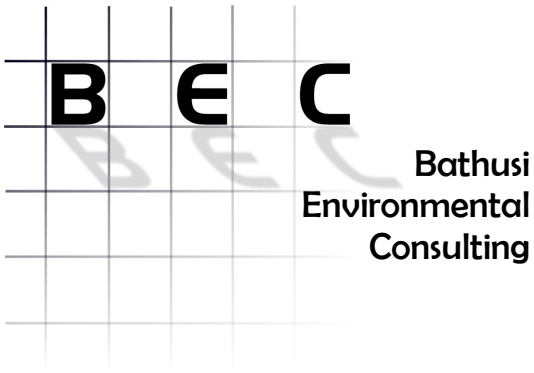
BEC Report Reference:	SLR - RSA – 2018/20
Report Version:	2018.04.25.01
Report Status	FINAL REPORT

Cell:	+27 (0)82 3765 933
email:	riaan@bathusi.org
Tel:	+27 (0)12 658 5579

STRATEGIC IMPACT STATEMENT FOR THE REDSTONE PV AUGMENTATION AS PART OF THE PLANNED REDSTONE CONCENTRATED SOLAR PLANT (CSP) PROJECT ON THE FARM HUMANSRUS 469, IN THE NORTHERN CAPE PROVINCE

presented by



Biological and Ecological Assessments

this report was prepared for

SOLARRESERVE®
South Africa Management
(Pty) Ltd.

I PROJECT DETAILS

Report Name:	Strategic Impact Statement for the Redstone PV Augmentation as part of the planned Redstone Concentrated Solar Plant (CSP) project on the Farm Humansrus 469, in the Northern Cape Province.
Report Type:	Biodiversity Impact Statement
BEC Project Reference:	SLR - RSA – 2018/20
Report Version:	2018.04.25.01
Date of Release:	25th April 2018
Report Author:	Riaan A. J. Robbeson (Pr.Sci.Nat.) (Bathusi Environmental Consulting)
Care of:	Leanna Janse van Rensburg (Leanna.JansevanRensburg@solarreserve.com)

II REPORT CITATION

When used as a reference, or included as an addendum, this report should be cited as:
Bathusi Environmental Consulting cc (2018). Strategic Impact Statement for the Redstone PV Augmentation as part of the planned Redstone Concentrated Solar Plant (CSP) project on the Farm Humansrus 469, in the Northern Cape Province. Reference Number SLR - RSA – 2018/20, Version 2018.04.25.01

III CONTRIBUTING SPECIALIST

The Natural Scientific Professions Act of 2003 aims to '*provide for the establishment of the South African Council of Natural Scientific Professions (SACNASP), and for the registration of professional, candidate and certified natural scientists; and to provide for matters connected therewith'.*

Quoting the Natural Scientific Professions Act of 2003: '*Only a registered person may practice in a consulting capacity*' (20(1) – pg. 14).

Table 1: Biodiversity specialists contributing to the project	
Botanical Investigator:	**Riaan Robbeson (Pr.Sci.Nat.)**
Qualification:	M.Sc. (Botany), UP
Affiliation:	South African Council for Natural Scientific Professions
Fields of Expertise:	Botanical Scientist & Ecological Scientist
Registration Number:	*400005/03*
Faunal Investigator:	**Dewald Kamffer (Pr.Sci.Nat.)**
Qualification:	M.Sc. (Conservation Biology), UP
Affiliation:	South African Council for Natural Scientific Professions
Fields of expertise:	Ecological Scientist & Zoological Scientist
Registration number:	*400204/05*

IV RESERVED COPYRIGHT

V REPORT NAVIGATION

VI LIST OF TABLES

VII LIST OF FIGURES

1 EXECUTIVE SUMMARY

The ACWA Power SolarReserve Redstone Solar Thermal Power Plant (RF (Pty) Ltd), (Redstone CSP Project) proposes the development, construction and operation of a Photovoltaic (PV) Power Plant with the generation capacity of up to 20 MW, with up to 30 MW hours storage, for the auxiliary load requirements, on the Remaining Extent of the Farm Humansrus 469. As part of the proposed PV Augmentation Project, two spatial arrangements were considered, namely:

1. Option A: Outside the heliostat field and
2. Option B: Inside the heliostat field, but subjected to technical (engineering) considerations.

The principal ecological report was compiled in August 2011; results highlighted a moderate sensitivity of most of the proposed area, with localised areas of elevated ecological importance and sensitivity embedded within the larger region. The Redstone CSP project was therefore planned to accommodate these areas of sensitivity, mainly by means of exclusion and the development of a suitable mitigation strategy.

The spatial difference of the development options (inside vs outside the heliostat field) resulted in a predictable difference in impact significance between the alternatives. Although the impact significance associated with Option 1 are higher compared to Option 2, neither option is likely to cause unacceptable impacts. The application of a suitable mitigation strategy is expected to negate any potential significant impact. Ultimately, Option 2 is recommended as the preferred option.

Table 2: Summary Table of Impacts associated with PV Augmentation Project

Development Phase	*Construction Phase*	*Operational Phase*	*Decommissioning Phase*
Option 1 (Outside heliostat field)			
Pre Mitigation	52	20	16
Post Mitigation	18	12	5
Option 2 (Inside heliostat field)			
Pre Mitigation	8	12	5
Post Mitigation	6	5	4

It is ultimately the conclusion of this report that, based on available information and a brief evaluation of the proposed spatial arrangements, neither of the options are expected to cause severe and unacceptable impacts within the biological receiving environment, with the understanding and assumption that the applied mitigation strategy incorporate all recommendation presented in this as well as the principal ecological reports. Specifically, the exacerbation of cumulative impacts is expected to be minor as the proposed PV Augmentation project will constitute a fairly insubstantial portion of the Redstone CSP project. Based on results and recommendations presented in this ecological impact statement, we regard the project as acceptable.

2 PROJECT SYNOPSIS

The ACWA Power SolarReserve Redstone Solar Thermal Power Plant (RF (Pty) Ltd), (Redstone CSP Project) proposes the development, construction and operation of a Photovoltaic (PV) Power Plant with the generation capacity of up to 20 MW, with up to 30 MW hours storage, for the auxiliary load requirements, on the Remaining Extent of the Farm Humansrus 469, spatially situated in the Hay District of the Northern Cape Province. The planned PV Power Plant will be situated immediately adjacent to the Redstone CSP Project, which is located approximately 30 km east of the town Postmasburg and within the governing boundaries of the Tsantsabane Local Municipality and the ZF Mgcawu District Municipality. The Project is designed to allow the ACWA Power SolarReserve Redstone Solar Thermal Power Plant RF (Pty) Ltd to generate renewable green energy for self-consumption in order to operate and run the Redstone CSP Projects auxiliary load requirements. The Redstone CSP Project was authorised under the National Environmental Management Act 107 of 1998 (NEMA) by the Department of Environmental Affairs (DEA) Ref. Nr 12/12/20/2316 (AM7).

As such a Basic Assessment process is required in terms of Listed Activity 1 of the 2014 EIA regulation as amended in 2017. As the principal ecological EIA was undertaken in August 2011[1], the DEA has requested that specialist reports are updated in order to adequately assess the proposed new installation and the expected and likely impacts on the receiving environment.

As part of the proposed PV Augmentation Project, two spatial arrangements will be considered, namely:

3. Option A: Outside the heliostat field, including Areas B and G of the Optimisation Plan (preferred alternative). The PV Power Plant is proposed on the western boundary of the Project Site, adjacent to the ACWA Power SolarReserve Redstone Solar Thermal Power Plant (RF (Pty) Ltd, CSP Facility, for ease of access to the power block/substation (refer **Figure 1**); or
4. Option B: Inside the heliostat field, but subjected to technical (engineering) considerations. The PV Power Plant is proposed within the heliostat field of the ACWA Power SolarReserve Redstone Solar Thermal Power Plant (RF (Pty) Ltd, CSP Facility, for ease of access to the power block/substation (refer **Figure 2**).

The proposed PV Augmentation Project will comprise of (approximately) 20 MW of PV installation (fixed or tracking) and will be developed on land of an estimated size of ~35.3 ha, of which only 19.9 ha (less than 20 ha) of the site will be subjected to construction activities, which will allow for sensitivities to be mapped and excluded from the development footprint. The PV plant will be connected to the Redstone Noko Substation via underground cabling via either the CSP Ring-road route, or straight through the heliostat field via the roads, depending on outcomes of this application. Allowance will be made for battery storage solution (containerised solution).

1 Strategic Biodiversity Impact Assessment for the proposed Concentrated Solar Plant (CSP) on Farm Humansrus 469, Northern Cape Province. SSI - HSP – 2012/01. Version 2011 11 02 (Bathusi Environmental Consulting cc)

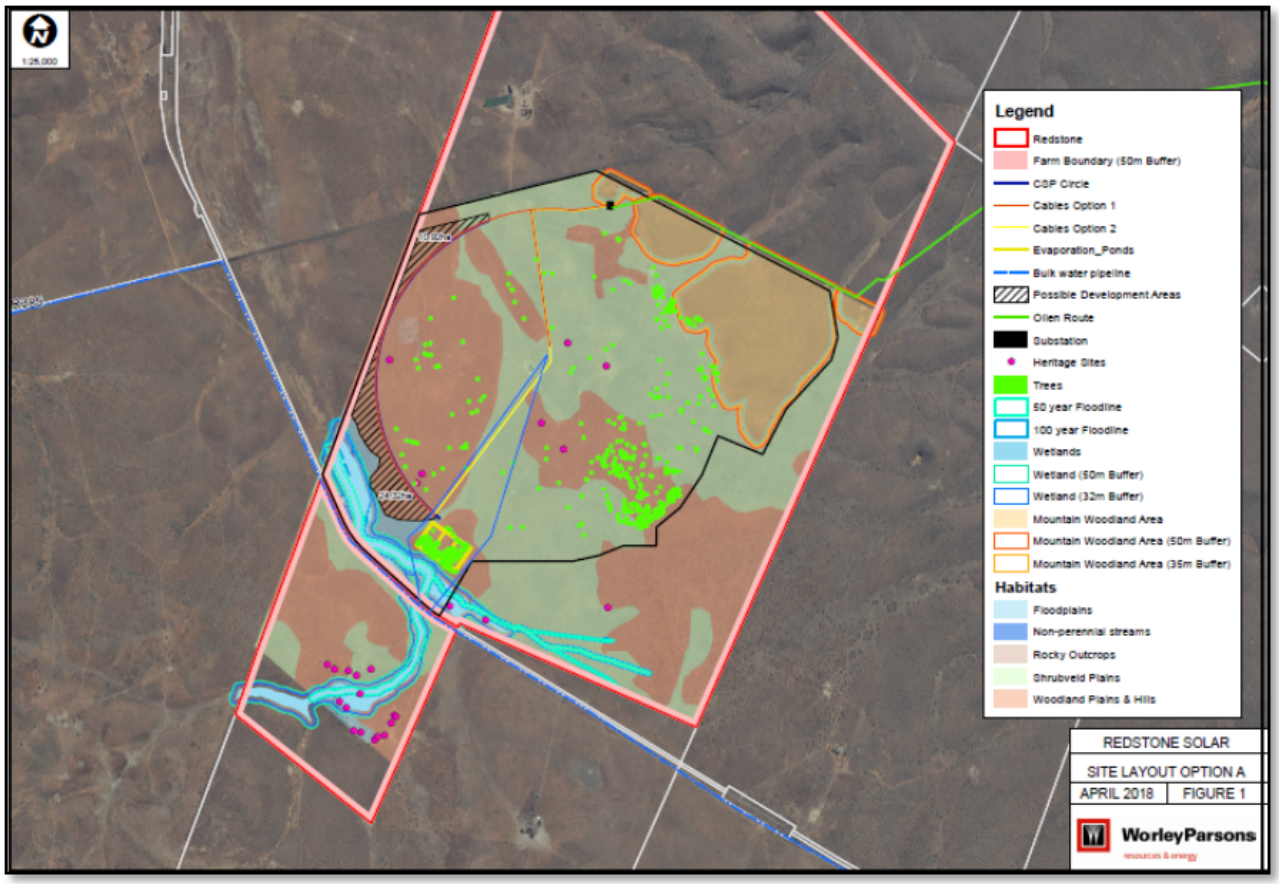


Figure 1: Site layout – Option A

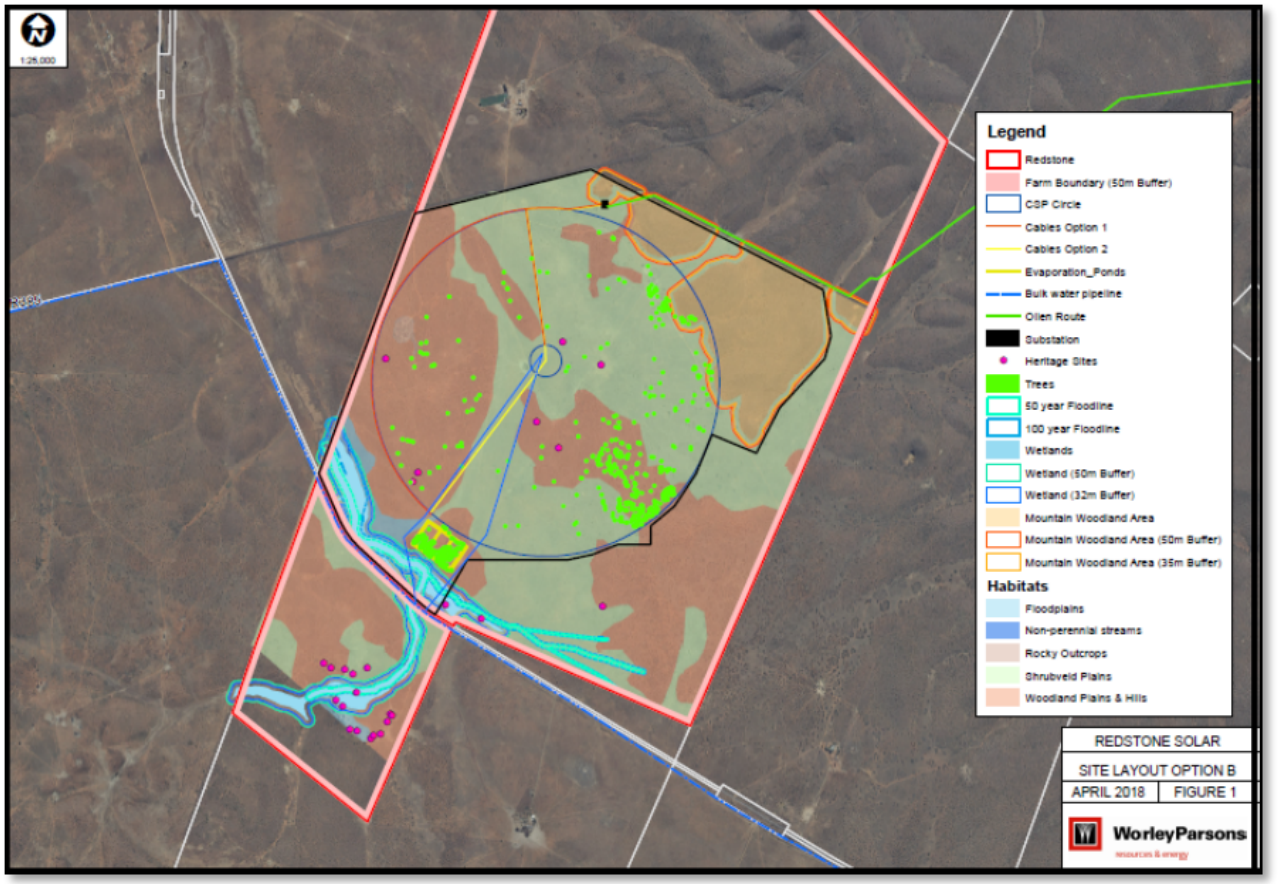


Figure 2: Site Layout – Option B

3 BACKGORUND TO THE PRINCIPAL ECOLOGICAL ASSESSMENT (2011)

The principal ecological report was compiled in August 2011. Key findings that were presented from the report, also relating to this particular project, include the following (*inter alia*):

⇒ The study area is situated within the Savanna Biome, including two regional vegetation types of the Kalahari savanna system, namely the Kalahari Plain Thorn Bushveld (Olifantshoek Plains Thornveld, Least Threatened) and Kalahari Mountain Bushveld (Kuruman Mountain Bushveld, Least Threatened).

⇒ The site investigation revealed the presence of approximately 129 plant species on the site. This alpha diversity is not regarded entirely representative of the floristic diversity as a result of a winter survey period. A diverse composition of grasses and forbs was noted in the grassland habitat types. The savanna physiognomy of woodland and shrubland habitat of the site is nonetheless indicated by the structural dominance of woody species.

⇒ No Threatened plant species are known to occur in the ¼-degree grid in which the study area is situated, but three protected tree species were recorded in the study area, including:
- *Acacia erioloba*
- *Boscia albitrunca*
- *Olea europaea* subsp. *africana*

⇒ Results of the photo analysis and site investigations revealed the presence of the following habitat types (refer **Figure 3),** with estimated ecological sensitivities (refer **Figure 4**):
- Closed Shrubveld (Medium-high ecological sensitivity);
- Drainage Line (High ecological sensitivity);
- Excavations (Low ecological sensitivity);
- Floodplains (High ecological sensitivity);
- Grassland Plains (Medium ecological sensitivity);
- Homestead (Low ecological sensitivity);
- *Olea europaea* Woodland (High ecological sensitivity); and
- Open Shrubveld (High ecological sensitivity).

⇒ The presence of 41 animal species was confirmed during the site investigation, including:
- 4 butterfly species;
- 10 reptile species; and
- 25 mammal species.

⇒ The faunal diversity also included the following Red Data mammals:
- South African Hedgehog (*Atelerix frontalis*, NT);
- Lesser Dwarf Shrew (*Suncus varilla*, DD); and
- Brown Hyaena (*Hyaena brunnea*, NT).

⇒ The forty-one animals confirmed to occur in the study area are regarded typical of an area the size of the study site in the Eastern Kalahari Bioregion, given the mixture of habitat types present in the study area and the immediate surrounds.

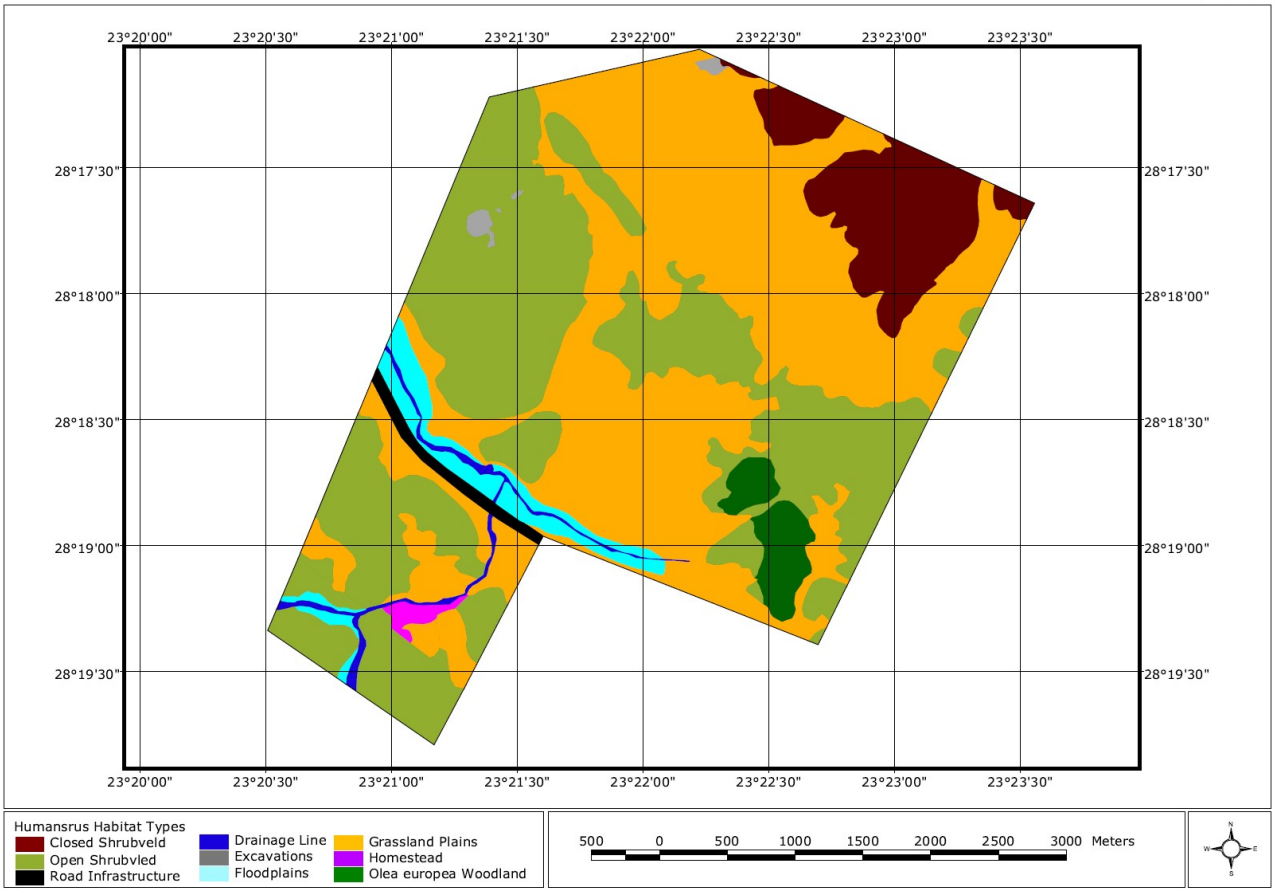


Figure 3: Habitat types of the principal study area (2011)

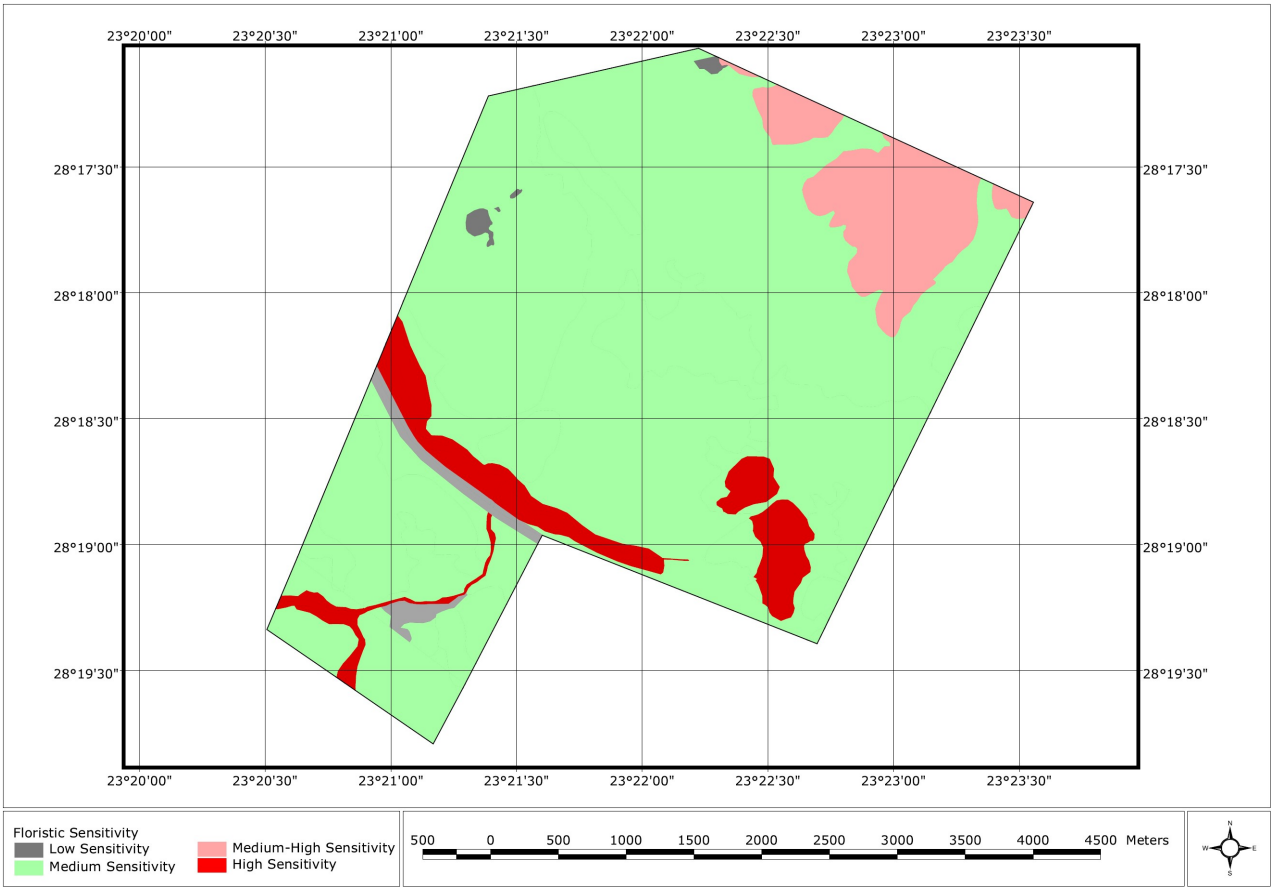


Figure 4: Floristic and faunal (ecological) sensitivities (2011)

3.2 COMPARATIVE ASSESSMENT OF DEVELOPMENT ALTERNATIVES

3.3 OPTION 1

As Option 1 will be spatially situated outside the heliostat field, it is assumed that existing natural habitat will be lost for land clearance and construction purposes. A brief evaluation of the ecological attributes and inherent sensitivities indicated that proposed development area (Area G) is situated in proximity to the sensitive Floodplain habitat type. Whilst not representing an unacceptable development option (red flag), the significance of impacts on sensitive environs associated with this option is expected to be substantially higher, compared to Option 2. However, with the implementation of mitigation measures, with specific reference to an adequate buffer zone, the significance of impacts could conceivably be reduced to acceptable levels, although still substantially higher compared to Option 2.

The secondary development area (Area B) comprises typical Shrubveld and Grassland habitat types that exhibit moderate ecological sensitivities. The expected significance of impacts associated with habitat losses in these parts are expected to be of moderate significance and, with the introduction of mitigation measures, could conceivably be reduced to substantially lower impact significance levels, although still slightly higher compared to impacts associated with Option 2.

The expected contribution to cumulative impacts on a local and regional scale is expected to be minimal.

Ultimately, the use of Areas B and G (Option 1) for the proposed PV Augmentation Project, is not expected to result in any losses of any threatened or range restricted habitat, plants or animal species (on a local or regional scale). The effective implementation (buffering) of mitigation strategies will provide adequate protection for nearby sensitive sites. However, because of inevitable loss of natural habitat, this Option is recommended as the second preferred option. The simple fact that Option 2 will not exacerbate habitat losses on a local scale, in addition to encroaching onto sensitive environs, renders Option 1 less preferable.

3.4 OPTION 2

The spatial arrangement of Option 2 within the existing heliostat field will negate any significant and severe impacts on the biological/ ecological receiving environment. This statement is made with the comprehension that all habitat within the heliostat field will be transformed as part of the CSP development (construction and operational phases). Densification of development within the heliostat field will not contribute to, or exacerbate, impacts associated with the development, with particular reference to cumulative impacts. The implementation of mitigation strategies, as contained in the principal ecological report as well as the EMP for the project, is expected to curtail exacerbation of expected and likely impacts.

The expected contribution to cumulative impacts on a local and regional scale is expected to be negligent.

Option 2 is therefore recommended as the preferred option.

It is noted that Option 2 is subject to engineering requirement

4 BRIEF IMPACT EVALUATION ON THE FLORISTIC AND FAUNAL RECEIVING ENVIRONMENT

A principal ecological assessment indicated the following impacts on the biological environment as relevant:

⇒ **Direct impacts:**
- Direct impacts on threatened flora species;
- Direct impacts on protected tree species;
- Direct impacts on threatened fauna species;
- Loss, or disruption of mammal migration routes on a local scale;
- Direct impacts on sensitive/ pristine habitat types of the study area;
- Direct impacts on common fauna species occurring on the study area;

⇒ **Indirect Impacts:**
- Faunal interactions with structures, servitudes and personnel;
- Impacts on surrounding habitat/ species, including ecosystem functioning;

⇒ **Cumulative Impacts:**
- Impacts on SA's conservation obligations & targets (VEGMAP vegetation types);
- Increase in local and regional fragmentation/ isolation of habitat; and
- Increase in environmental degradation, pollution (air, soils, surface water).

The evaluation of impacts in subsequent sections (for the comparative assessment between Options 1 and 2) will collectively consider Direct, Indirect and Cumulative Impacts during the respective phases of the project.

4.1 OPTION 1

4.1.1 Construction Phase

Phase Construction					
Aspect:	Ecology/ Biodiversity (Flora and Fauna)				
Activity:	PV Augmentation Project				
Impacts:	Direct Impacts: o Direct impacts on threatened flora species o Direct impacts on protected tree species o Direct impacts on threatened fauna species o Loss, or disruption of mammal migration routes on a local scale o Direct impacts on sensitive/ pristine habitat types of the study area o Direct impacts on common fauna species occurring on the study area				
	Indirect Impacts: o Faunal interactions with structures, servitudes and personnel o Impacts on surrounding habitat/ species, including ecosystem functioning				
	Cumulative Impacts: o Impacts on SA's conservation obligations & targets (VEGMAP vegetation types) o Increase in local and regional fragmentation/ isolation of habitat o Increase in environmental degradation, pollution (air, soils, surface water)				
	Residual Impacts: o Sterilised landscapes with low biodiversity/ ecological value				
Significance rating:	**Duration**	**Extent**	**Magnitude**	**Probability**	**Significance**
Pre-Mitigation	5	2	6	4	**52**
Post-Mitigation	3	1	2	3	**18**
Mitigation Measures:	Search and relocation, minimize land clearance, limit extent of habitat transformation				
	Ensure the absence of CI species, particularly sessile faunal species, through a thorough walkdown (search and rescue) of development areas. Ensure the absence of larger animals through frequent patrols, particularly prior to land clearance. Restrict losses of natural habitat to footprints, avoid peripheral or unnecessary losses				

	of natural habitat; ensure proper rehabilitation of areas outside development footprints (where accidental habitat degradation occurred). Worker/ contractor awareness programmes, ensuring minimal conflict situation. Control of human movement in adjacent natural habitat, frequent patrols, biological monitoring programmes, animal control (vervet monkeys, feral cats, rats, baboons, dogs, etc) Implement generic monitoring programme and mitigation measures that are aimed at identifying and preventing the uncontrolled spread of impacts into adjacent areas of natural habitat
	Refer to mitigation measures included in principal ecological report, Section 5

4.1.2 Operational Phase

Phase Operation					
Aspect:	Ecology/ Biodiversity (Flora and Fauna)				
Activity:	PV Augmentation Project				
Impacts:	Direct Impacts: o Direct impacts on threatened fauna species o Loss, or disruption of mammal migration routes on a local scale o Direct impacts on sensitive/ pristine habitat types of the study area				
	Indirect Impacts: o Faunal interactions with structures, servitudes and personnel o Impacts on surrounding habitat/ species, including ecosystem functioning				
	Cumulative Impacts: o Impacts on SA's conservation obligations & targets (VEGMAP vegetation types) o Increase in local and regional fragmentation/ isolation of habitat o Increase in environmental degradation, pollution (air, soils, surface water)				
	Residual Impacts: o Sterilised landscapes with low biodiversity/ ecological value				
Significance rating:	**Duration**	**Extent**	**Magnitude**	**Probability**	**Significance**
Pre-Mitigation	4	2	4	2	**20**
Post-Mitigation	2	2	2	2	**12**
Mitigation Measures:	Control peripheral impacts of project on adjacent areas of natural habitat				
	Ensure the absence of larger animals through frequent patrols, particularly prior to land clearance. Restrict losses of natural habitat to footprints, avoid peripheral or unnecessary losses of natural habitat; ensure proper rehabilitation of areas outside development footprints (where accidental habitat degradation occurred). Avoid encroachment of alien and invasive plant species. Worker/ contractor awareness programmes, ensuring minimal conflict situation, control of human movement in adjacent natural habitat, frequent patrols, biological monitoring programmes, animal control (vervet monkeys, feral cats, rats, baboons, dogs, etc) Implement generic monitoring programme and mitigation measures that are aimed at identifying and preventing the uncontrolled spread of impacts into adjacent areas of natural habitat				
	Refer to mitigation measures included in principal ecological report, Section 5				

4.1.3 Decommissioning Phase

Phase Decommissioning	
Aspect:	Ecology/ Biodiversity (Flora and Fauna)
Activity:	PV Augmentation Project
Impacts:	Direct Impacts: o Direct impacts on threatened fauna species o Loss, or disruption of mammal migration routes on a local scale o Direct impacts on sensitive/ pristine habitat types of the study area
	Indirect Impacts: o Faunal interactions with structures, servitudes and personnel o Impacts on surrounding habitat/ species, including ecosystem functioning
	Cumulative Impacts: o Increase in local and regional fragmentation/ isolation of habitat

	o Increase in environmental degradation, pollution (air, soils, surface water)				
	Residual Impacts: o Sterilised landscapes with low biodiversity/ ecological value				
Significance rating:	**Duration**	**Extent**	**Magnitude**	**Probability**	**Significance**
Pre-Mitigation	2	2	4	2	**16**
Post-Mitigation	2	1	2	1	**5**
Mitigation Measures:	Minimize losses of untransformed land/ adjacent habitat Ensure the absence of larger animals through frequent patrols, particularly prior to land clearance. Restrict losses of natural habitat to footprints, avoid peripheral or unnecessary losses of natural habitat; ensure proper rehabilitation of areas outside development footprints (where accidental habitat degradation occurred). Avoid encroachment of alien and invasive plant species. Worker/ contractor awareness programmes, ensuring minimal conflict situation, control of human movement in adjacent natural habitat, frequent patrols, biological monitoring programmes, animal control (vervet monkeys, feral cats, rats, baboons, dogs, etc) Implement generic monitoring programme and mitigation measures that are aimed at identifying and preventing the uncontrolled spread of impacts into adjacent areas of natural habitat Refer to mitigation measures included in principal ecological report, Section 5				

4.2 OPTION 2

4.2.1 Construction Phase

Phase Construction					
Aspect:	Ecology/ Biodiversity (Flora and Fauna)				
Activity:	PV Augmentation Project				
Impacts:	Direct Impacts: o Direct impacts on threatened flora species o Direct impacts on protected tree species o Direct impacts on threatened fauna species o Loss, or disruption of mammal migration routes on a local scale o Direct impacts on sensitive/ pristine habitat types of the study area o Direct impacts on common fauna species occurring on the study area				
	Indirect Impacts: o Faunal interactions with structures, servitudes and personnel o Impacts on surrounding habitat/ species, including ecosystem functioning				
	Cumulative Impacts: o Impacts on SA's conservation obligations & targets (VEGMAP vegetation types) o Increase in local and regional fragmentation/ isolation of habitat o Increase in environmental degradation, pollution (air, soils, surface water)				
	Residual Impacts: o Sterilised landscapes with low biodiversity/ ecological value				
Significance rating:	**Duration**	**Extent**	**Magnitude**	**Probability**	**Significance**
Pre-Mitigation	5	1	2	1	**8**
Post-Mitigation	3	1	2	1	**6**
Mitigation Measures:	Search and relocation, minimize land clearance, limit extent of habitat transformation Ensure the absence of CI species, particularly sessile faunal species, through a thorough walkdown (search and rescue) of development areas. Ensure the absence of larger animals through frequent patrols, particularly prior to land clearance. Restrict losses of natural habitat to footprints, avoid peripheral or unnecessary losses of natural habitat; ensure proper rehabilitation of areas outside development footprints (where accidental habitat degradation occurred). Worker/ contractor awareness programmes, ensuring minimal conflict situation, control of human movement in adjacent natural habitat, frequent patrols, biological monitoring programmes, animal control (vervet monkeys, feral cats, rats, baboons, dogs, etc) Implement generic monitoring programme and mitigation measures that are aimed at identifying and preventing the uncontrolled spread of impacts into adjacent areas of				

	natural habitat
	Refer to mitigation measures included in principal ecological report, Section 5

4.2.2 Operational Phase

Phase Operation					
Aspect:	Ecology/ Biodiversity (Flora and Fauna)				
Activity:	PV Augmentation Project				
Impacts:	Direct Impacts: o Direct impacts on threatened fauna species o Loss, or disruption of mammal migration routes on a local scale o Direct impacts on sensitive/ pristine habitat types of the study area				
	Indirect Impacts: o Faunal interactions with structures, servitudes and personnel o Impacts on surrounding habitat/ species, including ecosystem functioning				
	Cumulative Impacts: o Impacts on SA's conservation obligations & targets (VEGMAP vegetation types) o Increase in local and regional fragmentation/ isolation of habitat o Increase in environmental degradation, pollution (air, soils, surface water)				
	Residual Impacts: o Sterilised landscapes with low biodiversity/ ecological value				
Significance rating:	**Duration**	**Extent**	**Magnitude**	**Probability**	**Significance**
Pre-Mitigation	3	1	2	2	**12**
Post-Mitigation	2	1	2	1	**5**
Mitigation Measures:	Control peripheral impacts of project on adjacent areas of natural habitat				
	Ensure the absence of larger animals through frequent patrols, particularly prior to land clearance. Restrict losses of natural habitat to footprints, avoid peripheral or unnecessary losses of natural habitat; ensure proper rehabilitation of areas outside development footprints (where accidental habitat degradation occurred). Worker/ contractor awareness programmes, ensuring minimal conflict situation, control of human movement in adjacent natural habitat, frequent patrols, biological monitoring programmes, animal control (vervet monkeys, feral cats, rats, baboons, dogs, etc) Implement generic monitoring programme and mitigation measures that are aimed at identifying and preventing the uncontrolled spread of impacts into adjacent areas of natural habitat				
	Refer to mitigation measures included in principal ecological report, Section 5				

4.2.3 Decommissioning Phase

Phase Decommissioning					
Aspect:	Ecology/ Biodiversity (Flora and Fauna)				
Activity:	PV Augmentation Project				
Impacts:	Direct Impacts: o Direct impacts on threatened fauna species o Loss, or disruption of mammal migration routes on a local scale o Direct impacts on sensitive/ pristine habitat types of the study area				
	Indirect Impacts: o Faunal interactions with structures, servitudes and personnel o Impacts on surrounding habitat/ species, including ecosystem functioning				
	Cumulative Impacts: o Increase in local and regional fragmentation/ isolation of habitat o Increase in environmental degradation, pollution (air, soils, surface water)				
	Residual Impacts: o Sterilised landscapes with low biodiversity/ ecological value				
Significance rating:	**Duration**	**Extent**	**Magnitude**	**Probability**	**Significance**
Pre-Mitigation	2	1	2	1	**5**
Post-Mitigation	2	1	1	1	**4**
Mitigation Measures:	Minimize losses of untransformed land/ adjacent habitat				
	Ensure the absence of larger animals through frequent patrols, particularly prior to				

	land clearance. Restrict losses of natural habitat to footprints, avoid peripheral or unnecessary losses of natural habitat; ensure proper rehabilitation of areas outside development footprints (where accidental habitat degradation occurred). Worker/ contractor awareness programmes, ensuring minimal conflict situation, control of human movement in adjacent natural habitat, frequent patrols, biological monitoring programmes, animal control (vervet monkeys, feral cats, rats, baboons, dogs, etc) Implement generic monitoring programme and mitigation measures that are aimed at identifying and preventing the uncontrolled spread of impacts into adjacent areas of natural habitat
	Refer to mitigation measures included in principal ecological report, Section 5

5 SUGGESTED MITIGATION MEASURES

This list of mitigation measures might include strategies additional to the mitigation approach presented in the principal ecological report; care is therefore advised to amend the relevant EMP for the development accordingly to include the additional comments and suggestions.

5.1 GENERAL ASPECTS

Mitigation Measure 1 - Conduct a detailed walk through of the approved footprint to locate and identify all plant and animal species of conservation importance (as defined by pertinent legislation). Permits must be obtained prior to disturbance, relocation or destruction of such species. Reference is made of baboon spider burrows, species that utilise termitaria, etc.;

Mitigation Measure 2 - Implement a suitable buffer zone between the edge of sensitive areas and any type of development or surface disturbance;

Mitigation Measure 3 - Prevent contamination of nearby natural woodland, wetland and grassland areas from inadvertent pollution from construction infrastructure, storage areas, vehicles, etc.;

Mitigation Measure 4 - Remove and relocate as many plant species of conservation importance as possible that are present within development areas (within reason);

Mitigation Measure 5 - Limit potential damage to large tree individuals to an absolute minimum through the appropriate design of the facility and associated infrastructure;

Mitigation Measure 6 - Develop an integrated management plan to deal with aspects such as littering, inappropriate discarding of food, the infestation of invasive and problem animal species, such as rats, mice, vervet monkeys, baboons, feral cats, etc.

Mitigation Measure 7 - Compile and implement a botanical monitoring programme, the aim of which should be ensuring long-term success of rehabilitation and prevention of environmental degradation. Biodiversity monitoring should be conducted at least annually to assess the status of natural habitat and effects of the development on the natural environment;

Mitigation Measure 8 - Compile and implement an Alien and Invasive Management Programme;

Mitigation Measure 9 - Appoint an Environmental Officer (EO) prior to commencement of construction. Responsibilities should include, but not necessarily be limited to, ensuring adherence to EMP guidelines, guidance of activities, planning, reporting;

Mitigation Measure 10 - Appoint a qualified Biodiversity Control Officer for the duration of the construction process. The appropriate person should be adequately qualified to address **biological** aspects and eventualities that occur sporadically during the project (note that the purpose of such an appointment is not typical environmental management, but rather biological management).

Mitigation Measure 11 - Develop and implement a biodiversity monitoring programme that will determine the extent and severity of impacts on the biological environment, with specific reference to surrounding natural environment (refer **Sections 5.8 and 5.9**).

5.2 FENCES & DEMARCATION

Mitigation Measure 12 - Demarcate the approved footprint and construction areas by permanent means at the onset of construction to prevent accidental, or unwanted impacts in surrounding natural habitat and to control movement of personnel, vehicles, providing boundaries for construction and operational sites;

Mitigation Measure 13 - No painting or marking of rocks or vegetation to identify locality or other information shall be allowed, as it will disfigure the natural setting. Marking shall be done by steel stakes with tags, if required.

5.3 FIRE

Mitigation Measure 14 - The Project team must compile a Fire Management Plan (FMP) for implementation by all Contractors;

Mitigation Measure 15 - The FMP shall include *inter alia* aspects such as relevant training, equipment on site, prevention, response, rehabilitation and compliance to the National Veld and Forest Fire Act, Act No. 101 1998;

Mitigation Measure 16 - Prevent all open fires on site;

Mitigation Measure 17 - Provide demarcated fire-safe zones, facilities and suitable fire control measures;

Mitigation Measure 18 - Use of branches of trees, shrubs or any vegetation for fire making purposes is strictly prohibited;

Mitigation Measure 19 - The irresponsible use of welding equipment, oxy-acetylene torches and other naked flames, which could result in veld fires, or constitute a hazard should be guided by safe practice guidelines;

Mitigation Measure 20 - The use of fire as a vegetation management tool should be guided and instructed by a qualified ecologist.

5.4 ROADS & ACCESS

Mitigation Measure 21 - A road management plan (allowing for management of impacts on surrounding faunal habitats, i.e. dust, erosion, destruction of faunal habitats with high sensitivities) should be compiled prior to the commencement of construction activities to avoid exacerbated impacts on natural habitat and minimise the exposure of natural habitat to disruptive activities;

Mitigation Measure 22 - Access is to be established by vehicles passing over the same track on natural ground. Multiple tracks are not permitted;

Mitigation Measure 23 - Dust control on all roads should be prioritised during all stages of development and operation;

Mitigation Measure 24 - No roads should be allowed within ecologically sensitive areas. The use of roads around ecologically sensitive areas for buffers should be done with circumspect particularly in view of accidental killing of animals;

Mitigation Measure 25 - Vehicular traffic on site should not be allowed after dark to limit accidental killing of nocturnal animals;

Mitigation Measure 26 - Speed of vehicles on site should be limited to 30 km/h to allow for sufficient safety margins.

5.5 WORKERS & PERSONNEL

Mitigation Measure 27 - Provide adequate on-site ablution, sanitation, litter and waste management and hazardous materials management facilities;

Mitigation Measure 28 - Abluting anywhere other than in provided toilets shall not be permitted. Under no circumstances shall use of the veld be permitted;

Mitigation Measure 29 - In the event that workers are operating significant distances from proper facilities, adequate temporary facilities should be provided.

5.6 VEGETATION CLEARANCE & OPERATIONS

Mitigation Measure 30 - Conduct a protected species survey. Results of this survey will guide permitting requirements for the removal of protected trees and plants from the selected development footprint;

Mitigation Measure 31 - Identify and relocate plants of conservation concern (wherever possible) that will be adversely affected as part of an ecological management plan for the area. It is emphasised that the removal and/ or relocation of any conservation important plant is subject to provincial permitting obligations;

Mitigation Measure 32 - The removal or picking of any protected or unprotected plants shall not be permitted and no horticultural specimens (even within demarcated working areas) shall be removed, damaged or tampered with;

Mitigation Measure 33 - The landowner must immediately take steps to remove alien vegetation as per Conservation of Agricultural Resource Act (No. 43 of 1983). This should be done based on an alien invasive management strategy that should be compiled by a suitable ecologist. The plan must make reference to:

- Uprooting, felling or cutting;
- Treatment with a weed killer that is registered for use in connection with such plants in accordance with the directions for the use of such a weed killer;
- The application of control measures regarding the utilization and protection of veld in terms of regulation 9 of the Act;
- The application of control measures regarding livestock reduction or removal of animals in terms of regulations 10 and 11 of the Act;
- Any other method or strategy that may be applicable and that is specified by the executive officer by means of a directive.
- According to the Conservation of Agricultural Resource Act (No. 43 of 1983) as amended, the person applying herbicide must be adequately qualified and certified as well as registered with the appropriate authority to apply herbicides.

Mitigation Measure 34 - The size of areas subjected to land clearance must be kept to a minimum;

Mitigation Measure 35 - Only areas as instructed by the Site Manager must be cleared and grubbed;

Mitigation Measure 36 - Cleared vegetation and debris that has not been utilised must be collected and disposed of to a suitable waste disposal site. It may not be burned on site;

Mitigation Measure 37 - All vegetation not required to be removed must be protected against damage;

Mitigation Measure 38 - Removal of vegetation/ plants shall be avoided until such time as soil stripping is required and similarly exposed surfaces must be re-vegetated or stabilised as soon as is practically possible;

Mitigation Measure 39 - Monitoring the potential spread of declared weeds and invasive alien vegetation to neighbouring land and vice versa and protecting the agricultural resources and soil conservation works are regulated by the Conservation of Agricultural Resources Act (No 43 of 1983) and must be addressed on a continual basis, through an alien vegetation control and monitoring programme;

Mitigation Measure 40 - Remove and store topsoil separately in areas where excavation/ degradation takes place. Topsoil should be used for rehabilitation purposes to facilitate regrowth of species that occur naturally in the area. Removal of topsoil should be done to a depth of at least 1 m;

Mitigation Measure 41 - Stored topsoil must be free of deleterious matter such as large roots, stones, refuse, stiff or heavy clay and noxious weeds, which would adversely affect its suitability for planting;

Mitigation Measure 42 - No spoil material may be dumped outside the defined site;

Mitigation Measure 43 - Disturbance of vegetation must be limited to areas of construction;

Mitigation Measure 44 - Ensure proper surface restoration and resloping to prevent erosion, taking cognisance of local contours and landscaping;

Mitigation Measure 45 - Exposed areas with slopes less than 1:3 should be rehabilitated with a grass mix that blends in with the surrounding vegetation;

Mitigation Measure 46 - The grass mix should consist of locally indigenous grasses adapted to the local environmental conditions;

Mitigation Measure 47 - Revegetated areas should be fenced to prevent damage by grazing animals;

Mitigation Measure 48 - Re-vegetated areas showing inadequate surface coverage (less than 30% within eight months after re-vegetation) should be prepared and re-vegetated from scratch;

Mitigation Measure 49 - Damage to re-vegetated areas should be repaired promptly;

Mitigation Measure 50 - As far as practically possible, only indigenous plant species that are endemic to the area/region are to be used in landscaping activities on the site, as these species are adapted to the specific conditions (climatic, soil, etc) of the area and would require the least amount of irrigation, pesticides, etc;

Mitigation Measure 51 - Exotic weeds and invaders that might establish on the re-vegetated areas should be controlled to allow the vegetation to properly establish.

5.7 ANIMALS

Mitigation Measure 52 - Ensure the absence of conservation important sessile animal species, such as baboon spiders, from the site through a walkthrough procedure prior to the commencement of construction activities. Because of the high numbers of baboon spiders within the study area and the inevitable severe impacts on these animals, it is strongly suggested that oversight be exercised, and a suitable proportion of the communities be excavated and, either relocated or, donated to institutions for scientific research purposes;

Mitigation Measure 53 - By no means should any wild animal be captured to be kept as pets or for any other purpose;

Mitigation Measure 54 - No animal may be hunted, trapped, snared or killed for any purpose whatsoever. Fences and boundaries should be patrolled weekly to ensure the removal of snares;

Mitigation Measure 55 - Dangerous animals should be handled by a competent person, with specific reference to spiders, snakes, scorpions, mammals, etc.;

Mitigation Measure 56 - No indiscriminate killing of animals should be allowed;

Mitigation Measure 57 - Compile a graphic list of potentially dangerous animals and present this to all workers as part of site induction;

Mitigation Measure 58 - Ensure that a competent snake handler is available at all times to remove and relocate snakes from the construction site;

Mitigation Measure 59 - Ensure that proper treatment facilities and competent personnel is available in cases of snake bites;

Mitigation Measure 60 - Fences and boundaries should be patrolled weekly to locate and remove snares/ traps;

Mitigation Measure 61 - Sensitize all personnel to the presence, characteristics and behaviour of animals on the site;

Mitigation Measure 62 - Include suitable procedures in the event of encountering potentially dangerous animals on the site;

Mitigation Measure 63 - No domestic pets should be allowed on the site whatsoever, with specific reference to domestic feral cats.

6 RECOMMENDED MONITORING PROGRAMMES

The experimental design of the biannual monitoring survey focuses on delivering repeatable, statistically comparable results that will provide answers to the effectiveness of mitigation measures implemented and guide environmental managers in improving the environmental management programme to successfully mitigate impacts of the proposed project on vegetation, habitat and animals of the study area and immediate surrounds.

6.1 BOTANICAL MONITORING PROGRAMME

To ensure the accurate gathering of data, the following techniques and guidelines (*inter alia*) should be followed:

⇒ Fixed point monitoring should be applied as the preferred method of monitoring;
⇒ All data gathered should be measurable (qualitative and quantitative);
⇒ Monitoring report should be repeatable and temporally and spatially comparable;
⇒ Data gathered should be an accurate representation of the PES of the study area, as well as the habitat units represented by each monitoring site;
⇒ Data, when compared to previous sets, should show spatial and temporal trends; and
⇒ General habitat unit overviews should also be undertaken to augment quantitative data.

As part of the proposed Botanical Monitoring Programme, the following aspects are recommended for inclusion into the monitoring programme:

⇒ Temporal Monitoring of development related impacts;
⇒ Floristic diversity & compositional monitoring;
⇒ Floristic species richness monitoring;
⇒ Compositional monitoring within affected areas;
⇒ Conservation important plant monitoring programme;
⇒ Plants with ethno-botanical properties monitoring programme;
⇒ Alien and invasive plant monitoring;
⇒ Structural and compositional monitoring for burning regime;
⇒ Structural and compositional monitoring for stocking rates/ grazing potential;
⇒ Structural and compositional monitoring; and
⇒ Land change/ habitat loss and transformation monitoring programme.

It is recommended that the botanical monitoring programme be executed at least annually during the construction period and biennially during the operational period.

6.2 RECOMMENDED FAUNAL MONITORING PROGRAMMES

The different main faunal groups vary significantly in biology, ecology and numbers likely to be encountered during a survey bout. Therefore, different survey strategies are proposed for the main faunal groups. However, the biannual monitoring survey is designed to be completed in one week (all faunal groups) to limit the effects of seasonal change and the chances of extreme weather events (extreme cold spells, rainfall events, etc.) to interrupt survey bouts. It is also proposed that the biannual surveys are repeated during the exact same times of year (early summer and late summer) to enable reasonable comparisons of data collected between years. At least twelve pre-determined, fixed sample plots are proposed for the monitoring survey.

The recommended faunal monitoring includes two separate but equally important protocols:

1. Continual record keeping of animals observed in the project area, along the fence line and within sighting distance of the project area.
2. Biannual monitoring survey of the areas bordering the project area.

6.2.1 Continual Record Keeping

The on-site personnel (including the ECO) can provide invaluable data on the animals of the study area region. The number of personnel participating in the data collection will determine the accuracy and level of data collection acquired. Such a data collection effort will be preceded by a short training course on data collection and species identification by qualified specialists. Said training course will also assist in personnel in handling chance encounters with potentially dangerous animals.

6.2.2 Terrestrial Invertebrates

The proposed monitoring protocol for invertebrates is limited to terrestrial invertebrates. The focus of the terrestrial invertebrate monitoring protocol is twofold: firstly, to compare numbers of invertebrate species (i.e. species richness, species diversity and species evenness) between pre-determined, fixed sample plots (within and between survey bouts) and secondly, to compile a comprehensive species list of invertebrates that includes species rarely encountered (i.e. rare and unique invertebrate species of potential conservation importance). Said protocol design allows for statistical comparisons between samples as well as for much needed data collection on the invertebrates of the region; knowledge on the terrestrial invertebrates is severely lacking and such a monitoring programme could greatly assist in gaining knowledge and providing educated answers. All terrestrial invertebrates will be collected and identified (where possible specimens will be sent to experts to identify). The following sampling methods are proposed at each of the fixed sample plots:

- ⇒ Un-baited pitfall sampling;
- ⇒ Dung-baited pitfall sampling;
- ⇒ Sweep-netting;
- ⇒ Hand-netting;
- ⇒ Light-trapping;
- ⇒ UV-light searches for scorpions; and
- ⇒ Niche-specific active searches.

6.2.3 Reptiles and Amphibians

Reptiles and amphibians occur at much lower numbers in a natural environment than terrestrial invertebrates and birds. Effective monitoring protocols for these groups are therefore markedly different and the approach focuses on local species distributions rather than number comparisons. All observations of reptiles and amphibians during the survey periods will be combined with continual observations of these groups by personnel to compile a local geographic distribution of each species and determine changes of these distributions over time. In effect, continually monitoring the reaction of reptiles and amphibians to activities related to the proposed project. GPS waypoints and digital photos will enable the surveyor to create accurate local distribution patterns.

6.2.4 Birds

The focus of the bird monitoring protocol is twofold: firstly, to compare numbers of bird species (i.e. species richness, species diversity and species evenness) between pre-determined, fixed sample plots (within and between survey bouts) and secondly, to compile a comprehensive species list of birds that includes species rarely encountered (i.e. rare and unique species of potential conservation importance). Said protocol design allows for statistical comparisons between samples and providing a complete ecological illustration of the avifaunal communities of the project area and immediate surrounds. The monitoring protocol for birds could in time reveal the changes in bird community structure (if any) close to the project area and enable managers to mitigate impacts where necessary. Bird species will be identified by visual sightings and audio recognitions.

6.2.5 Mammals

The focus of the mammal monitoring protocol is twofold: firstly, to compare numbers of small mammal species (i.e. species richness, species diversity and species evenness) between pre-determined, fixed sample plots (within and between survey bouts) and secondly, to compile a comprehensive species list of mammals that includes species rarely encountered (i.e. rare and unique species of potential conservation importance). Large and medium-sized mammals occur at much lower numbers in a natural environment than terrestrial invertebrates and birds. Effective monitoring protocols for these groups are therefore markedly different and the approach focuses on local species distributions rather than number comparisons. All observations of large and medium-sized mammals during the survey periods will be combined with continual observations of these groups by personnel to compile a local geographic distribution of each species and determine changes of these distributions over time. In effect, continually monitoring the reaction of large and medium-sized mammals to activities related to the proposed project. GPS waypoints and digital photos will enable the surveyor to create accurate local distribution patterns.

7 CONCLUDING REMARKS

Inherent biological and ecological sensitivities/ importance of the receiving environment were established in the principal ecological report as localised areas of elevated biological importance and sensitivity embedded as nodal units within largely moderate ecological sensitivity region. The quantification of expected and likely impacts indicated severe, but localised, significance, which could be moderated acceptable levels through the application of a suitable mitigation strategy. The Redstone CPS Development was therefore planned to accommodate high sensitivity areas in the landscape by means of exclusion, as far as technically feasible and with a range mitigation measures that are encapsulated in the EMP document for the development. As such, the principal ecological assessment provides adequate and substantiating information to this proposed PV Augmentation project.

As part of the application, two spatial arrangements were recommended and evaluated (although it is noted that Option 2 is still subject to engineering approval due to possible technical constraints). A basic appraisal of the two spatial development arrangements, revealed that Option 2 (inside the heliostat field) is expected to result in lower impact significance, compare to Option 1 (outside the heliostat field), and are therefore recommended as the preferred option, mainly because expected habitat losses will not be exacerbated. Option 1, although comprising moderate sensitivity habitat and therefore causing minor habitat losses, could potentially also adversely affect nearby sensitive floodplain habitat. Ultimately, both options indicated impact significance levels within acceptable (moderate to low) levels.

The proposed addition of the PV Augmentation area (either development option) is therefore not expected to elevate the severity of expected and potential impacts within the biological environment beyond acceptable levels. Should Option 2 (inside the heliostat field) therefore not be deemed technically feasible and Option 1 (outside the heliostat field) be approved, a suitable buffer should be implemented for protection. The implementation of a mitigation strategy, as provided in both this and the principal reports, is expected to negate significant and severe impacts and effects to acceptable levels.

It is ultimately the conclusion of this report that, based on available information and a brief evaluation of the proposed spatial arrangements, neither of the options are expected to cause significant and unacceptable impacts within the biological receiving environment, with the understanding and assumption that the applied mitigation strategy incorporate all recommendation presented in this as well as the principal ecological reports. Specifically, the exacerbation of cumulative impacts is expected to be minor as the proposed PV Augmentation project will constitute a fairly insubstantial portion of the Redstone CSP project. Based on results and recommendations presented in this ecological impact statement, we regard the project as acceptable.

8 DECLARATION OF INDEPENDENCE

Individual declarations attached as addendums. All specialist investigators, project investigators and members of companies employed for conducting this biodiversity investigation declare that:

- ⇒ We act as independent specialist consultants conducting the assessment and compiling the report;
- ⇒ We consider ourselves bound to the rules and ethics of the South African council for natural scientific professions;
- ⇒ Bathusi Environmental Consulting cc is not a subsidiary, legally or financially, of the SolarReserve SA Management;
- ⇒ At the time of completing this report, we did not have any interest, hidden or otherwise, in the proposed development or activity as outlined in this document, other than fair financial compensation for work performed in a professional capacity;
- ⇒ We will not be affected in any manner by the outcome of the environmental process of which this assessment forms part of, other than being part of the public;
- ⇒ We do not necessarily object to or endorse the proposed development, but aim to present facts and recommendations based on scientific data and relevant professional experience;
- ⇒ We do not have any influence over decisions made by the governing authorities;
- ⇒ We undertake to disclose, to the competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2005;
- ⇒ We undertake to provide the competent authority with access to all information at our disposal regarding the application, whether such information is favourable to the applicant or not;
- ⇒ Should we consider ourselves in conflict with any of the above declarations, we shall formally submit a Notice of Withdrawal to all relevant parties and register as an Interested and Affected Party.

Signature of principal ecologist:

Bathusi Environmental Consulting cc (CK1999/052182/23)

Name of company:

25th April 2018

Date: