	

² Each time that birds in a pentad have been counted by a citizen scientist registered with the ADU, a pentad 'card' is submitted online to the ADU. The number of cards therefore indicate the number of times a pentad has been counted.

Species	2815_2315 (1 card)	2820_2315 (2 cards)
Pale Chanting Goshawk*		x
Rock Kestrel		x

* Priority Species (Retief et al. 2011, updated 2014).

Table 3: Raptors and Priority Species (Retief et al. 2011) Recorded in the 9 SABAP2 Pentad Squares in the Quarter Degree Square covering the Project Site

Species	Regional Red Data Status (Taylor et al. 2015)	Report rate (%) ** QDS 2823AD
Total species		205
Number of cards submitted		196
African Fish Eagle*		2.04
Barn Owl		0.51
Black-chested Snake Eagle		3.06
Black-shouldered Kite*		16.33
Blue Crane*	<i>Near-threatened</i>	2.04
Common Buzzard *		2.04
Gabar Goshawk		25.00
Greater Flamingo *	<i>Near-threatened</i>	1.53
Greater Kestrel*		9.18
Lanner Falcon*	<i>Vulnerable</i>	2.04
Lesser Flamingo*	<i>Near-threatened</i>	6.63
Lesser Kestrel*		3.57
Ludwig's Bustard *	<i>Endangered</i>	2.04
Martial Eagle*	<i>Endangered</i>	0.51
Northern Black Korhaan*		18.88
Pale Chanting Goshawk*		14.29
Pearl-spotted Owlet		0.51
Rock Kestrel		23.00
Spotted Eagle Owl*		2.55
Secretarybird*	<i>Vulnerable</i>	1.53
Tawny Eagle*	<i>Endangered</i>	0.51
Verreaux's Eagle*	<i>Vulnerable</i>	3.57

Species	Regional Red Data Status (Taylor <i>et al.</i> 2015)	Report rate (%) ** QDS 2823AD
White Stork		1.53
White-backed Vulture	<i>Critically Endangered</i>	1.53

3.3 Coordinated Waterbird count (CWAC) Data

There are four registered CWAC sites within 50 km of the proposed project site. Danielskuil, Great Pan and Rooipan are approximately 30 km from the project site, and Soutpan is approximately 50 km from the project site.

At Danielskuil 21 species of water associated birds have been recorded to date, none of which were priority species or raptors. No data was available for Great Pan and Rooipan. At Soutpan 25 species of water-associated birds were recorded, including one priority species (Greater Flamingo).

3.4 Important Bird Area project (IBA)

The proposed development is not situated within an IBA and there are no IBA's within 100 km of the proposed project site.

3.5 Proposed Humansrus Solar Thermal Energy Power Plant Specialist Avifaunal Impact Assessment

This study, conducted by the Endangered Wildlife Trust (EWT), was authored by Andrew Pearson in 2011. The study covered an area less than 5 km to the east of the project site. The study was a desk top assessment and included a single site visit. The study highlighted the species as being potentially important (although not necessarily recorded on the site during the study), including: Martial Eagle, Lesser Kestrel, Blue Crane, White-backed Vulture, Secretarybird, Greater Flamingo, Verreaux's Eagle, Black-shouldered Kite, Pale Chanting Goshawk, Rock Kestrel, Northern Black Korhaan, Double-banded Courser, Namaqua Sandgrouse, White-rumped Swift, Barn Swallow, Namaqua Dove, Sociable Weaver, Kalahari Scrub-robin, Red-billed Quelea and Yellow Canary.

The study did not report on any additional species or data not already recorded in the other data sources considered in this scoping report.

3.6 Metsimatala CSP Facility Pre-construction Avifaunal Monitoring

Two five day avifaunal surveys have been conducted by Arcus to date, one in November 2015 and one in February 2016.

Avifaunal monitoring comprised flight activity surveys from two vantage points (VPs), as well as walked transects, driven transects, and focal site surveys (Figure 2). Large terrestrial species and raptors were recorded incidentally in the course of travelling the length of the site *en route* to survey locations.

The following definitions were applied:

- Priority species: all species occurring on the BirdLife South Africa (BLSA) and EWT Avian Sensitivity Map priority species list³.

³ Retief, E, Anderson, M., Diamond, M., Smit, H., Jenkins, A. & Brooks, M. (2011) Avian Wind Farm Sensitivity Map for South Africa: Criteria and Procedures used. Priority species list updated in 2014 by BLSA. This list consists of 107 species with a priority score of 170 or more. The priority score was determined by BLSA and EWT after considering various factors including bird families most impacted upon by Wind Energy Facilities (WEFs), physical size, species behaviour, endemism, range size and conservation status. While the list is applicable to WEFs, it is believed to be of value for consideration in Solar Projects, and no such similar list is available for Solar Energy.

- Target species: those particular bird species that were⁴ recorded by a specific survey method.
 - Target species per survey method:
 - Walked transects (WT): all birds;
 - Driven transects (DT): all raptors; all large (non-passerine) priority species; corvids (crows and ravens) and korhaans.
 - Vantage point (VP) surveys: all raptors; all large (non-passerine) priority species; doves; corvids (crows and ravens); sandgrouse; korhaans; egrets; geese; ibises and lapwings.
 - Incidental observations: all Red Data species (Taylor, 2015); all raptors; and all large (non-passerine) priority species; and
 - Focal sites (FS): all species associated, utilising or interacting at/with the focal site.

3.6.1 First survey – November 2015

A total of 69 bird species were recorded during the first avifaunal survey from 16 – 20 November 2015. This included six raptors (Black-chested Snake Eagle, Booted Eagle, Gabar Goshawk, Lanner Falcon, Pale Chanting Goshawk and Greater Kestrel). No endemic or range-restricted species were recorded. One species recorded was a near-endemic (Fiscal Flycatcher). Northern Black Korhaan was the only large terrestrial species recorded. One Red Data species (Taylor *et al.* 2015) regionally listed as *Vulnerable* was recorded (Lanner Falcon).

During VP surveys a total of 12 species were recorded in 25 flights (Figure 3). This included the raptors Black-chested Snake Eagle, Booted Eagle, Gabar Goshawk, Greater Kestrel, and Lanner Falcon. Northern Black Korhaan, Crowned Lapwing, Western Cattle Egret, Pied Crow and Namaqua Sandgrouse were also recorded. The remainder were passerine species (Cape Turtle Dove, Namaqua Dove).

3.6.2 Second survey – February 2016

A total of 90 bird species were recorded during the second survey conducted from 25 to 29 February 2016. Raptors recorded were Black-chested Snake Eagle, Booted Eagle, Steppe Buzzard, Greater Kestrel, Jackal Buzzard, Lanner Falcon, Martial Eagle, Pale Chanting Goshawk and White-backed Vulture. Three Red Data species (Taylor *et al.* 2015) were recorded. These were White-backed Vulture (*Critically Endangered*), Martial Eagle (*Endangered*) and Lanner Falcon (*Vulnerable*). Six recorded species were near-endemics (Jackal Buzzard, Karoo Eremomela, Large-billed Lark, Karoo Prinia, Namaqua Warbler and Cape Weaver).

During vantage point surveys a total of 13 species were observed in 35 flights. This included the raptors Black-chested Snake Eagle, Booted Eagle, Common Buzzard, Greater Kestrel, Jackal Buzzard, Martial Eagle and Pale Chanting Goshawk. Hadedda Ibis, Namaqua Sandgrouse, Pied Crow, Spur-winged Goose and Namaqua Dove were also recorded.

Therefore a total of number of 113 species, including three Red Data species (White-backed Vulture, Martial Eagle and Lanner Falcon) have been recorded by Arcus during the monitoring surveys to date.

⁴ Species/groups of species may be added to a particular survey method's target species list as the programme progresses.

3.7 Vegetation and Land Use

The proposed Grid Connection routes cover various vegetation types the most prevalent being: Kuruman Mountain Bushveld; Kuruman Thornveld and Postmasburg Thornveld (Mucina and Rutherford, 2006; Figure 1). The CSP site is covered primarily by Olifantshoek Plains Thornveld, with sections of Kuruman Mountain Bushveld in the northwest. The land use on the CSP site is primarily that of communal grazing.

3.7.1 Avifaunal Micro-habitats

It is important to consider habitats that are generally evident at a much smaller spatial scale than vegetation types, and are determined by a host of factors such as vegetation type, topography, land use and man-made infrastructure. Inspection of the project site and surrounding areas (up to 10 km from the site), revealed the presence of the following bird micro-habitats.

3.7.1.1 *Kraals and Associated Reservoirs and/or Water Troughs*

Through overgrazing and the clearance of vegetation by livestock at these feeding and watering points, a microhabitat favoured by certain species has been created. Species such as chats, canaries, wagtails and sandgrouse are attracted to the water trough itself to drink, while the open, short grassy areas may be favoured by terrestrial species such as coursers, lapwings, francolins and korhaans and passerines such as larks, buntings and sparrowlarks.

3.7.1.2 *Scrubland/Thornveld*

Small patches of Acacia thickets and bushes were observed, usually close to disturbed areas such as kraals. As one moves to the periphery of the CSP site (towards the north and west particularly, as well as some distance to the south, across the tar road), away from the flat grassy areas, the elevation rises and small trees and bushveld appear (depicted as **"Kuruman Mountain Bushveld" discussed above**). Although much of the natural scrubland/thornveld is disturbed, these areas may attract smaller passerine species such as Robins and Shrikes. Weavers and Sparrow-weavers use the tree as structures for nesting and Raptors such the Southern Pale Chanting Goshawk and Lanner Falcon may use these areas for perching.

3.7.1.3 *Drainage Lines and Rivers*

There are some draining lines in the hills to the north and west of the site, which may occasionally hold water. Drainage lines are often associated with trees and thickets, and as such may be important to a host of passerine species. A NFEPA River, The Groenwaterspruit, is situated approximately 10 km northwest of the CSP site. Rivers and drainage lines are often used as fly-ways for various species e.g. ducks, herons, geese and ibises.

3.7.1.4 *Dams and Wetlands*

Artificially constructed dams have become important attractants to various bird species in the South African landscape. Various waterfowl frequent these areas and crane species often use dams to roost in communally. Birds such as flamingos and African Spoonbills may make use of these areas. Therefore dams are a key element of this study, and should be classed as focal sites for continues inspection during the EIA phase of this project.

The desktop study revealed the presence of natural Salt Pans in the surrounding area, which (when they hold water) may be used by various wading birds as well as birds such as geese, ducks and flamingos.

3.7.1.5 Hills and Ridges

Although limited on the CSP site, hills and ridges are prevalent in the broader areas surrounding the site and along the grid connection routes. These areas are associated with 'denser' more 'woody thicket' vegetation and thus would be utilised by a variety of common passerines. Where rock ridges and cliffs are present, raptors such as Verreaux's Eagle may be attracted to the Rock Hyrax (if present) prey source. Raptors such as Rock, Kestrel Greater Kestrel, Black Shouldered Kite, Booted Eagle, Martial Eagle and Black-chested Snake Eagle may hunt over hills and ridges and use slopes to 'gain lift' and for slope soaring.

3.7.1.6 Open Grassy Areas

Grassy areas (although predominantly over-grazed and disturbed) make up the majority of the CSP site and fall within the areas classified as Olifantshoek Plains Thornveld vegetation type. Grasslands (in their natural state) would represent a significant feeding area for many bird species such as Blue Crane, Secretarybird, Kori Bustard and Northern Black Korhaan. Although disturbed, the grassy open areas on the CSP site may be used by these species occasionally. The grassland patches are also a favourite foraging area for game birds such as francolins and Helmeted Guineafowl, as well as potentially for small mammals such as Suricates and Ground Squirrels. This in turn may attract large raptors because of both the presence and accessibility of prey.

3.7.1.7 Rural Community

Immediately to the east of the site lies the Metsimatala community. Birds such as crows, ibises, doves, sparrows and ravens are likely to frequent these areas, while raptors such as Black-shouldered Kite and Greater Kestrel may utilise structures (e.g. street lamps, telephone poles) as perched and hunt for rodents on along the grassy road verges.

Table 4 below shows the micro habitats that each Red Data bird potentially present on the project site (identified through the desk based data search and the surveys conducted to date) data typically frequents in the study area. It must be stressed that birds can and will, by virtue of their mobility, utilise almost any areas in a landscape from time to time. **However, the analysis below represents each species' most preferred or normal habitats.** These locations are where most of the birds of that species will spend most of their time. Occurrence is defined as a species actually using the site (either for foraging, roosting, hunting, breeding etc.). While it is likely that all these species may at some point traverse over or through the project site, the specialist has given a prediction of occurrence for each species in the table below.

Table 4: Preferred Habitats and Likelihood of Occurrence on the Project Site of the Red Data Species Potentially Present.

Species	Red Data Status	Preferred Habitats and/or Micro-habitats	Likelihood of Occurrence on site	Observed in monitoring surveys to date
White-backed Vulture	<i>Critically Endangered</i>	Savanna; Woodland; Thornveld	Likely	✓
Black Harrier*	<i>Endangered</i>	Grassland; Shrubland; Renosterveld	Possible	x
Ludwig's Bustard	<i>Endangered</i>	Karoo scrub; Arid Savanna	Possible	x

Species	Red Data Status	Preferred Habitats and/or Micro-habitats	Likelihood of Occurrence on site	Observed in monitoring surveys to date
Martial Eagle	<i>Endangered</i>	Savanna; Grassland; Open woodland; Karoo shrubland	Likely	✓
Tawny Eagle	<i>Endangered</i>	Woodland; Savannah	Unlikely	x
Black Stork	<i>Vulnerable</i>	Lakes; Rivers; Estuaries; Cliffs	Unlikely	x
Lanner Falcon	<i>Vulnerable</i>	Grassland; Karoo shrubland	Likely	✓
Secretarybird	<i>Vulnerable</i>	Savannah; Grassland; Open thornveld	Likely	x
Verreaux's Eagle	<i>Vulnerable</i>	Rocky hills and/or ridges; Cliffs; Mountains	Possible	x
Blue Crane	<i>Near-threatened</i>	Agricultural lands; Grassland	Unlikely	x
Greater Flamingo	<i>Near-threatened</i>	Lakes; Saltpans; Estuaries	Unlikely	x
Kori Bustard	<i>Near-threatened</i>	Semi-arid savanna; Open Thornveld; Grassland	Unlikely	x
Lesser Flamingo	<i>Near-threatened</i>	Lakes; Saltpans; Estuaries	Possible	x

4 IMPACT IDENTIFICATION AND ASSESSMENT

The following key potential impacts, arising from the proposed project's construction and operational phases have been identified. A preliminary significance rating and impact assessment (considering the baseline bird data available to date) has been done for each impact using set criteria (Appendix 2) and impact tables (Appendices 3 and 4), and is summarised in sections 4 and 5 below. Appendix 3 shows the impact tables for the CSP facility while Appendix 4 gives the impact tables for the Grid Connection. Mitigation measures for each of the identified impacts has also been provided in Appendices 3 and 4.

The list of impacts is preliminary and may be updated in the EIA report and following the completion of the bird monitoring on site. The impacts will all be re-assessed during the EIA phase of the study.

4.1 CSP Facility

4.1.1 Construction Phase

4.1.1.1 Habitat destruction

Clearing activities during the construction phase will remove vegetation and therefore habitat that birds may require for breeding, foraging and roosting. While some of the impact may be temporary in the case of construction offices or laydown areas mitigation through rehabilitation of such areas is possible, however there will also be direct long-term loss of vegetation associated with the footprint of the solar arrays, operation offices, and access roads.

For Technology Alternative 1 (i.e. parabolic trough), this impact was rated as Medium-High prior to mitigation and **Medium** after mitigation.

For Technology Alternative 2 (i.e. central receiver tower), this impact was rated as Medium-High prior to mitigation and **Medium** after mitigation.

4.1.1.2 Disturbance and displacement

Resident bird species (particularly sensitive and breeding species) may be disturbed by construction and activities associated with the CSP plant, which may lead to temporary or permanent displacement and/or a reduction in breeding success. It is noted though that due to the uniformity of the broader area, birds may quite easily move off and find similar habitat nearby.

For Technology Alternative 1 (i.e. parabolic trough), this impact was rated as Medium prior to mitigation and **Low** after mitigation.

For Technology Alternative 2 (i.e. central receiver tower), this impact was rated as Medium prior to mitigation and **Low** after mitigation.

4.1.2 Operation Phase

4.1.2.1 Burning

The reflective surfaces (of either heliostats or parabolic troughs) focus beams of sunlight into a small area resulting in concentrated solar flux which may burn birds. In technology **Alternative 2, large heliostat arrays focus solar flux on a central "power tower", exposing** passing birds to the risk of being singed or burnt in the flux beams, particularly as they aggregate close to the receiver. Birds may also be burnt in the stand-by focal points of the heliostats.

For Technology Alternative 1 (i.e. parabolic trough), this impact was rated as **Low** prior to and after mitigation.

For Technology Alternative 2 (i.e. central receiver tower), this impact was rated as **High** prior to and after mitigation.

4.1.2.2 Collision with Reflective Structures and/or CSP Infrastructure (Excluding Power Lines)

Birds may be attracted to, and collide with, the reflective surfaces (e.g. heliostats or parabolic troughs) which may be mistaken for large water bodies and can cause disorientation of flying birds, resulting in injury and/or death. For Technology Alternative 2, birds may also collide with the central receiver tower. Furthermore, if Technology Alternative 2 utilises evaporative cooling ponds, these bodies of water may provide artificial habitat to birds and their prey (e.g. insects), thus attracting more birds to the site which may result in a greater risk of collision with project structures.

For Technology Alternative 1 (i.e. parabolic trough), this impact was rated as Medium-High prior to mitigation and **Medium** after mitigation.

For Technology Alternative 2 (i.e. central receiver tower), this impact was rated as High prior to mitigation and **Medium-High** after mitigation.

4.1.2.3 *Disturbance and Displacement*

Resident bird species (particularly sensitive and breeding species) may be disturbed by operational and maintenance activities associated with the CSP plant, which may lead to temporary or permanent displacement and/or a reduction in breeding success.

For Technology Alternative 1 (i.e. parabolic trough), this impact was rated as Medium prior to mitigation and **Low** after mitigation.

For Technology Alternative 2 (i.e. central receiver tower), this impact was rated as Medium prior to mitigation and **Low** after mitigation.

4.1.2.4 *Collision with Power Lines*

Birds may collide with over-head power lines (excluding grid connection lines) on the CSP site, particularly during times of low light or poor visibility. Species at most risk are generally fast flying, large-bodied birds with poor manoeuvrability such as bustards, korhaans, cranes and flamingos.

For Technology Alternative 1 (i.e. parabolic trough), this impact was rated as Medium-High prior to mitigation and **Low** after mitigation.

For Technology Alternative 2 (i.e. central receiver tower), this impact was rated as Medium-High prior to mitigation and **Low** after mitigation.

4.1.2.5 *Electrocution*

Birds are electrocuted either in the on-site substation or on overhead powerlines on the CSP site.

For Technology Alternative 1 (i.e. parabolic trough), this impact was rated as High prior to mitigation and **Low** after mitigation.

For Technology Alternative 2 (i.e. central receiver tower), this impact was rated as High prior to mitigation and **Low** after mitigation.

4.1.2.6 *Water Pollution and Waste-water*

Pollution of water resources used by birds may result from the operational CSP, through use of chemicals and other pollutants on the site as well as the production of wastewater (brine), which can be difficult to manage and treat. On Technology Alternative 2, artificial evaporation ponds may attract waterbirds, which could be poisoned and/or drown.

For Technology Alternative 1 (i.e. parabolic trough), this impact was rated as **Low** prior to and after mitigation.

For Technology Alternative 2 (i.e. central receiver tower), this impact was rated as Medium prior to mitigation and **Low** after mitigation.

4.1.2.7 *Excessive Use of Water*

Certain CSP technologies, particularly those employing wet-cooling technologies, may use large amounts of water during operations. Excessive use of water, may drain/deplete local reserves used by birds in naturally dry habitats.

For Technology Alternative 1 (i.e. parabolic trough), this impact was rated as **Low** prior to and after mitigation.

For Technology Alternative 2 (i.e. central receiver tower), this impact was rated as Medium prior to mitigation and **Medium** after mitigation.

4.2 Grid Connection

4.2.1 Construction Phase

4.2.1.1 Habitat destruction

Clearing activities during the construction phase will remove vegetation and therefore habitat that birds may require for breeding, foraging and roosting. While some of the impact may be temporary as some areas could be rehabilitated, there will also be direct long-term loss of vegetation associated with the footprint of the power line towers, and clearances of servitudes and access tracks.

For Route Alternative 1, this impact was rated as Medium-High prior to mitigation and **Medium** after mitigation.

For Route Alternative 2, this impact was rated as Medium prior to mitigation and **Medium** after mitigation.

4.2.1.2 Disturbance and Displacement

Resident bird species (particularly sensitive and breeding species) may be disturbed by construction, activities associated with the grid connection, which may lead to temporary or permanent displacement and/or a reduction in breeding success. It is noted though that due to the uniformity of the broader area, birds may quite easily move off and find similar habitat nearby.

For Route Alternative 1, this impact was rated as Medium prior to mitigation and **Low** after mitigation.

For Route Alternative 2, this impact was rated as Medium prior to mitigation and **Low** after mitigation.

4.2.2 Operation Phase

4.2.2.1 Collision with Power Lines

Birds may collide with the new grid connection over-head power lines, particularly during times of low light or poor visibility. Species at most risk are generally fast flying, large-bodied birds with poor manoeuvrability such as bustards, korhaans, cranes and flamingos.

For Route Alternative 1, this impact was rated as High prior to mitigation and **Medium** after mitigation.

For Route Alternative 2, this impact was rated as High prior to mitigation and **Medium** after mitigation.

4.2.2.2 Electrocutation

When perching on the towers of the new grid connection power line, large birds may be electrocuted if they bridge the air gap between live components. Of particular concern are large raptors (e.g. Martial Eagle and White-backed Vulture) and storks, which due to their size and nature are prone to electrocution impacts.

For Route Alternative 1, this impact was rated as Very High prior to mitigation and **Medium** after mitigation.

For Route Alternative 2, this impact was rated as Very High prior to mitigation and **Medium** after mitigation.

4.2.2.3 *Disturbance and Displacement*

Resident bird species (particularly sensitive and breeding species) may be disturbed by operational and maintenance activities (e.g. ongoing clearance of servitudes, tower and line repairs and standard maintenance) associated with the grid connection power line, which may lead to temporary or permanent displacement and/or a reduction in breeding success. Of particular concern is disturbance to breeding eagles (e.g. Martial Eagle) which may build nests on the new infrastructure and roosting vultures.

For Route Alternative 1, this impact was rated as Medium prior to mitigation and **Low** after mitigation.

For Route Alternative 2, this impact was rated as Medium prior to mitigation and **Low** after mitigation.

4.3 **Cumulative Impacts**

All of the above mentioned impacts, and particularly those associated with the operational phase of the proposed project, may be intensified to some degree due to the potential cumulative impacts of a number of proposed commercial scale solar energy projects within 50 km of the project site.

Approximately 8 large solar energy projects in various stages of the EIA application process fall within this 50 km radius of the project site. Should some or all of these projects be constructed the cumulative impact significance of the residual impacts of burning and collision (if Technology Alternative 2 is constructed) may be High. The other impacts discussed above, are likely to have a cumulative impact ranging between Low and Medium.

Cumulative impacts will be examined and re-assessed in more detail during the EIA phase of the study and following the completion of the bird monitoring programme.

5 **EIA SURVEY DESIGN AND FURTHER INVESTIGATION**

The significance of the abovementioned impacts will be re-rated following the completion of the pre-construction bird monitoring programme as part of the EIA phase. This monitoring programme is currently designed to meet the requirements of the draft Birds and Solar Energy Best Practice Guidelines, for a CSP Parabolic Trough Facility (in the proposed location and based on the proposed size of the project). Should the Developer wish to construct Technology Alternative 2 (i.e. a CSP central tower), the monitoring programme would need to be revised and would have to incorporate monitoring over a 12 month period to remain in line with the draft guidelines.

Post mitigation impacts at this stage are not viewed as being of an extent or significance so as to preclude development and no additional surveys or survey effort is currently recommended for the EIA phase (unless Technology Alternative 2 is carried in to this phase as a viable alternative).

5.1 **EIA Assessment Methodology**

The data collected from the above surveys will be analysed in detail by the avifaunal specialist and incorporated into an avifaunal impact assessment report (AIAR) which will be compiled during the EIA Phase. It will provide further detail regarding the baseline conditions at the proposed project site, confirm the anticipated impacts documented in this

scoping report following a detailed review of the latest literature available, and provide an updated impact assessment and significance rating.

The assessment of potential impacts on avifauna will be done through the following stages:

- Describing the avifaunal baseline environment through survey (as described above) and desk study.
- Determining the value of the avifaunal receptors. This will be done primarily through the compilation of a list of focal species by considering factors such as abundance, behaviour on site, breeding and flight activity (i.e. by considering the survey results) as well as priority species status (as per Retief *et al.*, 2011, updated 2014), Regional Red Data status (Taylor, 2015) and whether the species is endemic or not.
- Determination of avifaunal sensitivities and no-go areas. An avifaunal sensitivity map based on the findings of the study will be produced.
- Identifying and characterising the potential impacts on the focal species. Potential avifaunal impacts will be assessed to determine significance using a standard methodology, both before and after mitigation.
- Describing mitigation, compensation, enhancement and monitoring measures associated with the proposed project.
- Alternatives will be assessed by the avifaunal specialist.

5.2 Stakeholder Consultation

Stakeholders will be consulted accordingly. BirdlifeSA will be consulted prior to the compilation of the final AIAR.

6 CONCLUSION

Based on a desk based study and the two site surveys conducted to date, it can be concluded that the Project site appears moderately sensitive in terms of avifauna. While up to 13 Red Data species may at some time utilise or traverse over the CSP site, only three have been recorded to date by monitoring on and around the CSP site. Of these, the species of most concern at this stage is the *Critically Endangered* White-backed Vulture, and the *Endangered* Martial Eagle. It was noted though that these species were rarely recorded in the surveys conducted and in fact, the abundance and flight activity levels of all raptors and priority species recorded to date is relatively low.

Commercial scale solar farms, and particularly CSP developments, are relatively new in South Africa and little information therefore exists on the potential impacts of these technologies on South African avifauna. Some information is available internationally which shows that the main potential impacts may include: burning; collision; electrocution; disturbance and displacement; habitat destruction; water pollution; and excessive use of water. Impacts of associated infrastructure (e.g. the grid connection power lines) is however well understood.

Potential impacts have been identified and given a preliminary rating. The most significant potential impacts to date are associated with the SCP facility Alternative Technology 2 (i.e. central receiver tower) and are burning and collision with reflective structures and/or CSP infrastructure which were rated (after the application of mitigation) as High and Medium-High respectively. The cumulative impact significance of the residual impacts of burning and collision (if Technology Alternative 2 is constructed) may be High.

Generally, all the impacts at this stage are not viewed as being of an extent or significance so as to preclude development, and the project may proceed.

All the identified impacts and cumulative impacts will be examined and re-assessed in more detail during the EIA phase of the study and following the completion of the bird monitoring programme.

7 REFERENCES

- Barnes, K.N. (ed). 1998. *The Important Bird Areas of Southern Africa*. BirdLife South Africa, Johannesburg.
- Endangered Wildlife Trust (EWT), 2011. Proposed Humansrus Solar Thermal Energy Power Plant: Specialist Avifaunal Impact Assessment. September 2011.
- Harrison, J.A., Allan, D.G., Underhill, L.G., Herremans, M., Tree, A.J., Parker, V & Brown, C.J. (eds). 1997. *The atlas of southern African birds*. Vol. 1&2. BirdLife South Africa: Johannesburg.
- Mucina & Rutherford. 2006. *The vegetation of South Africa, Lesotho and Swaziland*. Strelitzia 19. South African National Biodiversity Institute, Pretoria.
- Retief, E.F, Diamond, M., Anderson, M.D., Smit, Dr. H.A., Jenkins Dr. A. & Brooks, M. 2011, updated 2014. Avian Wind Farm Sensitivity Map for South Africa: Criteria and Procedures Used.
- Taylor, P.B., Navarro, R.A., Wren-Sargent, M., Harrison, J.A. & Kieswetter, S.L. 1999. *Coordinated waterbird Counts in South Africa, 1992-1997*. Avian Demography Unit, Cape Town.
- Taylor, M.R., Peacock, F., Wanless R.W. (eds.) 2015. *The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland*. BirdLife South Africa, Johannesburg, South Africa

APPENDIX 1: ARCUS SURVEY SPECIES SUMMARY

Alphabetical Name		Regional Red Data Status (Taylor <i>et al.</i> 2015)	Endemic or Near-endemic ⁵	Survey 1	Survey 2
Barbet, Acacia Pied	<i>Tricholaema leucomelas</i>				x
Batis, Pririt	<i>Batis pririt</i>			x	x
Bee-eater, European	<i>Merops apiaster</i>				x
Bishop, Southern Red	<i>Euplectes orix</i>			x	x
Bokmakierie	<i>Telophorus zeylonus</i>			x	x
Bulbul, African Red-eyed	<i>Pycnonotus nigricans</i>			x	x
Bunting, Cape	<i>Emberiza capensis</i>			x	x
Bunting, Golden-breasted	<i>Emberiza flaviventris</i>			x	
Bunting, Lark-like	<i>Emberiza impetuani</i>			x	x
Buzzard, Steppe	<i>Buteo buteo</i>				x
Buzzard, Jackal	<i>Buteo rufofuscus</i>		x		x
Canary, White-throated	<i>Crithagra albogularis</i>			x	
Canary, Yellow	<i>Crithagra flaviventris</i>			x	x
Chat, Ant-eating	<i>Myrmecocichla formicivora</i>			x	x
Chat, Familiar	<i>Cercomela familiaris</i>			x	x
Cisticola, Desert	<i>Cisticola aridulus</i>				x

⁵ Endemic or Near-endemic (i.e. ~70% or more of population in RSA) to South Africa according to the BirdLife South Africa Checklist of Birds in South Africa, 2014.

Alphabetical Name		Regional Red Data Status (Taylor <i>et al.</i> 2015)	Endemic or Near-endemic ⁵	Survey 1	Survey 2
Cisticola, Grey-backed	<i>Cisticola subruficapilla</i>			x	x
Cisticola, Levaillant's	<i>Cisticola tinniens</i>			x	
Coot, Red-knobbed	<i>Fulica cristata</i>			x	x
Crombec, Long-billed	<i>Sylvietta rufescens</i>				x
Crow, Pied	<i>Corvus albus</i>			x	x
Cuckoo, Diederik	<i>Chrysococcyx caprius</i>				x
Dove, Cape Turtle	<i>Streptopelia capicola</i>			x	x
Dove, Laughing	<i>Streptopelia senegalensis</i>			x	x
Dove, Namaqua	<i>Oena capensis</i>			x	x
Dove, Rock	<i>Columba livia</i>				x
Duck, Yellow-billed	<i>Anas undulata</i>				x
Eagle, Black-chested Snake	<i>Circaetus pectoralis</i>			x	x
Eagle, Booted	<i>Hieraaetus pennatus</i>			x	x
Eagle, Martial	<i>Polemaetus bellicosus</i>	Endangered			x
Egret, Western Cattle	<i>Bubulcus ibis</i>			x	
Eremomela, Karoo	<i>Eremomela gregalis</i>		x		x
Eremomela, Yellow-bellied	<i>Eremomela icteropygialis</i>			x	x
Falcon, Lanner	<i>Falco biarmicus</i>	Vulnerable		x	x
Finch, Red-headed	<i>Amadina erythrocephala</i>				x

Alphabetical Name		Regional Red Data Status (Taylor <i>et al.</i> 2015)	Endemic or Near-endemic ⁵	Survey 1	Survey 2
Finch, Scaly-feathered	<i>Sporopipes squamifrons</i>			x	x
Fiscal, Common	<i>Lanius collaris</i>			x	x
Flycatcher, Chat	<i>Bradornis infuscatus</i>				x
Flycatcher, Fiscal	<i>Sigelus silens</i>		x	x	
Goose, Egyptian	<i>Alopochen aegyptiaca</i>				x
Goose, Spur-winged	<i>Plectropterus gambensis</i>				x
Goshawk, Gabar	<i>Melierax gabar</i>			x	
Goshawk, Pale Chanting	<i>Melierax canorus</i>			x	x
Greenshank, Common	<i>Tringa nebularia</i>			x	
Guineafowl, Helmeted	<i>Numida meleagris</i>				x
Heron, Grey	<i>Ardea cinerea</i>			x	
Hoopoe, African	<i>Upupa africana</i>			x	
Ibis, African Sacred	<i>Threskiornis aethiopicus</i>			x	
Ibis, Hageda	<i>Bostrychia hagedash</i>				x
Kestrel, Greater	<i>Falco rupicoloides</i>			x	x
Korhaan, Northern Black	<i>Afrotis afraoides</i>			x	x
Korhaan, Red-crested	<i>Lophotis ruficrista</i>				x
Lapwing, Blacksmith	<i>Vanellus armatus</i>			x	x
Lapwing, Crowned	<i>Vanellus coronatus</i>			x	x

Alphabetical Name		Regional Red Data Status (Taylor <i>et al.</i> 2015)	Endemic or Near-endemic ⁵	Survey 1	Survey 2
Lark, Eastern Clapper	<i>Mirafra fasciolata</i>			x	x
Lark, Grey-backed Sparrow	<i>Eremopterix verticalis</i>			x	
Lark, Karoo Long-billed	<i>Certhilauda subcoronata</i>				x
Lark, Large-billed	<i>Galerida magnirostris</i>		x		x
Lark, Sabota	<i>Calendulauda sabota</i>				x
Lark, Spike-heeled	<i>Chersomanes albobfasciata</i>			x	x
Longclaw, Cape	<i>Macronyx capensis</i>				x
Martin, Rock	<i>Hirundo fulgula</i>			x	x
Moorhen, Common	<i>Gallinula chloropus</i>			x	
Mousebird, Red-faced	<i>Urocolius indicus</i>			x	x
Mousebird, White-backed	<i>Colius colius</i>				x
Neddicky	<i>Cisticola fulvicapilla</i>			x	
Penduline-tit, Cape	<i>Anthoscopus minutus</i>			x	x
Pipit, African	<i>Anthus cinnamomeus</i>				x
Pipit, Buffy	<i>Anthus vaalensis</i>			x	
Plover, Three-banded	<i>Charadrius tricollaris</i>			x	x
Prinia, Black-chested	<i>Prinia flavicans</i>			x	x
Prinia, Karoo	<i>Prinia maculosa</i>		x		x
Quail-finch, African	<i>Ortygospiza fuscocrissa</i>				x

Alphabetical Name		Regional Red Data Status (Taylor <i>et al.</i> 2015)	Endemic or Near-endemic⁵	Survey 1	Survey 2
Robin, Kalahari Scrub	<i>Erythropygia paena</i>			x	x
Robin, Karoo Scrub	<i>Erythropygia coryphoeus</i>				x
Ruff	<i>Philomachus pugnax</i>			x	
Sandgrouse, Namaqua	<i>Pterocles namaqua</i>			x	x
Sandpiper, Wood	<i>Tringa glareola</i>			x	
Shrike, Lesser Grey	<i>Lanius minor</i>				x
Shrike, Red-backed	<i>Lanius collurio</i>				x
Snipe, African	<i>Gallinago nigripennis</i>			x	
Sparrow, Cape	<i>Passer melanurus</i>			x	x
Sparrow, Southern Grey-headed	<i>Passer diffusus</i>				x
Sparrow-weaver, White-browed	<i>Plocepasser mahali</i>			x	x
Starling, Cape Glossy	<i>Lamprotornis nitens</i>			x	x
Starling, Pale-winged	<i>Onychognathus nabouroup</i>				x
Starling, Wattled	<i>Creatophora cinerea</i>				x
Stilt, Black-winged	<i>Himantopus himantopus</i>			x	
Sunbird, Dusky	<i>Cinnyris fuscus</i>				x
Swallow, Barn	<i>Hirundo rustica</i>			x	x
Swallow, Greater Striped	<i>Cecropis cucullata</i>			x	x
Swift, Alpine	<i>Tachymartus melba</i>			x	x

Alphabetical Name		Regional Red Data Status (Taylor <i>et al.</i> 2015)	Endemic or Near-endemic ⁵	Survey 1	Survey 2
Swift, Bradfield's	<i>Apus bradfieldi</i>				x
Swift, Common	<i>Apus apus</i>				x
Swift, Little	<i>Apus affinis</i>			x	x
Swift, White-rumped	<i>Apus caffer</i>			x	
Tchagra, Brown-crowned	<i>Tchagra australis</i>				x
Teal, Red-billed	<i>Anas erythrorhyncha</i>			x	
Thrush, Short-toed Rock	<i>Monticola brevipes</i>			x	
Tit, Ashy	<i>Parus cinerascens</i>				x
Tit-Babbler, Chestnut-vented	<i>Sylvia subcaerulea</i>			x	x
Vulture, White-backed	<i>Gyps africanus</i>	Critically Endangered			x
Wagtail, Cape	<i>Motacilla capensis</i>			x	x
Warbler, African Reed	<i>Acrocephalus baeticatus</i>			x	
Warbler, Lesser Swamp	<i>Acrocephalus gracillirostris</i>				x
Warbler, Namaqua	<i>Phragmacia substriata</i>		x		x
Warbler, Rufous-eared	<i>Malcorus pectoralis</i>			x	x
Waxbill, Violet-eared	<i>Uraeginthus granatinus</i>			x	
Weaver, Cape	<i>Ploceus capensis</i>		x		x
Weaver, Sociable	<i>Philetairus socius</i>				x
Weaver, Southern Masked	<i>Ploceus velatus</i>			x	x

Alphabetical Name		Regional Red Data Status (Taylor <i>et al.</i> 2015)	Endemic or Near-endemic ⁵	Survey 1	Survey 2
Whydah, Pin-tailed	<i>Vidua macroura</i>				x
Whydah, Shaft-tailed	<i>Vidua regia</i>				x

APPENDIX 2: IMPACT ASSESSMENT METHODOLOGY

METHODOLOGY FOR IMPACT ASSESSMENT AND RISK RATING

The tables below indicate and explain the methodology and criteria used for the evaluation of the Environmental Risk Ratings as well as the calculation of the final Environmental Significance Ratings of the identified potential environmental impacts.

Each potential environmental impact is scored for each of the Evaluation Components as per Table 4 below.

Table 1: Scale utilised for the evaluation of the Environmental Risk Ratings

Evaluation Component	Rating Scale and Description/criteria
MAGNITUDE of NEGATIVE IMPACT (at the indicated spatial scale)	<p>10 - Very high: Bio-physical and/or social functions and/or processes might be <i>severely</i> altered.</p> <p>8 - High: Bio-physical and/or social functions and/or processes might be <i>considerably</i> altered.</p> <p>6 - Medium: Bio-physical and/or social functions and/or processes might be <i>notably</i> altered.</p> <p>4 - Low : Bio-physical and/or social functions and/or processes might be <i>slightly</i> altered.</p> <p>2 - Very Low: Bio-physical and/or social functions and/or processes might be <i>negligibly</i> altered.</p> <p>0 - Zero: Bio-physical and/or social functions and/or processes will remain <i>unaltered</i>.</p>
MAGNITUDE of POSITIVE IMPACT (at the indicated spatial scale)	<p>10 - Very high (positive): Bio-physical and/or social functions and/or processes might be <i>substantially</i> enhanced.</p> <p>8 - High (positive): Bio-physical and/or social functions and/or processes might be <i>considerably</i> enhanced.</p> <p>6 - Medium (positive): Bio-physical and/or social functions and/or processes might be <i>notably</i> enhanced.</p> <p>4 - Low (positive): Bio-physical and/or social functions and/or processes might be <i>slightly</i> enhanced.</p> <p>2 - Very Low (positive): Bio-physical and/or social functions and/or processes might be <i>negligibly</i> enhanced.</p> <p>0 - Zero (positive): Bio-physical and/or social functions and/or processes will remain <i>unaltered</i>.</p>
DURATION	<p>5 - Permanent</p> <p>4 - Long term: Impact ceases after operational phase/life of the activity > 60 years.</p> <p>3 - Medium term: Impact might occur during the operational phase/life of the activity – 60 years.</p> <p>2 - Short term: Impact might occur during the construction phase - < 3 years.</p> <p>1 - Immediate</p>
EXTENT (or spatial scale/influence of impact)	<p>5 - International: Beyond National boundaries.</p> <p>4 - National: Beyond Provincial boundaries and within National boundaries.</p> <p>3 - Regional: Beyond 5 km of the proposed development and within Provincial boundaries.</p> <p>2 - Local: Within 5 km of the proposed development.</p> <p>1 - Site-specific: On site or within 100 m of the site boundary.</p> <p>0 - None</p>

IRREPLACEABLE loss of resources	5 – Definite loss of irreplaceable resources. 4 – High potential for loss of irreplaceable resources. 3 – Moderate potential for loss of irreplaceable resources. 2 – Low potential for loss of irreplaceable resources. 1 – Very low potential for loss of irreplaceable resources. 0 - None
REVERSIBILITY of impact	5 – Impact cannot be reversed. 4 – Low potential that impact might be reversed. 3 – Moderate potential that impact might be reversed. 2 – High potential that impact might be reversed. 1 – Impact will be reversible. 0 – No impact.
PROBABILITY (of occurrence)	5 - Definite: >95% chance of the potential impact occurring. 4 - High probability: 75% - 95% chance of the potential impact occurring. 3 - Medium probability: 25% - 75% chance of the potential impact occurring 2 - Low probability: 5% - 25% chance of the potential impact occurring. 1 - Improbable: <5% chance of the potential impact occurring.
Evaluation Component	Rating Scale and Description/criteria
CUMULATIVE impacts	High: The activity is one of several similar past, present or future activities in the same geographical area, and might contribute to a very significant combined impact on the natural, cultural, and/or socio-economic resources of local, regional or national concern. Medium: The activity is one of a few similar past, present or future activities in the same geographical area, and might have a combined impact of moderate significance on the natural, cultural, and/or socio-economic resources of local, regional or national concern. Low: The activity is localised and might have a negligible cumulative impact. None: No cumulative impact on the environment.

Once the Environmental Risk Ratings have been evaluated for each potential environmental impact, the Significance Score of each potential environmental impact is calculated by using the following formula:

- **SS (Significance Score) = (magnitude + duration + extent + irreplaceable + reversibility) x probability.**

The maximum Significance Score value is 150.

The Significance Score is then used to rate the Environmental Significance of each potential environmental impact as per Table 5 below. The Environmental Significance rating process

is completed for all identified potential environmental impacts both before and after implementation of the recommended mitigation measures.

Table 2: Scale used for the evaluation of the Environmental Significance Ratings

Significance Score	Environmental Significance	Description/criteria
125 – 150	Very high (VH)	An impact of very high significance will mean that the project cannot proceed, and that impacts are irreversible, regardless of available mitigation options.
100 – 124	High (H)	An impact of high significance which could influence a decision about whether or not to proceed with the proposed project, regardless of available mitigation options.
75 – 99	Medium-high (MH)	If left unmanaged, an impact of medium-high significance could influence a decision about whether or not to proceed with a proposed project. Mitigation options should be relooked.
40 – 74	Medium (M)	If left unmanaged, an impact of moderate significance could influence a decision about whether or not to proceed with a proposed project.
<40	Low (L)	An impact of low is likely to contribute to positive decisions about whether or not to proceed with the project. It will have little real effect and is unlikely to have an influence on project design or alternative motivation.
+	Positive impact (+)	A positive impact is likely to result in a positive consequence/effect, and is likely to contribute to positive decisions about whether or not to proceed with the project.

Table 3. Example of risk assessment and scoring

Bio-Physical Aspects			
	Technology Alternative 1	Technology Alternative 2	No-Go Alternative
Identified Environmental Impacts	Removal, destruction and transformation of natural vegetation and faunal habitats	Removal, destruction and transformation of natural vegetation and faunal habitats	The proposed development will not take place and as such this impact will not occur
Magnitude of Impact	Low (4)	Low (4)	-
Duration of impact:	Long term (4)	Long term (4)	-
Extent of the impact	Local (2)	Local (2)	-
Degree to which local resources are irreplaceable	Low (2)	Low (2)	-
Degree to which the impact can be reversed:	Moderate (3)	Moderate (3)	-
Probability of occurrence:	High Probability (4)	High Probability (4)	-
Cumulative impact prior to mitigation:			
Significance rating of impact prior to mitigation (Low, Medium, Medium-High, High, or Very-High)	Medium (60)	Medium (60)	-

Proposed mitigation:	<ul style="list-style-type: none"> Strictly limit CSP Facility and associated infrastructure construction and development to the proposed project footprint. Use existing roads as far as possible and limit the number of additional roads constructed. 		-
Cumulative impact post mitigation:			-
Significance rating of impact after mitigation (Low, Medium, Medium-High, High, or Very-High)	Medium (56)	Medium (56)	-
	Technology Alternative 1	Technology Alternative 2	No-Go Alternative
Identified Environmental Impacts	Reduction of agricultural potential of land	Reduction of agricultural potential of land	The proposed development will not take place and as such this impact will not occur
Magnitude of Impact	Low (4)	Low (4)	-
Duration of impact:	Long term (4)	Long term (4)	-
Extent of the impact	Local (2)	Local (2)	-
Degree to which local resources are irreplaceable	Low (2)	Low (2)	-
Degree to which the impact can be reversed:	Moderate (3)	Moderate (3)	-

Probability of occurrence:	High Probability (4)	High Probability (4)	-
Cumulative impact prior to mitigation:			
Significance rating of impact prior to mitigation (Low, Medium, Medium-High, High, or Very-High)	Medium (60)	Medium (60)	-
Proposed mitigation:	<ul style="list-style-type: none"> Strictly limit CSP Facility and associated infrastructure construction and development to the proposed project footprint. Use existing roads as far as possible and limit the number of additional roads constructed. Ensure adequate erosion control measures are implemented to reduce the risk of soil erosion during the construction phase. 		-
Cumulative impact post mitigation:			-
Significance rating of impact after mitigation (Low, Medium, Medium-High, High, or Very-High)	Medium (56)	Medium (56)	-
	Technology Alternative 1	Technology Alternative 2	No-Go Alternative
Identified Environmental Impacts	Dust generation and emissions	Dust generation and emissions	The proposed development will not take place and as such this impact will not occur
Magnitude of Impact	Very low (2)	Very low (2)	-

Duration of impact:	Medium term (3)	Medium term (3)	-
Extent of the impact	Local (2)	Local (2)	-
Degree to which local resources are irreplaceable	Low (2)	Low (2)	-
Degree to which the impact can be reversed:	High (2)	High (2)	-
Probability of occurrence:	Medium probability (3)	Medium probability (3)	-
Cumulative impact prior to mitigation:			
Significance rating of impact prior to mitigation (Low, Medium, Medium-High, High, or Very-High)	Low (33)	Low (33)	-
Proposed mitigation:	<ul style="list-style-type: none"> Dust Management as well as Traffic Management Plans must be implemented in order to manage and reduce unnecessary traffic movement in the area and subsequently decrease undesired dust emissions. 		-
Cumulative impact post mitigation:			-
Significance rating of impact after mitigation (Low, Medium, Medium-High, High, or Very-High)	Low (16)	Low (16)	-

	Technology Alternative 1	Technology Alternative 2	No-Go Alternative
Identified Environmental Impacts	Transformation of early Proterozoic palaeontological heritage	Transformation of early Proterozoic palaeontological heritage	The proposed development will not take place and as such this impact will not occur
Magnitude of Impact	Low (4)	Low (4)	-
Duration of impact:	Long term (4)	Long term (4)	-
Extent of the impact	Local (2)	Local (2)	-
Degree to which local resources are irreplaceable	Moderate (3)	Moderate (3)	-
Degree to which the impact can be reversed:	Moderate (3)	Moderate (3)	-
Probability of occurrence:	High Probability (4)	High Probability (4)	-
Cumulative impact prior to mitigation:			
Significance rating of impact prior to mitigation (Low, Medium, Medium-High, High, or Very-High)	Medium (64)	Medium (64)	-

Proposed mitigation:	<ul style="list-style-type: none"> • It is advised that sites marked for erection of pylons or construction of associated infrastructure, which will require excavation into fresh bedrock sediments of the Campbellrand and Asbestos Hills Subgroup, be mapped and recorded prior to the construction phase of the development. • Ensure development is restricted to the project footprint. 		-
Cumulative impact post mitigation:			-
Significance rating of impact after mitigation (Low, Medium, Medium-High, High, or Very-High)	Medium (45)	Medium (45)	-

APPENDIX 3: IMPACT RATING TABLES: CSP FACILITY

Table 1: Preliminary Scoping Phase Impact Assessment Rating for Habitat Destruction during Construction.

Bio-Physical Aspects			
	Technology Alternative 1 (parabolic trough)	Technology Alternative 2 (central receiver tower)	No-Go Alternative
Identified Environmental Impacts	Removal and/or destruction and/or alteration of habitat used by birds.	Removal and/or destruction and/or alteration of habitat used by birds.	The proposed development will not take place and as such this impact will not occur
Magnitude of Impact	Low (4)	Medium (6)	-
Duration of impact:	Long term (4)	Long term (4)	-
Extent of the impact	Local (2)	Local (2)	-
Degree to which local resources are irreplaceable	Low (2)	Low (2)	-
Degree to which the impact can be reversed:	Moderate (3)	Moderate (3)	-
Probability of occurrence:	Definite (5)	Definite (5)	-
Cumulative impact prior to mitigation:	Medium	Medium	-
Significance rating of impact prior to mitigation (Low, Medium, Medium-High, High, or Very-High)	Medium-High (75)	Medium-High (85)	-
Proposed mitigation:	<ul style="list-style-type: none"> A site specific Construction Environmental Management Plan (CEMP) must be implemented, which gives appropriate and detailed description of how construction activities must be conducted to reduce unnecessary destruction of habitat. All 		-

	<p>contractors are to adhere to the CEMP and should apply good environmental practice during construction</p> <ul style="list-style-type: none"> • High traffic areas and buildings such as offices, batching plants, storage areas etc. should, where possible be situated in areas that are already disturbed; • Existing roads and farm tracks should be used where possible; • The minimum footprint areas of infrastructure should be used wherever possible, including road widths and lengths; • No off-road driving; • Environmental Control Officers to oversee activities and ensure that the site specific construction environmental management plan (CEMP) is implemented and enforced; • Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and to this end a habitat restoration plan is to be developed by a specialist and included within the Construction Environmental Management Plan (CEMP). 		
Cumulative impact post mitigation:	Medium	Medium	-
Significance rating of impact after mitigation (Low, Medium, Medium-High, High, or Very-High)	Medium (65). Magnitude is reduced to 3, and reversibility to 2.	Medium (70). Magnitude is reduced to 4, and reversibility to 2.	-

Table 2: Preliminary Scoping Phase Impact Assessment Rating for Disturbance and Displacement during Construction.

Bio-Physical Aspects			
	Technology Alternative 1 (parabolic trough)	Technology Alternative 2 (central receiver tower)	No-Go Alternative
Identified Environmental Impacts	Disturbance of birds (particularly sensitive and breeding species), which may lead to temporary or permanent displacement and/or a reduction in breeding success.	Disturbance of birds (particularly sensitive and breeding species), which may lead to temporary or permanent displacement and/or a reduction in breeding success.	The proposed development will not take place and as such this impact will not occur
Magnitude of Impact	Medium (6)	Medium (6)	-

Duration of impact:	Short-term (2)	Short-term (2)	-
Extent of the impact	Regional (3)	Regional (3)	-
Degree to which local resources are irreplaceable	Moderate (3)	Moderate (3)	-
Degree to which the impact can be reversed:	Moderate (3)	Moderate (3)	-
Probability of occurrence:	High (4)	High (4)	-
Cumulative impact prior to mitigation:	Medium	Medium	
Significance rating of impact prior to mitigation (Low, Medium, Medium-High, High, or Very-High)	Medium (68)	Medium (68)	-
Proposed mitigation:	<ul style="list-style-type: none"> • A site specific Construction Environmental Management Plan (CEMP) must be implemented, which gives appropriate and detailed description of how construction activities must be conducted. All contractors are to adhere to the CEMP and should apply good environmental practice during construction. • Environmental Control Officers to oversee activities and ensure that the site specific construction environmental management plan (CEMP) is implemented and enforced; • The appointed Environmental Control Officer (ECO) must be trained by an avifaunal specialist to identify the potential Red Data species as well as the signs that indicate possible breeding by these species. The ECO must then, during audits/site visits, make a concerted effort to look out for such breeding activities of Red Data species, and such efforts may include the training of construction staff (e.g. in Toolbox talks) to identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species. If any of the Red Data species are confirmed to be breeding (e.g. if a nest site is found), construction activities within 500 m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed. • Prior to construction, an avifaunal specialist should conduct a site walkthrough, covering the final road and power line routes as well as the CSP layout, to identify 		-

	any nests/breeding/roosting activity of sensitive species, as well as any additional sensitive habitats. The results of which may inform the final construction schedule in close proximity to that specific area, including abbreviating construction time, scheduling activities around avian breeding and/or movement schedules, and lowering levels of associated noise.		
Cumulative impact post mitigation:	Low	Low	-
Significance rating of impact after mitigation (Low, Medium, Medium-High, High, or Very-High)	Low (34). Probability reduces to 2	Low (34). Probability reduces to 2	-

Table 3: Preliminary Scoping Phase Impact Assessment Rating for Burning during Operation.

Bio-Physical Aspects			
	Technology Alternative 1 (parabolic trough)	Technology Alternative 2 (central receiver tower)	No-Go Alternative
Identified Environmental Impacts	Birds may fly between the troughs and the receiver unit. The reflective surfaces focus beams of sunlight into a small area resulting in concentrated solar flux which may burn the bird.	Large heliostat arrays focus solar flux on a central "power tower", exposing passing birds to the risk of being singed or burnt in the flux beams, particularly as they aggregate close to the receiver. Birds may be burnt in the stand-by focal points.	The proposed development will not take place and as such this impact will not occur
Magnitude of Impact	Very High (10)	Very High (10)	-
Duration of impact:	Long-Term (4)	Long-Term (4)	-
Extent of the impact	Local (2)	Local (2)	-

Degree to which local resources are irreplaceable	High (4)	High (4)	-
Degree to which the impact can be reversed:	Cannot (5)	Cannot (5)	-
Probability of occurrence:	Improbable (1)	High (4)	-
Cumulative impact prior to mitigation:	Low	High	
Significance rating of impact prior to mitigation (Low, Medium-High, High, or Very-High)	Low (25)	High (100)	-
Proposed mitigation:	<ul style="list-style-type: none"> • For Technology Alternative 2, the occurrence and intensity of standby focal points should be kept to a minimum by careful focusing of heliostats when not in use. • Attractants to birds, such as foraging and perching opportunities should be limited in the immediate vicinity of the facility. • Develop and implement an operational monitoring programme for birds in line with applicable guidelines, which must include searching for mortalities. • Frequent and regular review of operational phase monitoring data and results by an avifaunal specialist. • The above reviews should strive to identify sensitive locations at the development including that may require additional mitigation. If unacceptable impacts are observed (in the opinion of the bird specialist and independent review), the specialist should conduct a literature review specific to the impact and provide updated and relevant mitigation options to be implemented. As a starting point for the review of possible mitigations, the following may need to be considered: <ul style="list-style-type: none"> ○ Assess the suitability of using deterrent devices to reduce burning risk. ○ Various approaches to standby aiming of heliostats, which could significantly reduce flux levels. 		-
Cumulative impact post mitigation:	Low	High	-
Significance rating of impact after mitigation	Low (25)	High (100)	-

(Low, Medium, Medium-High, High, or Very-High)			
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Table 4: Preliminary Scoping Phase Impact Assessment Rating for Collision with Reflective Structures and/or CSP infrastructure (excluding power lines) during Operation.

Bio-Physical Aspects			
	Technology Alternative 1 (parabolic trough)	Technology Alternative 2 (central receiver tower)	No-Go Alternative
Identified Environmental Impacts	Birds collide with the parabolic troughs. Birds may be attracted to the reflective surfaces which may be mistaken for large water bodies and can cause disorientation of flying birds, resulting in injury and/or death.	Birds collide with heliostats and/or the central receiver tower. Birds may be attracted to the reflective surfaces which may be mistaken for large water bodies and can cause disorientation of flying birds, resulting in injury and/or death.	The proposed development will not take place and as such this impact will not occur
Magnitude of Impact	Very High (10)	Very High (10)	-
Duration of impact:	Long-Term (4)	Long-Term (4)	-
Extent of the impact	Local (2)	Local (2)	-
Degree to which local resources are irreplaceable	High (4)	High (4)	-
Degree to which the impact can be reversed:	Cannot (5)	Cannot (5)	-
Probability of occurrence:	Medium (3)	High (4)	-
Cumulative impact prior to mitigation:	Medium	High	

Significance rating of impact prior to mitigation (Low, Medium, Medium-High, High, or Very-High)	Medium-High (75)	High (100)	-
Proposed mitigation:	<ul style="list-style-type: none"> • Where possible, infrastructure should be located away from known bird flight paths or features which are attractive to birds, e.g. natural or man-made open water areas or agricultural fields. • To limit bird traffic across the site, perch able structures should be avoided where possible. • Lighting should be kept to a minimum to avoid attracting insects and birds and light sensors/switches should be utilised to keep lights off when not required. • Lighting fixtures should be hooded and directed downward, to minimize the skyward and horizontal illumination which could attract night-flying birds (Ledec et al., 2010). • Where possible, lighting should be intermittent or flashing-beam lights. • Careful selection of and modifications to solar facility equipment should be made where possible. For instance, white borders could be applied to trough panels to reduce the resemblance that arrays have of waterbodies. • Develop and implement an operational monitoring programme for birds in line with applicable guidelines, which must include searching for mortalities. • Frequent and regular review of operational phase monitoring data and results by an avifaunal specialist. • The above reviews should strive to identify sensitive locations at the development including that may require additional mitigation. If unacceptable impacts are observed (in the opinion of the bird specialist and independent review), the specialist should conduct a literature review specific to the impact and provide updated and relevant mitigation options to be implemented. As a starting point for the review of possible mitigations, the following may need to be considered: <ul style="list-style-type: none"> ○ Assess the suitability of using deterrent devices to reduce collision risk. 		-
Cumulative impact post mitigation:	Medium	Medium	-
Significance rating of impact after mitigation (Low, Medium, Medium-High, High, or Very-High)	Medium (50)	Medium-High (75)	-

Table 5: Preliminary Scoping Phase Impact Assessment Rating for Disturbance and Displacement during Operation.

Bio-Physical Aspects			
	Technology Alternative 1 (parabolic trough)	Technology Alternative 2 (central receiver tower)	No-Go Alternative
Identified Environmental Impacts	Disturbance of birds (particularly sensitive and breeding species), which may lead to temporary or permanent displacement and/or a reduction in breeding success.	Disturbance of birds (particularly sensitive and breeding species), which may lead to temporary or permanent displacement and/or a reduction in breeding success.	The proposed development will not take place and as such this impact will not occur
Magnitude of Impact	Medium (6)	Medium (6)	-
Duration of impact:	Medium-term (2)	Medium-term (2)	-
Extent of the impact	Regional (3)	Regional (3)	-
Degree to which local resources are irreplaceable	Moderate (3)	Moderate (3)	-
Degree to which the impact can be reversed:	Moderate (3)	Moderate (3)	-
Probability of occurrence:	Medium (3)	Medium (3)	-
Cumulative impact prior to mitigation:	Medium	Medium	
Significance rating of impact prior to mitigation (Low, Medium, Medium-High, High, or Very-High)	Medium (51)	Medium (51)	-
Proposed mitigation:	<ul style="list-style-type: none"> A site specific Operational Environmental Management Plan (OEMP) must be implemented, which gives appropriate and detailed description of how operational 		-

	<p>and maintenance activities must be conducted to reduce unnecessary disturbance. All contractors are to adhere to the OEMP and should apply good environmental practice during all operations.</p> <ul style="list-style-type: none"> The on-site facilities manager (or a suitably appointed Environmental Manager) must be trained by an avifaunal specialist to identify the potential Red Data species as well as the signs that indicate possibly breeding by these species. If a priority species or Red Data species is found to be breeding (e.g. a nest site is located) on or within 3 km of the operational facility, the nest/breeding site must not be disturbed and the avifaunal specialist must be contacted for further instruction. Operational phase bird monitoring, in line with applicable guidelines, must be implemented. 	
Cumulative impact post mitigation:		-
Significance rating of impact after mitigation (Low, Medium, Medium-High, High, or Very-High)	Low (32). Reversibility is 2, and probability is 2.	Low (32). Reversibility is 2, and probability is 2.

Table 6: Preliminary Scoping Phase Impact Assessment Rating for Collision with associated power lines during Operation.

Bio-Physical Aspects			
	Technology Alternative 1 (parabolic trough)	Technology Alternative 2 (central receiver tower)	No-Go Alternative
Identified Environmental Impacts	Birds collide with overhead power lines on the CSP site.	Birds collide with overhead power lines on the CSP site.	The proposed development will not take place and as such this impact will not occur
Magnitude of Impact	Very High (10)	Very High (10)	-
Duration of impact:	Long-Term (4)	Long-Term (4)	-
Extent of the impact	Regional (3)	Regional (3)	-

Degree to which local resources are irreplaceable	High (4)	High (4)	-
Degree to which the impact can be reversed:	Cannot (5)	Cannot (5)	-
Probability of occurrence:	Medium (3)	Medium (3)	-
Cumulative impact prior to mitigation:	Medium	Medium	
Significance rating of impact prior to mitigation (Low, Medium, Medium-High, High, or Very-High)	Medium-High (78)	Medium-High (78)	-
Proposed mitigation:	<ul style="list-style-type: none"> All on site power cables and power lines to be buried underground 		-
Cumulative impact post mitigation:			-
Significance rating of impact after mitigation (Low, Medium, Medium-High, High, or Very-High)	Low (26). Probability is 1	Low (26). Probability is 1	-

Table 7: Preliminary Scoping Phase Impact Assessment Rating for Electrocutation on the CSP site during Operation.

Bio-Physical Aspects			
	Technology Alternative 1 (parabolic trough)	Technology Alternative 2 (central receiver tower)	No-Go Alternative
Identified Environmental Impacts	Birds may be electrocuted either in the on-site substation or on overhead powerlines on the CSP site.	Birds may be electrocuted either in the on-site substation or on overhead powerlines on the CSP site.	The proposed development will not take place and as such this impact will not occur
Magnitude of Impact	Very High (10)	Very High (10)	-
Duration of impact:	Long-Term (4)	Long-Term (4)	-
Extent of the impact	Regional (3)	Regional (3)	-
Degree to which local resources are irreplaceable	High (4)	High (4)	-
Degree to which the impact can be reversed:	Cannot (5)	Cannot (5)	-
Probability of occurrence:	High (4)	High (4)	-
Cumulative impact prior to mitigation:	High	High	
Significance rating of impact prior to mitigation (Low, Medium, Medium-High, High, or Very-High)	High (104)	High (104)	-
Proposed mitigation:	<ul style="list-style-type: none"> All on site power cables and power lines to be buried underground. 		-

	<ul style="list-style-type: none"> Within the on-site substation, electrical component are to be properly insulated in line with Eskom standard guidelines. Where possible, clearances between live components should be greater than 2 m. 		
Cumulative impact post mitigation:	Low	Low	-
Significance rating of impact after mitigation (Low, Medium, Medium-High, High, or Very-High)	Low (26). Probability is 2	Low (26). Probability is 2	-

Table 8: Preliminary Scoping Phase Impact Assessment Rating for Water Pollution and Waste Water during Operation.

Bio-Physical Aspects			
	Technology Alternative 1 (parabolic trough)	Technology Alternative 2 (central receiver tower)	No-Go Alternative
Identified Environmental Impacts	Pollution of water resources used by birds.	Pollution of water resources used by birds. Production of wastewater (brine), which can be difficult to manage and treat. Artificial evaporation ponds attract waterbirds, which could be poisoned and/or drown.	The proposed development will not take place and as such this impact will not occur
Magnitude of Impact	Low (4)	Medium (6)	-
Duration of impact:	Medium-term (3)	Medium-term (3)	-
Extent of the impact	Regional (3)	Regional (3)	-
Degree to which local resources are irreplaceable	Low (2)	Moderate (3)	-

Degree to which the impact can be reversed:	Moderate (3)	Moderate (3)	-
Probability of occurrence:	Low (2)	Medium (3)	-
Cumulative impact prior to mitigation:	Low	Medium	
Significance rating of impact prior to mitigation (Low, Medium, Medium-High, High, or Very-High)	Low (30)	Medium (54)	-
Proposed mitigation:	<ul style="list-style-type: none"> All cleaning products used on the site should be environmentally friendly and bio-degradable. The OEMP must include site specific measures for the effective management and treatment of waste water. 	<ul style="list-style-type: none"> Ensure that birds do not get in contact with evaporation ponds i.e. ponds should be covered with wire mesh or netting to reduce the possibilities of, attracting, drowning, or poisoning birds. All cleaning products used on the site should be environmentally friendly and bio-degradable. All cleaning products used on the site should be environmentally friendly and bio-degradable. The OEMP must include site specific measures for the effective management and treatment of waste water. 	-
Cumulative impact post mitigation:	Low	Low	-
Significance rating of impact after mitigation (Low, Medium, Medium-High, High, or Very-High)	Low (26)	Low (30). Magnitude 4. Irreplaceability is 2. Probability is 2.	-

Table 9: Preliminary Scoping Phase Impact Assessment Rating for Excessive Use of Water during Operation.

Bio-Physical Aspects			
	Technology Alternative 1 (parabolic trough)	Technology Alternative 2 (central receiver tower)	No-Go Alternative
Identified Environmental Impacts	Excessive use of water, which may drain local reserves used by birds in naturally dry habitats.	Excessive use of water, which may drain local reserves used by birds in naturally dry habitats.	The proposed development will not take place and as such this impact will not occur
Magnitude of Impact	Low (4)	Medium (6)	-
Duration of impact:	Medium-term (3)	Medium-term (3)	-
Extent of the impact	Regional (3)	Regional (3)	-
Degree to which local resources are irreplaceable	Moderate (3)	Moderate (3)	-
Degree to which the impact can be reversed:	Moderate (3)	Moderate (3)	-
Probability of occurrence:	Low (2)	High (4)	-
Cumulative impact prior to mitigation:	Low	Medium	
Significance rating of impact prior to mitigation (Low, Medium, Medium-High, High, or Very-High)	Low (32)	Medium (72)	-
Proposed mitigation:	None recommended	None recommended	-

Cumulative impact post mitigation:	Low	Medium	-
Significance rating of impact after mitigation (Low, Medium, Medium-High, High, or Very-High)	Low (32)	Medium (72)	-

APPENDIX 4: IMPACT RATING TABLES: GRID CONNECTION

Table 1: Preliminary Scoping Phase Impact Assessment Rating for Habitat Destruction during Construction- Grid Connection.

Bio-Physical Aspects			
	Route Alternative 1	Route Alternative 2	No-Go Alternative
Identified Environmental Impacts	Removal and/or destruction and/or alteration of habitat used by birds.	Removal and/or destruction and/or alteration of habitat used by birds.	The proposed development will not take place and as such this impact will not occur
Magnitude of Impact	Low (4)	Very Low (2)	-
Duration of impact:	Long term (4)	Long term (4)	-
Extent of the impact	Local (2)	Local (2)	-
Degree to which local resources are irreplaceable	Low (2)	Low (2)	-
Degree to which the impact can be reversed:	Moderate (3)	Moderate (3)	-
Probability of occurrence:	Definite (5)	Definite (5)	-
Cumulative impact prior to mitigation:	Medium	Medium	-
Significance rating of impact prior to mitigation (Low, Medium, Medium-High, High, or Very-High)	Medium-High (75)	Medium (65)	-
Proposed mitigation:	<ul style="list-style-type: none"> A site specific Construction Environmental Management Plan (CEMP) must be implemented, which gives appropriate and detailed description of how construction activities must be conducted to reduce unnecessary destruction of habitat. All contractors are to adhere to the CEMP and should apply good environmental practice during construction 		-

	<ul style="list-style-type: none"> • High traffic areas and buildings such as offices, batching plants, storage areas etc. should, where possible be situated in areas that are already disturbed; • Existing roads and farm tracks should be used where possible; • The minimum footprint areas of infrastructure should be used wherever possible, including road widths and lengths; • No off-road driving; • Environmental Control Officers to oversee activities and ensure that the site specific construction environmental management plan (CEMP) is implemented and enforced; • Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and to this end a habitat restoration plan is to be developed by a specialist and included within the Construction Environmental Management Plan (CEMP). 		
Cumulative impact post mitigation:	Medium	Medium	-
Significance rating of impact after mitigation (Low, Medium, Medium-High, High, or Very-High)	Medium (65). Magnitude is reduced to 3, and reversibility to 2.	Medium (60). Reversibility to 2.	-

Table 2: Preliminary Scoping Phase Impact Assessment Rating for Disturbance and Displacement during Construction-Grid Connection

Bio-Physical Aspects			
	Route Alternative 1	Route Alternative 2	No-Go Alternative
Identified Environmental Impacts	Disturbance of birds (particularly sensitive and breeding species), which may lead to temporary or permanent displacement and/or a reduction in breeding success.	Disturbance of birds (particularly sensitive and breeding species), which may lead to temporary or permanent displacement and/or a reduction in breeding success.	The proposed development will not take place and as such this impact will not occur
Magnitude of Impact	Medium (6)	Medium (6)	-
Duration of impact:	Short-term (2)	Short-term (2)	-

Extent of the impact	Regional (3)	Regional (3)	-
Degree to which local resources are irreplaceable	Moderate (3)	Moderate (3)	-
Degree to which the impact can be reversed:	Moderate (3)	Moderate (3)	-
Probability of occurrence:	Medium (3)	Medium (3)	-
Cumulative impact prior to mitigation:	Medium	Medium	
Significance rating of impact prior to mitigation (Low, Medium, Medium-High, High, or Very-High)	Medium (51)	Medium (51)	-
Proposed mitigation:	<ul style="list-style-type: none"> • A site specific Construction Environmental Management Plan (CEMP) must be implemented, which gives appropriate and detailed description of how construction activities must be conducted. All contractors are to adhere to the CEMP and should apply good environmental practice during construction. • Environmental Control Officers to oversee activities and ensure that the site specific construction environmental management plan (CEMP) is implemented and enforced; • The appointed Environmental Control Officer (ECO) must be trained by an avifaunal specialist to identify the potential Red Data species as well as the signs that indicate possible breeding by these species. The ECO must then, during audits/site visits, make a concerted effort to look out for such breeding activities of Red Data species, and such efforts may include the training of construction staff (e.g. in Toolbox talks) to identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species. If any of the Red Data species are confirmed to be breeding (e.g. if a nest site is found), construction activities within 500 m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed. • Prior to construction, an avifaunal specialist should conduct a site walkthrough, covering the final power line route, to identify any nests/breeding/roosting activity of sensitive species, as well as any additional sensitive habitats. The results of which may inform the final construction schedule in close proximity to that specific area, 		-

	including abbreviating construction time, scheduling activities around avian breeding and/or movement schedules, and lowering levels of associated noise.		
Cumulative impact post mitigation:	Low	Low	-
Significance rating of impact after mitigation (Low, Medium, Medium-High, High, or Very-High)	Low (34). Probability reduces to 2	Low (34). Probability reduces to 2	-

Table 3: Preliminary Scoping Phase Impact Assessment Rating for Collision with power lines during Operation-Grid Connection.

Bio-Physical Aspects			
	Route Alternative 1	Route Alternative 2	No-Go Alternative
Identified Environmental Impacts	Birds collide with overhead power lines.	Birds collide with overhead power lines.	The proposed development will not take place and as such this impact will not occur
Magnitude of Impact	Very High (10)	Very High (10)	-
Duration of impact:	Long-Term (4)	Long-Term (4)	-
Extent of the impact	Regional (3)	Regional (3)	-
Degree to which local resources are irreplaceable	High (4)	High (4)	-
Degree to which the impact can be reversed:	Cannot (5)	Cannot (5)	-
Probability of occurrence:	Medium (4)	Medium (4)	-

Cumulative impact prior to mitigation:	High	High	
Significance rating of impact prior to mitigation (Low, Medium, Medium-High, High, or Very-High)	High (104)	High (104)	-
Proposed mitigation:	<ul style="list-style-type: none"> • Where possible, grid infrastructure should avoid sensitive avifaunal habitats. • Where possible, grid infrastructure should follow existing servitudes such as existing power lines, roads and fences. • An avifaunal specialist must conduct a site walk through of the final Grid Connection route and pylon positions prior to construction to determine if, and where, bird flight diverters (BFDs) are required. • Install bird flight diverters as per the instructions of the specialist following the site walkthrough, which may include the need for modified BFDs fitted with solar powered LED lights on certain spans. • The operational monitoring programme for the associated CSP site must be in line with applicable monitoring guidelines and must include regular (at least monthly) monitoring of the grid connection power line for collision (and electrocution) mortalities. Any mortalities should be reported to the Endangered Wildlife Trust (EWT). 		-
Cumulative impact post mitigation:	Medium	Medium	-
Significance rating of impact after mitigation (Low, Medium, Medium-High, High, or Very-High)	Medium (72). Extent is 2. Irreplaceability is 3. Probability is 3	Medium (72). Extent is 2. Irreplaceability is 3. Probability is 3	-

Table 4: Preliminary Scoping Phase Impact Assessment Rating for Electrocution during Operation- Grid Connection

Bio-Physical Aspects			
	Route Alternative 1	Route Alternative 2	No-Go Alternative

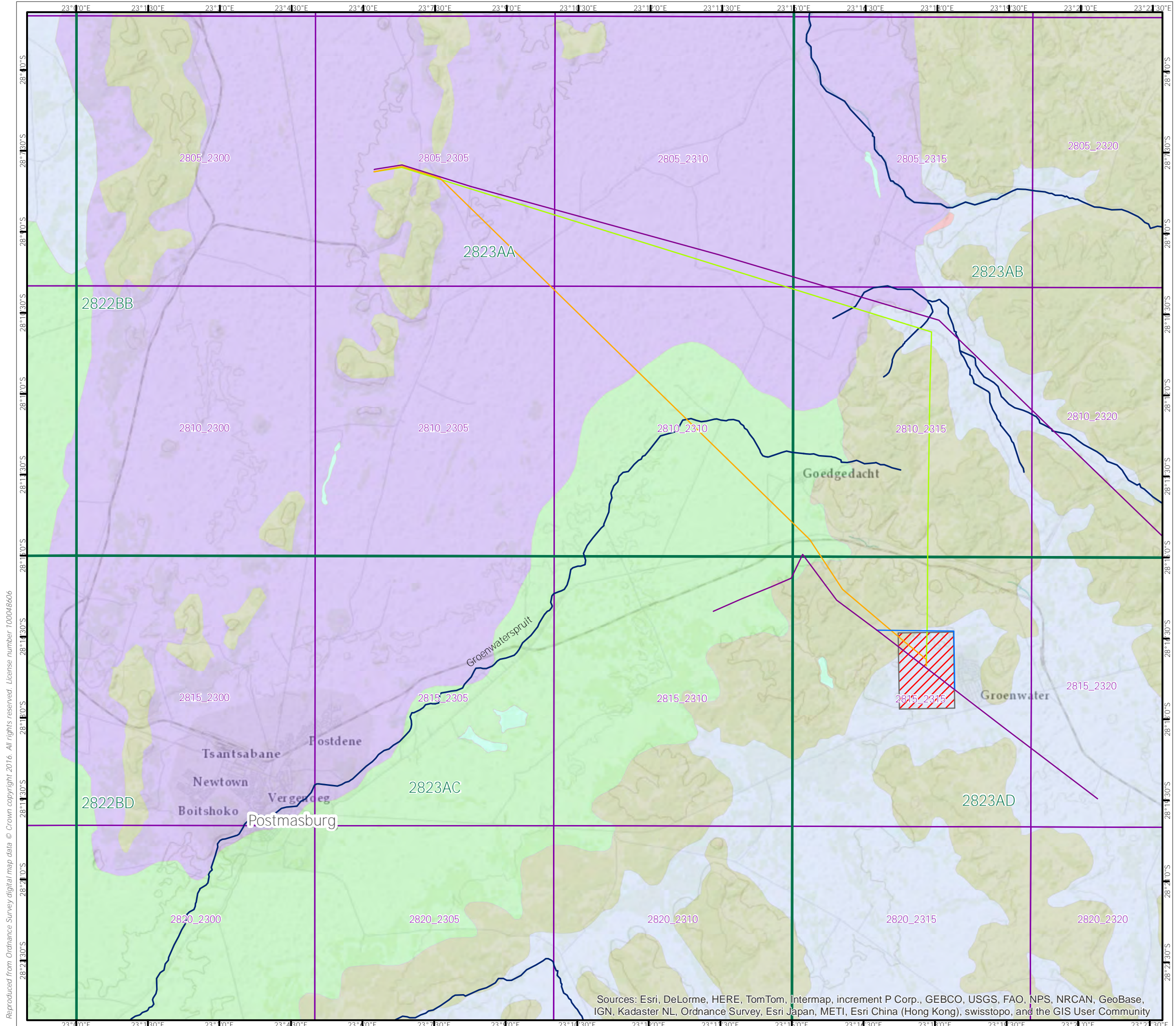
Identified Environmental Impacts	Birds are electrocuted either on overhead powerlines.	Birds are electrocuted either on overhead powerlines.	The proposed development will not take place and as such this impact will not occur
Magnitude of Impact	Very High (10)	Very High (10)	-
Duration of impact:	Long-Term (4)	Long-Term (4)	-
Extent of the impact	Regional (3)	Regional (3)	-
Degree to which local resources are irreplaceable	High (4)	High (4)	-
Degree to which the impact can be reversed:	Cannot (5)	Cannot (5)	-
Probability of occurrence:	Definite (5)	Definite (5)	-
Cumulative impact prior to mitigation:	High	High	
Significance rating of impact prior to mitigation (Low, Medium, Medium-High, High, or Very-High)	Very High (130)	Very High (130)	-
Proposed mitigation:	<ul style="list-style-type: none"> Any grid connection power line/s must be of a design that minimizes electrocution risk by using adequately insulated 'bird friendly' monopole structures, with clearances between live components of 2 m or greater and which provide a safe bird perch. The structures to be constructed must be approved by the Endangered Wildlife Trust's (EWT) Wildlife and Energy Programme. The operational monitoring programme for the associated WEF site must be in line with applicable guidelines and must include regular monitoring of the grid connection power line and all new associated substations for electrocution (and collision) mortalities. Any mortalities should be reported to the EWT. 		-
Cumulative impact post mitigation:	Medium	Medium	-

Significance rating of impact after mitigation (Low, Medium, Medium-High, High, or Very-High)	Medium (50). Irreplaceability is 3. Probability is 2.	Medium (50). Irreplaceability is 3. Probability is 2.	-
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Table 5: Preliminary Scoping Phase Impact Assessment Rating for Disturbance and Displacement during Operation-Grid Connection

Bio-Physical Aspects			
	Route Alternative 1	Route Alternative 2	No-Go Alternative
Identified Environmental Impacts	Disturbance of birds (particularly sensitive and breeding species) during operation and maintenance, which may lead to temporary or permanent displacement and/or a reduction in breeding success.	Disturbance of birds (particularly sensitive and breeding species) during operation and maintenance, which may lead to temporary or permanent displacement and/or a reduction in breeding success.	The proposed development will not take place and as such this impact will not occur
Magnitude of Impact	Low (4)	Low (4)	-
Duration of impact:	Medium-term (3)	Medium-term (3)	-
Extent of the impact	Regional (3)	Regional (3)	-
Degree to which local resources are irreplaceable	Moderate (3)	Moderate (3)	-
Degree to which the impact can be reversed:	High (2)	High (2)	-
Probability of occurrence:	Medium (3)	Medium (3)	-
Cumulative impact prior to mitigation:	Medium	Medium	

Significance rating of impact prior to mitigation (Low, Medium, Medium-High, High, or Very-High)	Medium (45)	Medium (45)	-
Proposed mitigation:	<ul style="list-style-type: none"> • A site specific Operational Environmental Management Plan (OEMP) must be implemented, which gives appropriate and detailed description of how operational and maintenance activities must be conducted to reduce unnecessary disturbance. All contractors are to adhere to the OEMP and should apply good environmental practice during all operations. • The applicable maintenance staff that conduct maintenance or repairs on this power line must be trained by an avifaunal specialist to identify the potential Red Data species as well as the signs that indicate possibly breeding by these species. If a priority species or Red Data species is found to be breeding (e.g. a nest site is located) on or within 3 km of the operational facility, the nest/breeding site must not be disturbed and the avifaunal specialist must be contacted for further instruction. • No nests may be disturbed or removed from any power line structures prior to consultation with and approval from the avifaunal specialist. • Operational phase bird monitoring, in line with applicable guidelines, must be implemented. 		-
Cumulative impact post mitigation:	Low	Low	-
Significance rating of impact after mitigation (Low, Medium, Medium-High, High, or Very-High)	Low (30). Probability reduces to 2	Low (30). Probability reduces to 2	-



- CSP Project Site
- Route Alternative 1
- Route Alternative 2
- Proposed Reroute of Existing 132 kV OHTL
- Existing Power Line
- NFEPA River
- Quarter Degree Square
- SABAP2 Pentad
- Kuruman Mountain Bushveld
- Kuruman Thornveld
- Northern Upper Karoo
- Olifantshoek Plains Thornveld
- Postmasburg Thornveld
- Southern Kalahari Salt Pans



1:125,000 Scale @ A3

0 2.5 5 km

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Approved: AB	

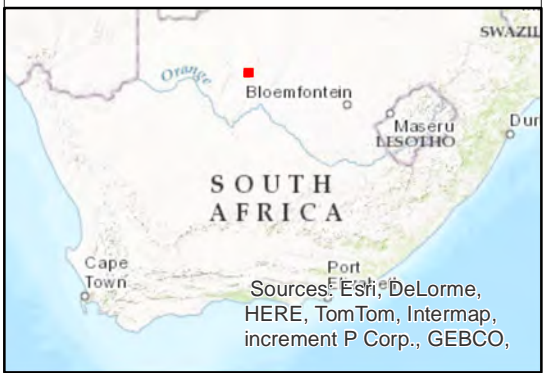
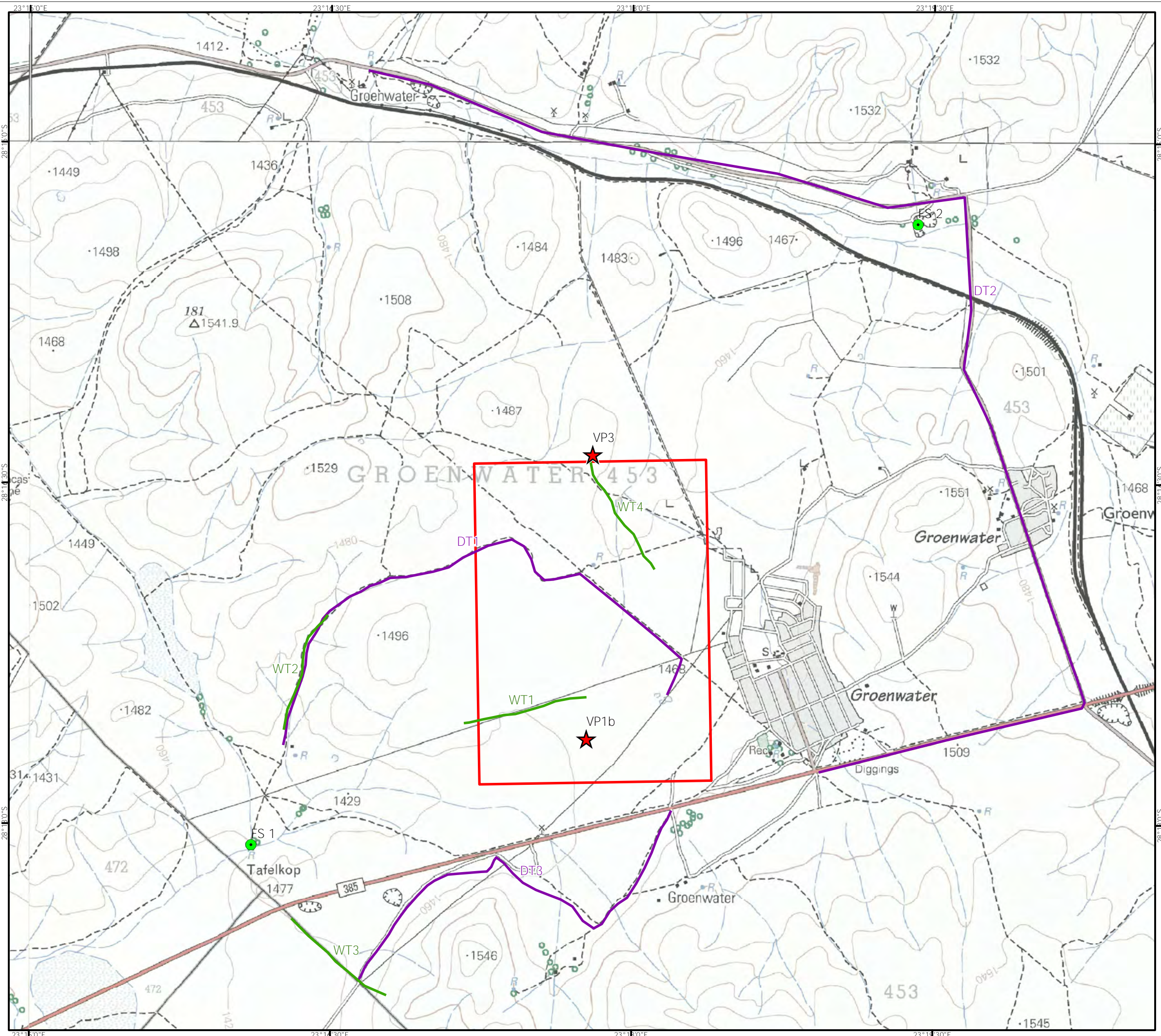
Project Location, Vegetation, Rivers and SABAP Squares
Figure 1

**Metsimatala CSP Facility
Avifaunal Impact Assessment
Scoping Report**

Sources: Esri, DeLorme, HERE, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community

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- CSP Project Site Boundary
- ★ Vantage Point
- Focal Site
- Walked Transect
- Driven Transect



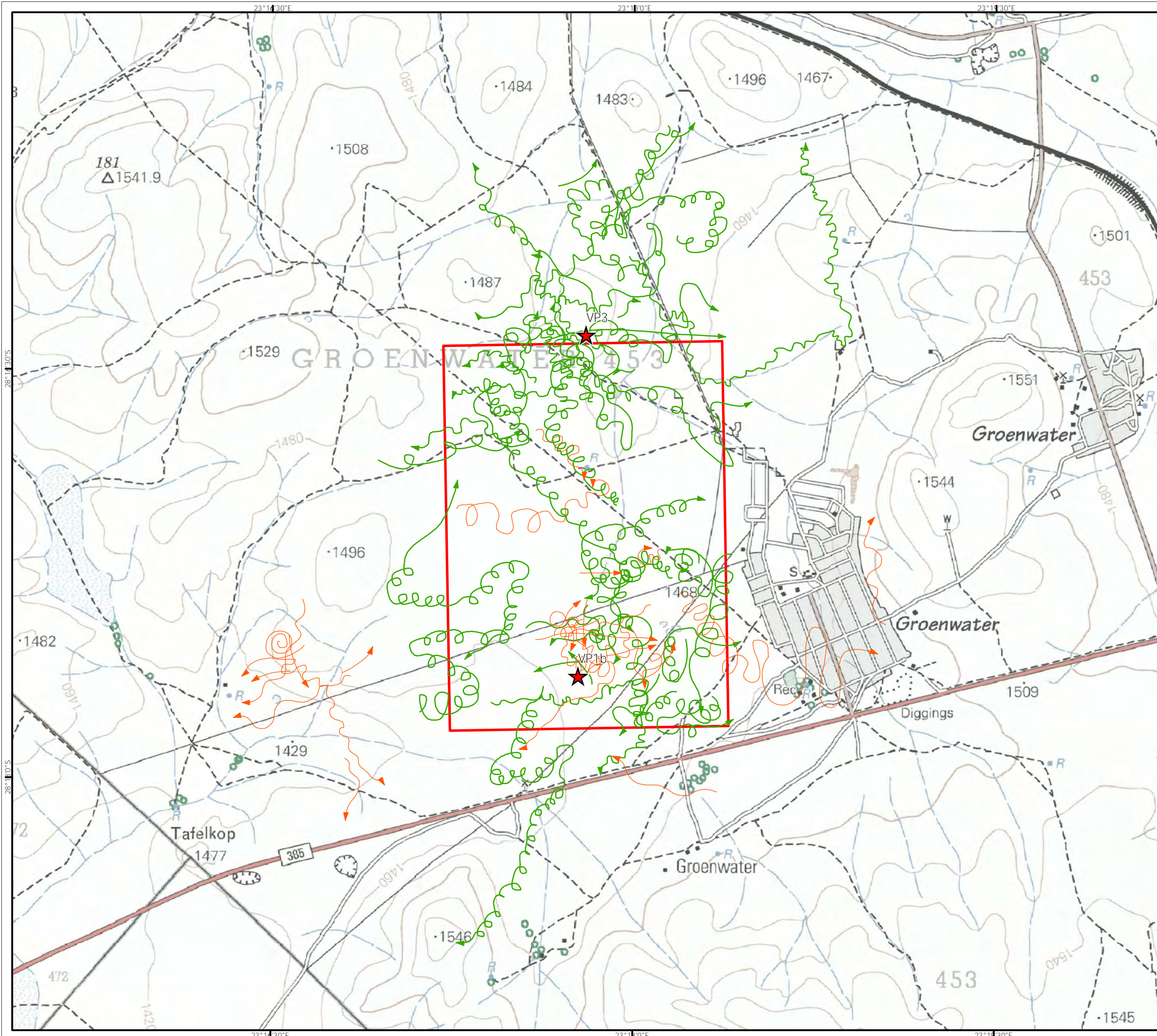
1:30,000 Scale @ A3

0 0.5 1 km

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Reviewed: SC	Date: 18/03/2016
Approved: AB	

Survey Locations
Figure 2

Metsimatala CSP Facility
Avifaunal Impact Assessment
Scoping Report



- CSP Project Site Boundary
- ★ Vantage Point
- Survey 1 Flight
- Survey 2 Flight



1:25,000 Scale @ A3

0 0.5 1 km

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**Target Species Flights
 Survey 1 and 2
 Figure 3**

**Metsimatala CSP Facility
 Avifaunal Impact Assessment
 Scoping Report**

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