ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED SOVENTIX SOLAR PV PROJECT, DE AAR, NORTHERN CAPE:

FAUNA & FLORA SPECIALIST EIA REPORT

PRODUCED FOR ECOLEGES

BY

SIMON TODD CONSULTING
Simon.Todd@3foxes.co.za
Christy.Bragg@3foxes.co.za

May 2017

CONTENTS

DECLARATION OF CONSULTANTS' INDEPENDENCE

- I Simon Todd, as the appointed independent specialist hereby declare that I:
- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and 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 NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2014 (specifically in terms of regulation 12 of GN No. R. 982) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 48 of GN No. R. 982.

Note: The terms of reference must be attached.

Simon Todd Pr.Sci.Nat 400425/11.
May 2017

NEMA 2014 Checklist

Section		***NEMA 2014 Regulations for Specialist Studies***	**Position in report (pg.)**	**check**
1	1	A specialist report prepared in terms of these Regulations must contain—		
	(a)	details of-		
		(i) the specialist who prepared the report; and	4-5	✓
		(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;		
	(b)	a declaration that the person is independent in a form as may be specified by the competent authority;		✓
	(c)	an indication of the scope of, and the purpose for which, the report was prepared;	6	✓
	(d)	a description of the methodology adopted in preparing the report or carrying out the specialised process;	8-10	✓
	(e)	a description of any assumptions made and any uncertainties or gaps in knowledge;	8	✓
	(f)	a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment;	10-17	✓
	(g)	recommendations in respect of any mitigation measures that should be considered by the applicant and the competent authority;	20-23	✓
	(h)	a description of any consultation process that was undertaken during the course of carrying out the specialist report;	See main EIA report	✓
	(i)	a summary and copies of any comments that were received during any consultation process; and	See main EIA report	✓
	(j)	any other information requested by the competent authority.		
	2	Where a proposed development and the geographical area within which it is located has been subjected to a pre-assessment using a spatial development tool, and the output of the pre-assessment in the form of a site specific development protocol has been adopted in the prescribed manner, the content of a specialist report may be determined by the adopted site specific development protocol applicable to the specific proposed development in the specific geographical area it is proposed in.	N/A	✓

Professional Profile of Consultant:

Simon Todd Consulting has extensive experience in the assessment of renewable energy developments, having provided ecological assessments for more than 80 different renewable energy developments. This includes a large number of PV developments in the Northern Cape Province. Simon Todd is a recognised ecological expert with specific experience and expertise in arid environments and is a past chairman of the Arid-Zone Ecology Forum and has 20 years' experience working throughout the country. Simon Todd is registered with the South African Council for Natural Scientific Professions (No. 400425/11).

Recent experience and relevant PV projects in the wider area the following:

- Mogobe, Legoko & Kathu 75MW Solar PV Plants, near Kathu, Northern Cape. Fauna and Flora Assessment. Cape EAPrac. 2015.
- Environmental Impact Assessment for the proposed Humansrus Solar PV Energy Facility 1 & 2 Near Copperton, Northern Cape: Fauna & Flora Specialist Report for EIA. CapeEAPrac 2015.
- Environmental Impact Assessment for the proposed Postmasburg Solar PV Energy Facility 2 and Associated Grid Connection Infrastructure, Postmasburg, Northern Cape. Fauna & Flora Specialist Report for EIA. CapeEAPrac 2015.
- Environmental Impact Assessment for the Proposed Re Capital 3 Solar Energy Facility and Associated Grid Connection Infrastructure, Dyason's Klip, Northern Cape. Fauna & Flora Specialist Report for EIA. CapeEAPrac 2013.
- Environmental Impact Assessment for the Proposed Bosjesmansberg Solar Energy Facility East of Copperton, Northern Cape Province. Fauna & Flora Specialist Report for EIA. Savannah Environmental 2013.

1 INTRODUCTION

Soventix South Africa (Pty) Ltd is proposing the establishment of a 225MW solar PV plant on several portions of the farm Goedehoop, Hanover District, Northern Cape. The project will include the construction of a 225MW solar photo-voltaic (PV) farm, in the form of 3 interconnected 75MW plants; connected to a sub-station that ties into the existing ESKOM 400KV overhead powerlines. The size of the proposed development footprint, is approximately 520ha. This area includes three 75MW solar PV plants (170ha each), with associated infrastructure, as well as the sub-station that will tie into the ESKOM overhead 400KV power lines. Existing roads will be used for main access, which may need to be enlarged to allow large equipment to access the site during construction.

Soventix South Africa (Pty) Ltd has appointed Ecoleges Environmental Consultants to conduct the required EIA process. As part of the specialist studies required for the EIA, Ecoleges Environmental Consultants has appointed Simon Todd Consulting to provide a specialist fauna and flora assessment of the development site as part of the EIA process.

A site visit and a desktop review of the available ecological information for the area was conducted in order to identify and characterize the ecological features of the site. This information is used to derive an ecological sensitivity map that presents the ecological constraints and opportunities for development at the site, which can be used for development planning. As part of the required EIA process, this ecological specialist study details the ecological characteristics of the site and provides an assessment of the likely ecological impacts associated with the development of the solar energy facilities. Impacts are assessed for the preconstruction, construction, operation, and decommissioning phases of the development. A variety of avoidance and mitigation measures associated with each identified impact are recommended to reduce the likely impact of the development, which should be included in the EMPr for the development. The full scope of the study and the details of the development are described below.

1.1 SCOPE OF STUDY

The specific terms of reference for the scoping study includes the following:

- a description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed project.
- a description and evaluation of environmental issues and potential impacts (including assessment of direct, indirect and cumulative impacts) that have been identified.
- a statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts.
- an indication of the methodology used in determining the significance of potential environmental impacts.

- an assessment of the significance of direct indirect and cumulative impacts of the development.
- a description and comparative assessment of all alternatives including cumulative impacts
- recommendations regarding practical mitigation measures for potentially significant impacts, for inclusion in the Environmental Management Programme (EMPr).
- an indication of the extent to which the issue could be addressed by the adoption of mitigation measures.
- a description of any assumptions uncertainties and gaps in knowledge.
- an environmental impact statement which contains :
    - a summary of the key findings of the environmental impact assessment;
    - an assessment of the positive and negative implications of the proposed activity;
    - a comparative assessment of the positive and negative implications of identified alternatives.

1.2 ASSESSMENT APPROACH & PHILOSOPHY

The assessment will be conducted according to the EIA Regulations, published by the Department of Environmental Affairs (2014) as well as within the best-practice guidelines and principles for biodiversity assessment as outlined by Brownlie (2005) and De Villiers et al. (2005).

This includes adherence to the following broad principles:

- That a precautionary and risk-averse approach be adopted towards projects which may result in substantial detrimental impacts on biodiversity and ecosystems, especially the irreversible loss of habitat and ecological functioning in threatened ecosystems or designated sensitive areas: i.e. Critical Biodiversity Areas (as identified by systematic conservation plans, Biodiversity Sector Plans or Bioregional Plans) and Freshwater Ecosystem Priority Areas.

- Demonstrate how the proponent intends complying with the principles contained in section 2 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA), which, amongst other things, indicates that environmental management should.

    - In order of priority aim to: avoid, minimise or remedy disturbance of ecosystems and loss of biodiversity;
    - Avoid degradation of the environment;

- Avoid jeopardising ecosystem integrity;
- Pursue the best practicable environmental option by means of integrated environmental management;
- Protect the environment as the people's common heritage;
- Control and minimise environmental damage; and
- Pay specific attention to management and planning procedures pertaining to sensitive, vulnerable, highly dynamic or stressed ecosystems.

These principles serve as guidelines for all decision-making concerning matters that may affect the environment. As such, it is incumbent upon the proponent to show how proposed activities would comply with these principles and thereby contribute towards the achievement of sustainable development as defined by the NEMA.

In order to adhere to the above principles and best-practice guidelines, the following approach forms the basis for the study approach and assessment philosophy:
The study will include data searches, desktop studies, site walkovers / field survey of the property and baseline data collection, describing:

- A description of the broad ecological characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size, relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering, viability, etc.

In terms of **pattern**, the following will be identified or described:

Community and ecosystem level

- The main vegetation type, its aerial extent and interaction with neighbouring types, soils or topography;
- Threatened or vulnerable ecosystems (*cf. SA vegetation map/National Spatial Biodiversity Assessment, fine-scale systematic conservation plans, etc*).

Species level

- Red Data Book species (giving location if possible using GPS)
- The viability of an estimated population size of the RDB species that are present (include the degree of confidence in prediction based on availability of information and specialist knowledge, i.e. High=70-100% confident, Medium 40-70% confident, low 0-40% confident)
- The likelihood of other RDB species, or species of conservation concern, occurring in the vicinity (include degree of confidence).

Fauna

- Describe and assess the terrestrial fauna present in the area that will be affected by the proposed development.

- Conduct a faunal assessment that can be integrated into the ecological study.
- Describe the existing impacts of current land use as they affect the fauna.
- Clarify species of special concern (SSC) and that are known to be:
    - endemic to the region;
    - that are considered to be of conservational concern;
    - that are in commercial trade (CITES listed species);
    - or, are of cultural significance.
- Provide monitoring requirements as input into the Environmental Management Plan (EMP) for faunal related issues.

Other pattern issues

- Any significant landscape features or rare or important vegetation associations such as seasonal wetlands, alluvium, seeps, quartz patches or salt marshes in the vicinity.
- The extent of alien plant cover of the site, and whether the infestation is the result of prior soil disturbance such as ploughing or quarrying (alien cover resulting from disturbance is generally more difficult to restore than infestation of undisturbed sites).
- The condition of the site in terms of current or previous land uses.

In terms of **process**, the following will be identified or described:

- The key ecological "drivers" of ecosystems on the site and in the vicinity, such as fire.
- Any mapped spatial component of an ecological process that may occur at the site or in its vicinity (i.e. *corridors* such as watercourses, upland-lowland gradients, migration routes, coastal linkages or inland-trending dunes, and *vegetation boundaries* such as edaphic interfaces, upland-lowland interfaces or biome boundaries)
- Any possible changes in key processes, e.g. increased fire frequency or drainage/artificial recharge of aquatic systems.
- Furthermore, any further studies that may be required during or after the EIA process will be outlined.
- All relevant legislation, permits and standards that would apply to the development will be identified.
- The opportunities and constraints for development will be described and shown graphically on an aerial photograph, satellite image or map delineated at an appropriate level of spatial accuracy.

1.3 RELEVANT ASPECTS OF THE DEVELOPMENT

The proposed development site is located on several portions of the farm Goedehoop, Hanover District, Northern Cape, between Hanover and De Aar, on the east of the N10. The proposed development footprint, is approximately 520ha, including three 75MW solar PV plants (170ha each), with associated infrastructure, as well as the sub-station that will tie into the ESKOM overhead 400KV power lines. Existing roads will be used for main access, which may need to be enlarged to allow large equipment to access the site during construction.

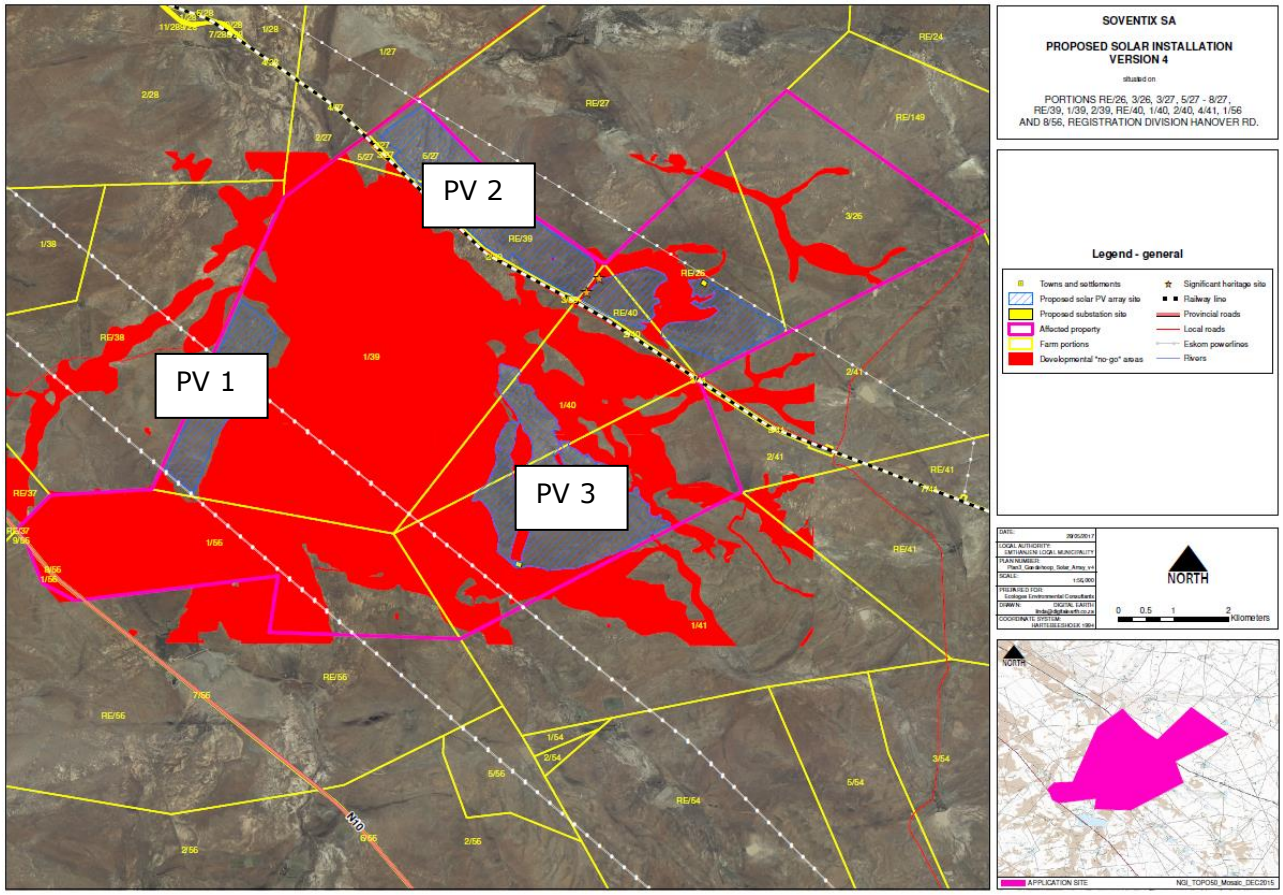

Figure 1. Satellite image of the Soventix solar development site, illustrating the proposed development alternatives, with the substation sites in red and the three PV sites (labelled 1,2 and 3) in white. The red areas are no-go areas resulting from this as well as the other specialist studies that have been integrated to refine the final potential development areas as demarcated here. As a result of taking all these sensitivities into account, the layout is considered to be a mitigated layout that takes the ecological sensitivities identified into account.

2 METHODOLOGY

2.1 DATA SOURCING AND REVIEW

Data sources from the literature consulted and used where necessary in the study includes the following:

Vegetation:

- Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina and Rutherford 2006) as well as the National List of Threatened Ecosystems (2011), where relevant.
- Critical Biodiversity Areas were obtained from the newly developed Northern Cape Conservation Plan for the study area.
- Information on plant and animal species recorded for the Quarter Degree Square (QDS) 3024 was extracted from the SABIF/SIBIS database hosted by SANBI. This is a considerably larger area than the study area, but this is necessary to ensure a conservative approach as well as counter the fact that the site itself or the immediate area has not been well sampled in the past.
- The IUCN conservation status (Figure 2) of the species in the list was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (2014).
- Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment, NFEPA (Nel et al. 2011).
- Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2008 (NPAES).

Fauna

- Lists of mammals, reptiles, amphibians and avifauna which are likely to occur at the site were derived based on distribution records from the literature and various spatial databases.
- Literature consulted includes Branch (1988) and Alexander and Marais (2007) for reptiles, Du Preez and Carruthers (2009) for amphibians, Friedmann and Daly (2004), EWT, SANBI (2016) and Skinner and Chimimba (2005) for mammals.
- Apart from the literature sources, additional information on reptiles were extracted from the SARCA web portal, hosted by the ADU, http://vmus.adu.org.za
- The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site.
- The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria (See Figure 2) and where species have not been assessed

under these criteria, the CITES status is reported where possible. These lists are adequate for mammals and amphibians, the majority of which have been assessed, however the majority of reptiles have not been assessed and therefore, it is not adequate to assess the potential impact of the development on reptiles, based on those with a listed conservation status alone. In order to address this shortcoming, the distribution of reptiles was also taken into account such that any narrow endemics or species with highly specialized habitat requirements occurring at the site were noted.

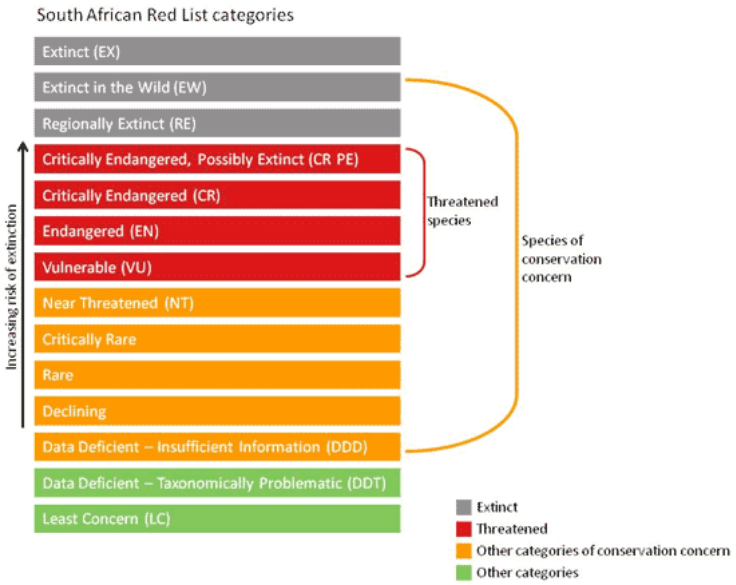

Figure 2. Schematic representation of the South African Red List categories. Taken from http://redlist.sanbi.org/redcat.php

2.2 Site Visit

The site was visited over 4 days from 1-4 March 2017. During the site visit, the different biodiversity features, habitat, and landscape units present at the site within each PV target area were identified and mapped in the field. Specific features visible on the satellite imagery of the site were also marked for field inspection and were verified and assessed during the site visit. This included features such as pans and rocky outcrops that were not visible from the access roads of the site and might have otherwise been missed. Walk-through-surveys were conducted within representative areas across the different habitat units identified and all plant and animal species observed were recorded. Active searches for reptiles and amphibians were also conducted within habitats likely to harbour or be important for such species such as around wetlands and in the rocky hills. The presence of sensitive habitats such as wetlands or pans and unique edaphic environments such as rocky outcrops or quartz patches were noted in the field if present and recorded on a GPS and mapped onto satellite imagery of the site. Small mammal trapping was conducted for 3

nights using 60 sherman traps baited with a peanut butter and oats mixture. The traps were distributed within the rocky hills and the open plains of the site and aimed at maximising the number of habitats sampled. Traps were set every evening before sundown and checked each morning before 8am.

2.3 SENSITIVITY MAPPING & ASSESSMENT

An ecological sensitivity map of the site was produced by integrating the available ecological and biodiversity information available in the literature and various spatial databases with mapping based on the satellite imagery of the site as well as personal knowledge of the site. This includes delineating different habitat units identified on the satellite imagery and assigning likely sensitivity values to the units based on their ecological properties, conservation value and the potential presence of species of conservation concern. The ecological sensitivity of the different units identified in the mapping procedure was rated according to the following scale:

- **Low** – Areas of natural or transformed habitat with a low sensitivity where there is likely to be a negligible impact on ecological processes and terrestrial biodiversity. Most types of development can proceed within these areas with little ecological impact.
- **Medium**- Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impact such as erosion low. These areas usually comprise the bulk of habitats within an area. Development within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.
- **High** – Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. These areas may contain or be important habitat for faunal species or provide important ecological services such as water flow regulation or forage provision. Development within these areas is undesirable and should only proceed with caution as it may not be possible to mitigate all impacts appropriately.
- **Very High** – Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles. These areas are essentially no-go areas from a developmental perspective and should be avoided as much as possible.

In some situations, areas were also classified between the above categories, such as Medium-High, where it was deemed that an area did not fit well into a certain category but rather fell most appropriately between two sensitivity categories. There are **no** sensitivities that are identified as "Medium to High" or similar ranged categories because this adds uncertainty to the mapping as it is not clear if an area falls at the bottom or top of such a range.

2.4 SAMPLING LIMITATIONS AND ASSUMPTIONS

The current study is based on a four-day site visit in March 2017 as well as a desktop analysis of the available literature and databases. The timing of the site visit was near-optimal and followed extensive rainfall in the region with the result that the vegetation was in an excellent condition for sampling with the majority of species present in flower or seed. In addition, faunal activity was high and most of the common species of the area were observed at the site. As a result, there are few resulting limitations in terms of the field assessment and the results of the site visit are considered reliable and comprehensive. The lists of fauna and flora derived for the site are based on those observed at the site as well as those derived from the literature and databases from a significantly larger area that the study area to ensure a conservative approach in this regard as many areas have not been well-sampled in the past. This represents a sufficiently conservative and cautious approach which takes the study limitations into account.

In terms of the assessment itself, there are some limitations present which result from the fact that a final layout has not been provided by the developer for the assessment and it is therefore not possible to provide a definitive assessment. The current assessment is contingent on the developer avoiding the placement of PV panels and other major infrastructure within the areas demarcated as High Impact and No-Go areas in Section 3.7. Significant impact to these areas would be considered a fatal flaw and compromise the viability of the project. A final layout of the development should be provided for assessment before the final report is submitted and this report must be considered a draft report until such time as a full detailed layout can be provided for assessment.

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT- BASELINE

3.1 BROAD-SCALE VEGETATION PATTERNS

According to the national vegetation map (Mucina & Rutherford 2006), the entire site falls within a single vegetation type, Northern Upper Karoo. Northern Upper Karoo is one of the most extensive vegetation types in the country and occupies over 40 000km^2 of the interior Karoo. This vegetation type occurs on the Upper Karoo plateau from Prieska, Vosburg and Carnarvon in the west to Phillipstown, Petrusville and Petrusburg in the east. It is bordered by Niekerkshoop, Douglas and Petrusburg in the north and by Carnarvon, Pampoenpoort and De Aar in the south. The vegetation consists of shrubland dominated by dwarf Karoo shrubs, grasses and *Acacia mellifera* subsp. *detinens*, and other low trees particularly on the sandy soils. The vegetation is flat to gently sloping with isolated hills of Upper Karoo Hardeveld in the south and Vaalbos Rocky Shrubland in the northeast and with many interspersed pans (Mucina & Rutherford 2006). Soils and geology are not very specific and consist of shales of the Volksrust formation and the Prince Albert Formation, as well as

Dwyka Group diamictites, while there are also dolerite sills and sheets in places. Large areas are also covered by superficial deposits of calcrete from the Kalahari Group. Soils are variable and may be deeper sandy soils or shallow soils of the Glenrosa and Mispah forms. Land types are mainly Ae, Ag and Fc. Four plant species are known to be endemic to the vegetation type, *Lithops hookeriana, Stomatium pluridens*, *Galenia exigua* and *Manulea deserticola*.

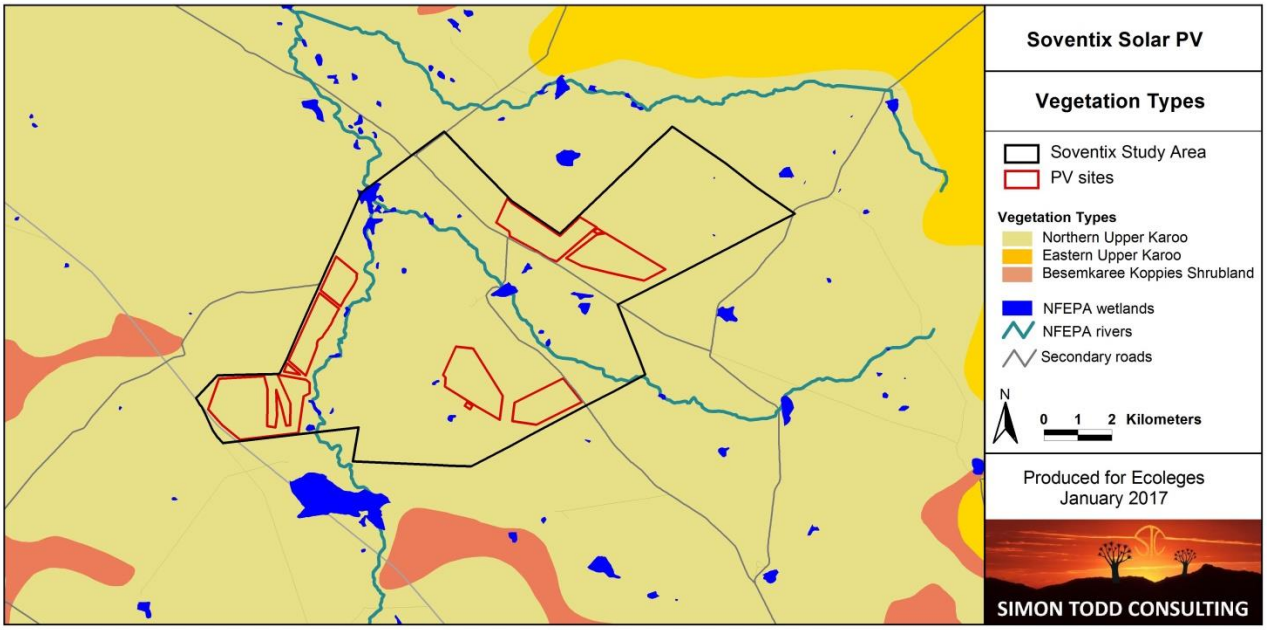

Figure 3. Broad-scale overview of the vegetation in and around the Soventix PV site. The vegetation map is an extract of the national vegetation map as produced by Mucina & Rutherford (2006), and also includes rivers and wetlands delineated by the National Freshwater Ecosystem Priority Areas assessment (Nel et al. 2011).

Northern Upper Karoo has not been significantly affected by transformation and is still approximately 96% intact and is classified as Least Threatened (Mucina & Rutherford 2006). The NFEPA aquatic ecosystems layers show that several highly ranked priority wetlands occur in the area, many supporting cranes, some of which are adjacent to the PV sites. The Brak River is also considered a high priority NFEPA river.

From the results of the site visit and the presence of the Brak River on the site, which clearly has a large floodplain area, it is evident that the VegMap provides an oversimplification of the vegetation of the site and there are at least three distinct vegetation types present on the site. The open plains of the site correspond with the Northern Upper Karoo vegetation type, but the dolerite hills and koppies present have vegetation more closely allied with Upper Karoo Hardeveld, while the floodplain of the Brak

River is clearly characterised by an azonal vegetation type, allied with Upper Gariep Alluvial Vegetation. The floodplain has however been heavily modified by human activity with a lot of diversion walls and historical disturbance present.

3.2 SITE DESCRIPTION

PV1 Site Description

The major feature of the PV1 development area is a series of dolerite ridges and outcrops which characterise the southern part of the proposed development area. Although some of these have been excluded from the footprint, they extend well beyond the excluded areas. As these are physically and ecologically unsuitable for development, they should be excluded from the development footprint. In addition, as there are some areas where the outcrops are scattered across the plains with open areas in between, these areas should be avoided as development of the intervening areas would disrupt the connectivity of the landscape and negatively affect the ecological functioning of this area. The combination of rocky hills and plains creates a diversity of habitats that is important for fauna and the diversity of these areas is higher than areas without open plains. The areas that should not be developed due to the presence of the rocky hills are indicated in Section 3.6. These exclusions have been included in the revised mitigated layout and would not be affected by the final layout.

The site also includes extensive open plains in the north and west that are considered largely suitable for development. The open plains in the north are bounded between the Brak River in the east and the property boundary in the west and have no features of significance. Provided that the Brak River is appropriately buffered from impact, this area is considered highly suitable for development as there are no significant biodiversity features present within the development footprint. In the west, the open plains in this area are also considered suitable for development, although there is a low ridge that traverses this area that would also be better avoided.

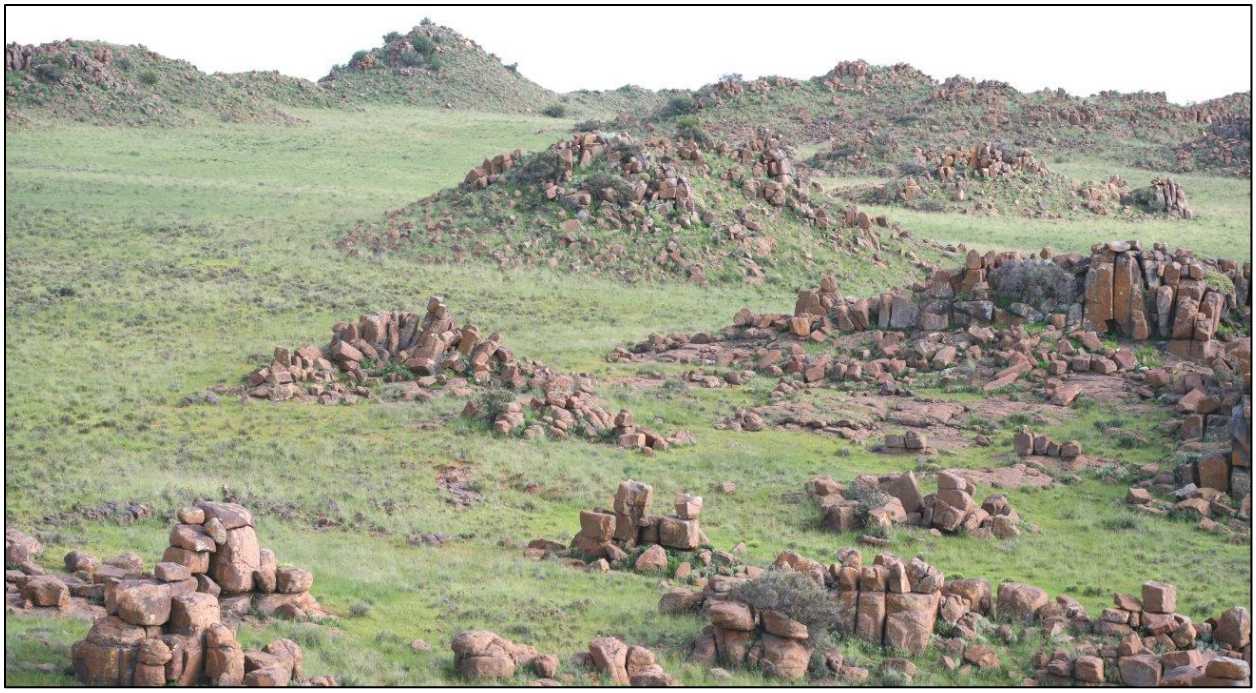

Image 1. Looking northwest over the rocky outcrops which characterise the central part of the PV1 area. These are clearly not suitable for development and the intervening areas should also be avoided. This area has been excluded from the final development footprint.

Image 2. Looking south from within the PV1 area, showing open plains between two dolerite ridges. Although the intervening area could accommodate some PV panels, this would disrupt the connectivity and functioning of the landscape and is not recommended. This area has also been excluded from the final development footprint, but is described here to illustrate the ecosystems present on site as well as highlight the avoidance implemented by the developer.

Image 3. Looking up the channel of the Brak River which forms the eastern boundary of the northern extent of the PV1 area. Although this area has clearly been degraded through over-utilisation and erosion in the past, it has recovered to a large degree and is important for fauna and ecosystem functioning.

Image 4. Looking north along the northern development area of PV1, showing the homogeneous and open nature of the plains in this area. This is considered a favourable area for development with low impacts on fauna and vegetation. This area is the focus of development in the PV1 area after the other areas to the south were excluded from the development footprint.

Image 5. The northern extent of the PV1 development area, showing the low shrubland which characterises this area. The taller plants visible in the distance are planted prickly pear (*Opuntia*) plants.

Image 6. The western plains of the PV1 development area are also homogenous and considered relatively suitable for development. The rocky ridge visible on the far right of the image is however within the development footprint and would need to be avoided. This area was excluded from the final development footprint as a result of avifaunal and other sensitivities.

PV2 Site Description

The majority of PV2 consists of flat open plains with relatively few features or species of conservation concern present. These areas are considered suitable for development and development of these areas would generate relatively low impacts on fauna and flora. There is however a low ridge with runs through the central part of the site and which is not considered suitable for development as the hills are significant for biodiversity and ecological functioning. The area which should not be developed is indicated in Section 3.6 and has been duly excluded from the final development footprint as provided by the developer.

Image 7. Looking west across the eastern half of the PV2 development area from a low rocky ridge, showing the homogenous nature of the plains in this part of the development area. This area is considered low sensitivity and suitable for development from an ecological perspective.

Image 8. The rocky ridge that runs through the central part of the PV2 development is for the most part relatively low, but is ecologically important as it provides habitat for rock-dwelling species as well as larger shrubs and small trees which are not present on the open plains of the area. These areas are not considered suitable for development and have been excluded from the footprint.

Image 9. The open plains in the east of the PV2 development area are similar to those in the west and are considered suitable for development. The low ridge which characterises the central part of the PV2 site is visible in the distance.

PV3 Site Description

The PV3 development area consists of two parts, an eastern and western section, both of which consist largely of extensive open plains. However, the primary difference between the two areas is that large parts of the western section consists of low-lying flats that are seasonally waterlogged. As a result of the nature of this area and the potential for ecological impacts due to the disruption of runoff and flow patterns, this area is not considered suitable for development. In addition, as the soils are sometimes waterlogged, significant additional material would need to be brought onto the site to stabilise the soil for construction and operation. There are also some wetlands and pans in the this area that are likely to be negatively affected by development of this area.

Image 10. The western part of PV3 consists of flat plains which are important for water movement in the area. The seasonally waterlogged nature of the area is attested by the sedge in the left foreground. This area has been excluded from the final development footprint.

Image 11. Looking out over the western section of the PV3 area, showing the flat nature of this area, with the bright green areas indicating areas where water moves through the plains in broad areas.

Image 12. A tadpole shrimp *Triops granarius* swims in a ephemeral pool created in a depression within PV3. Other fauna such as clam shrimps Leptestheria spp. were also present.

Image 13. Looking south over PV3, showing the flat nature of the site and the consequent potential for disruption of flow patterns. Standing water associated with a drainage line is also visible in the distance and flooding onto the adjacent plain occurs during large rainfall events.

Image 14. Looking east over the eastern section of PV3, showing the homogenous plains. This area is considered low sensitivity and suitable for development.

Image 15. The northern section of the eastern section of PV3, showing the homogenous grassy shrubland which characterises this part of the site. This area is considered low sensitivity and suitable for development and forms the majority of the PV3 development area.

3.3 LISTED AND PROTECTED PLANT SPECIES

According to the SIBIS database, a total of 407 plant species are found in the QDS 3024, of which only four red data-listed plant species are represented, *Chasmatophyllum maninum* and *Chasmatophyllum rouxii* (listed as DDD (data deficient, insufficient information)), *Cynodon polevansii*, which is listed DDT (Data Deficient – Taxonomically Problematic), and *Rapanea melanophloeos*, which is listed as Declining. The *Chasmatophyllum* species are associated with rocky flats and areas of exposed bedrock and *Chasmatophyllum maninum* is confirmed present at the site. *Rapanea* is associated with forest patches that usually occur around the base or in small kloofs of sandstone outcrops in vegetation types such as Besemkaree Koppies Shrubland and as it was not observed at the site and it is highly unlikely to be present. Other species of significance observed at the site include *Stomatium pluridens* and *Euphorbia crassipes*, which are regional endemics and provincially protected, while other protected species include *Aloe broomii* var. *broomii*, *Aloe claviflora*, *Pachypodium succulentum*, *Ammocharis coranica*, and *Boscia albitrunca*. .

3.4 CRITICAL BIODIVERSITY AREAS & BROAD-SCALE PROCESSES

The site falls within the planning domain of the Northern Cape Provincial Biodiversity Plan, developed by the Department of Environment and Nature Conservation, Northern Cape (2016). The potential impact of the development on Critical Biodiversity Areas should be considered in detail as these areas have been identified through systematic conservation planning exercises and represent biodiversity priority areas which should be maintained in a natural to near natural state in order to safeguard biodiversity pattern and ecological processes. The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to meet national biodiversity objectives.

Figure 4 indicates that PV2 and PV3 occur within Ecological Support Areas while the eastern section of PV lies within CBA 1 and CBA 2 areas associated with the Brak Rivier. In terms of other broad-scale planning studies, the site does not fall within a National Protected Areas Expansion Strategy Focus Area (NPAES), indicating that the area has not been identified as an area of exceptional biodiversity or of significance for the long-term maintenance of broad-scale ecological processes and climate change buffering within the region.

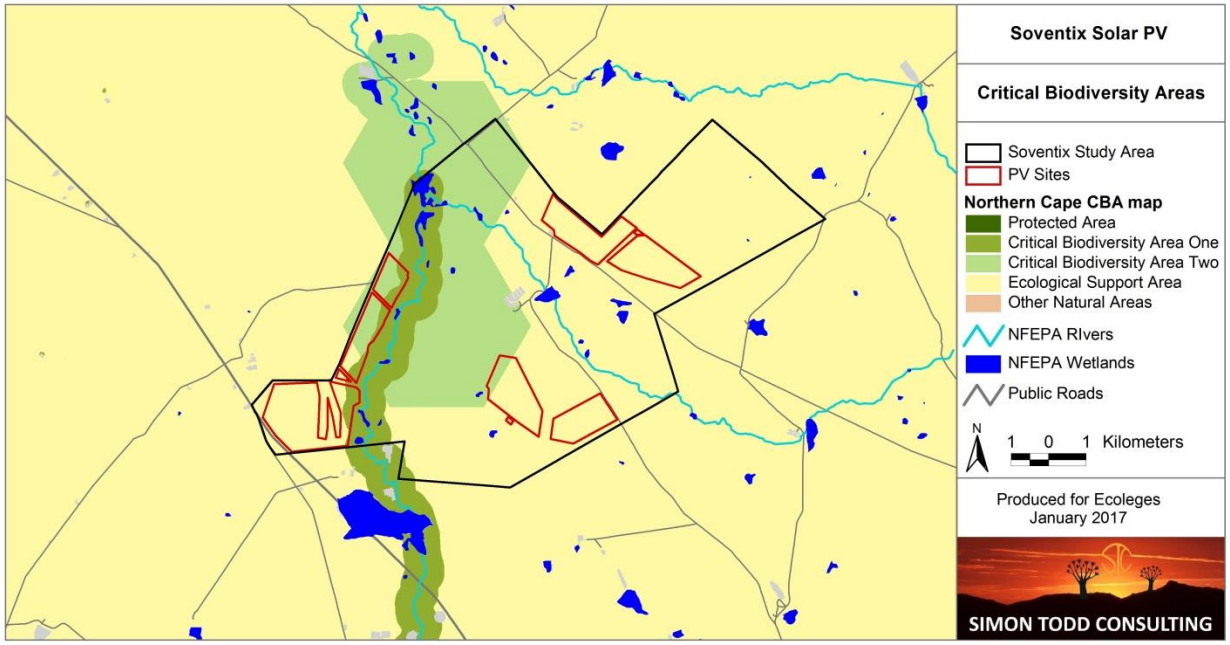

Figure 4. Critical Biodiversity Areas map of the proposed Soventix PV project and the surrounding area.

3.5 CUMULATIVE IMPACT

Due to the large number of developments in the broader area, there is potential for cumulative impact to generate additional impacts on broad-scale ecological processes and the countries' ability to meet conservation targets. A map of all the DEA-registered renewable energy developments within 30-50km of the site are depicted in Figure 5 below and illustrates that the current development site is surrounded by a number other renewable energy developments. Several of these are already constructed or currently under construction. However, the DEA map does not indicate the actual footprint of the facilities which are, in most cases, much smaller than the cadastral units indicated. The total footprint of 75MW PV plants is in the order to 250ha, which although is a fairly large area at the local level, is small when considered at the scale of a 30km radius from the site (70 685ha). Most of the developments in the broader area are to the north of the site around De Aar and are not within 30km of the site. As a result, there is a node of development around De Aar, but less development in the vicinity of the Soventix site. There are no more than 4 developments within 30km with a total extent of less than 1000ha, which in the context of the low current levels of transformation is relatively low. The Soventix site would add approximately 50% to this at about 510ha to develop the whole site. This would have some local impact, but it is clear that regional impact will remain low.

Cumulative impacts are nevertheless a potential concern in the area and their impact on fauna is highlighted as a greater concern than that on flora. The vegetation in the area, especially on the plains, is Northern Upper Karoo which is one of the most extensive vegetation types in the country and has a low overall abundance of species of conservation concern. In terms of fauna, smaller fauna such as rodents will experience some habitat loss due to transformation within the footprint of the current and other PV facilities. Medium and larger fauna are however likely to be more vulnerable to the cumulative impacts of development as they would be affected by habitat loss, difficulty in passing security fencing as well as noise and disturbance. In context of the current project, the plains around the site are still largely undeveloped and the three proposed development areas are separated by some distance, which would facilitate movement of fauna across the site as there will still be large intact corridors present. In addition, the Brak River is likely to be an important movement corridor in the region and, as this will not be directly affected by the development, the overall impact on landscape connectivity is likely to be low, especially given the largely intact nature of the surrounding landscape.

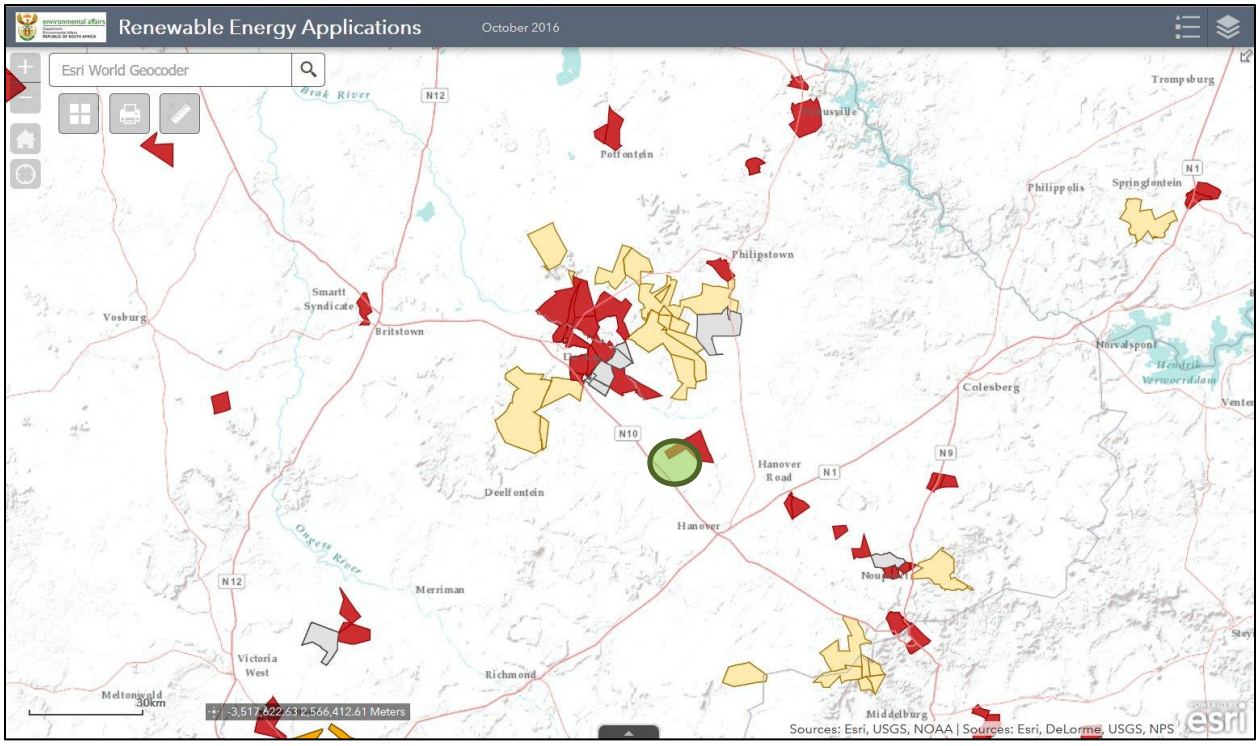

Figure 5. The Soventix PV site, represented by the green oval, lies within a broader matrix of other proposed and built renewable energy facilities (red indicates PV and the pale yellow wind energy developments) in the landscape. It is however important to note that the actual facilities are considerably smaller than the cadastral units depicted above.

3.6 FAUNAL COMMUNITIES

Mammals

The site lies within the range of 63 terrestrial mammals, including three listed species (EWT & SANBI, Red Data Book of Mammals of South Africa, Lesotho and Swaziland, 2016). The five listed species are the Brown Hyaena *Hyaena brunnea* (NT), South African Hedgehog *Atelerix frontalis* (NT), the African White-tailed Rat *Mystromys albicaudatus* (VU), the Black-footed Cat *Felis nigripes* (VU) and the Serval *Leptailrus serval* (NT). While the Hedgehog and Black-footed Cat are likely to occur in the broad area, the Brown Hyaena is less likely to be present due to naturally low population density as well as persecution from farmers. Adequate cover and water are essential habitat requirements for the Serval and given the sparse cover at the site this species is unlikely to occur here and the area is not viewed as important habitat for this species which favours tall grassland. All of these species have relatively wide ranges across South Africa and the development would not be likely to result in a significant overall decline in the available habitat for these species. At a local level, there is likely to be some impact on listed species if present. However as these are secretive animals which occur at a low density, it is likely that affected individuals would still

be able to utilise the majority of the site. In terms of specific habitats and areas at the site which are likely to be of above average significance for mammals, the vicinity of the Brak River is important as habitat as well as for landscape connectivity, while the rocky hills are also identified as being important habitat for fauna and have higher species richness than the adjacent plains.

Faunal diversity in the area is quite high and a wide array of species were directly or indirectly observed during the site visit. The majority of species observed are medium sized mammals, typical of the area and no particularly rare or notable species were observed. Species that were observed in the area include Cape Porcupine *Hystrix africaeaustralis*, Steenbok *Raphicerus campestris*, Duiker *Sylvicapra grimmia*, Springbok *Antidorcas marsupialis*, Aardvark *Orycteropus afer*, Rock Hyrax *Procavia capensis*, Cape Hare *Lepus capensis*, Hewitt's Red Rock Rabbit *Pronologus saundersiae*, South African Ground Squirrel *Xerus inauris*, Springhare *Pedetes capensis*, Namaqua Rock Mouse *Aethomys namaquensis*, Black-backed Jackal *Canis mesomelas*, Bat-eared Fox *Otocyon megalotis*, Yellow Mongoose *Cynictis penicillata* and African Wild Cat *Felis silvestris*. Only two species were trapped in the small mammal trapping with the Namaqua Rock Mouse *Aethomys namaquensis* being common in the rocky hills while the Hairy Footed Gerbil *Gerbillurus paeba* was common on the plains. While there are likely other small mammal species present as well, trapping success in arid ecosystems is less than 5% and consequently, less common species are not easily encountered in short-term studies.

The Namaqua Rock Mouse *Aethomys namaquensis* and Hairy Footed Gerbil *Gerbillurus paeba* are the most common small mammals at the site and while the Namaqua Rock Mouse is largely restricted to rocky environments, the Hairy-footed Gerbil occurs across the site on the open plains where it lives down burrows that it constructs.

Impacts on mammals are likely to be restricted largely to disturbance during the construction phase and habitat loss during the operational phase. Although this is relatively low in the context of the landscape, impacts on habitat fragmentation and landscape connectivity are likely to be increasingly significant as the landscape becomes increasingly transformed as a result of the large number of the developments in the area. The Brak

River is likely of significance in terms of landscape connectivity for fauna and it would be important to maintain this clear of development to ensure that it retains this function.

Reptiles

According to the distribution maps available in the literature and the SARCA database, as many as 31 reptiles could occur at the site. Species observed on the site include Bibron's Gecko *Chondrodactylus bibronii*, Southern Rock Agama *Agama atra*, Karoo Girdled Lizard *Karusasaurus polyzonus*, Spotted Sand Lizard *Pedioplanis lineoocellata lineoocellata*, Western Three-striped Skink *Trachylepis occidentalis*, Variegated Skink Trachylepis variegata, Marsh Terrapin *Pelomedusa subrufa*, Verrox's Tent Tortoise *Psammobates tentorius verroxii*, Cape Cobra *Naja nivea* and Leopard Tortoise *Stigmochelys pardalis*. The site represents a relatively rich habitat for reptiles as it contains various types of rocky outcrops as well as densely vegetated riparian areas and flats of varying texture. Despite the likely high reptile richness at the site, no listed species are known from the area.

In terms of the likely impact of the development on reptiles, habitat loss is likely to be of local significance only due to the relatively low footprint of the development and the relatively low reptile diversity of the site. Furthermore, many species would be able to use the vegetation under the panels and some species would take advantage of the buildings and structures present. Some transient disturbance of reptiles during construction is likely due to disturbance and vegetation clearing. Overall, as there are few range-restricted or listed reptile species at the site, impacts on reptiles from the development are likely to be local in nature and not of broader significance.

Tortoises such as the Leopard Tortoise (left) and Verrox's Tent Tortoise (right) are common at the site and are likely to experience some habitat loss as a result of the development. Tortoises are also vulnerable to electrocution on electric fencing and if the PV areas are to be fenced, then the live strands should be on the inside of the fence or more than 30cm from the ground.


Bibron's Gecko (left) and the Karoo Girdled Lizard are both associated with rocky habitats and occur within the rocky hills of the site and also on small isolated outcrops that occur on the plains of the site.

Amphibians

Eleven frog species are known from the broad area around the site, including the Giant Bullfrog *Pyxicephalus adpersus* which is listed as Near Threatened. The majority of species known from the area are toads and sand frogs which are relatively independent of water except for breeding purposes, which reflects the aridity of the area. A large proportion of the site contains well developed drainage lines and wetlands, which are likely to be the most important areas for amphibians at the site. Natural pans and man-made shallow water bodies are also present and confirmed as breeding sites for amphibians including the Giant Bullfrog, which can be confirmed present at the site (see image below). These features should be appropriately buffered to limit impact on amphibians at the site.


Frogs observed at the site include the Karoo Pygmy Toad (left) and the Giant Bullfrog, both of which were observed to be using small dams and aquatic features for breeding purposes.

Habitat loss and erosion would be a primary risk factor for amphibians associated with the development, as this would impact water quality and amphibian habitat. During the construction phase, pollution, particularly from petrochemicals would also be a significant

risk factor. With the appropriate mitigation, these risks can however be reduced to an acceptable level.

3.7 SITE SENSITIVITY ASSESSMENT

The sensitivity map for the whole Soventix PV site is illustrated below in Figure 6. At a broad level, the site consists of areas of contrasting sensitivity, which is driven by the presence of the Brak River system at the site and a series of dolerite outcrops which are considered high sensitivity in comparison with the open plains of the site which are comparatively low sensitivity. This pattern is the main driver of the sensitivity of the site and the consequent development potential of the PV target areas. The major sensitive feature of the broader site is the Brak River system which has extensive silty floodplains that are occasionally inundated. Within each PV area there are also some dolerite ridges and outcrops which are considered sensitive and unsuitable for development. These occupy different proportions of each PV area and will have the greatest impact on the PV1 development area. The low-lying plains in the west of PV3 are also considered sensitive due to the movement of water through this area and its function as a seasonal wetland and area of high productivity.

The final layout of the development has taken account of these sensitivities and avoids the areas which are considered to be no-go areas. This is a significant mitigation measure and such avoidance is considered instrumental in bringing potential impacts down to acceptable levels. As a result of the avoidance that has been implemented, the potential impact of the development has been significantly reduced and a number of potentially significant impacts have been avoided or reduced to low levels.

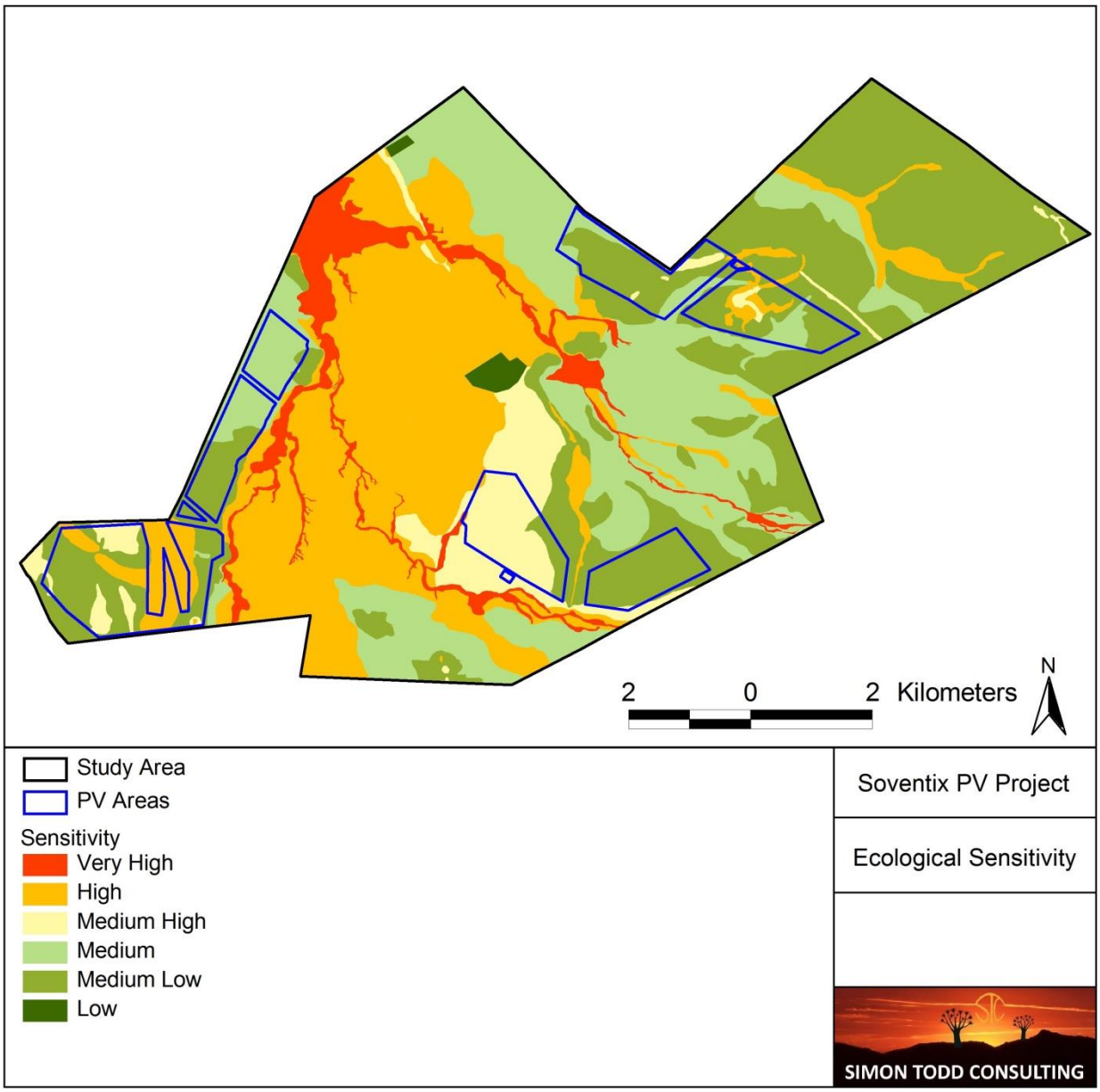

Figure 6. Ecological sensitivity map of the Soventix PV site, which is dominated by the presence of the Brak River system and associated floodplains as well as a series of dolerite hills.

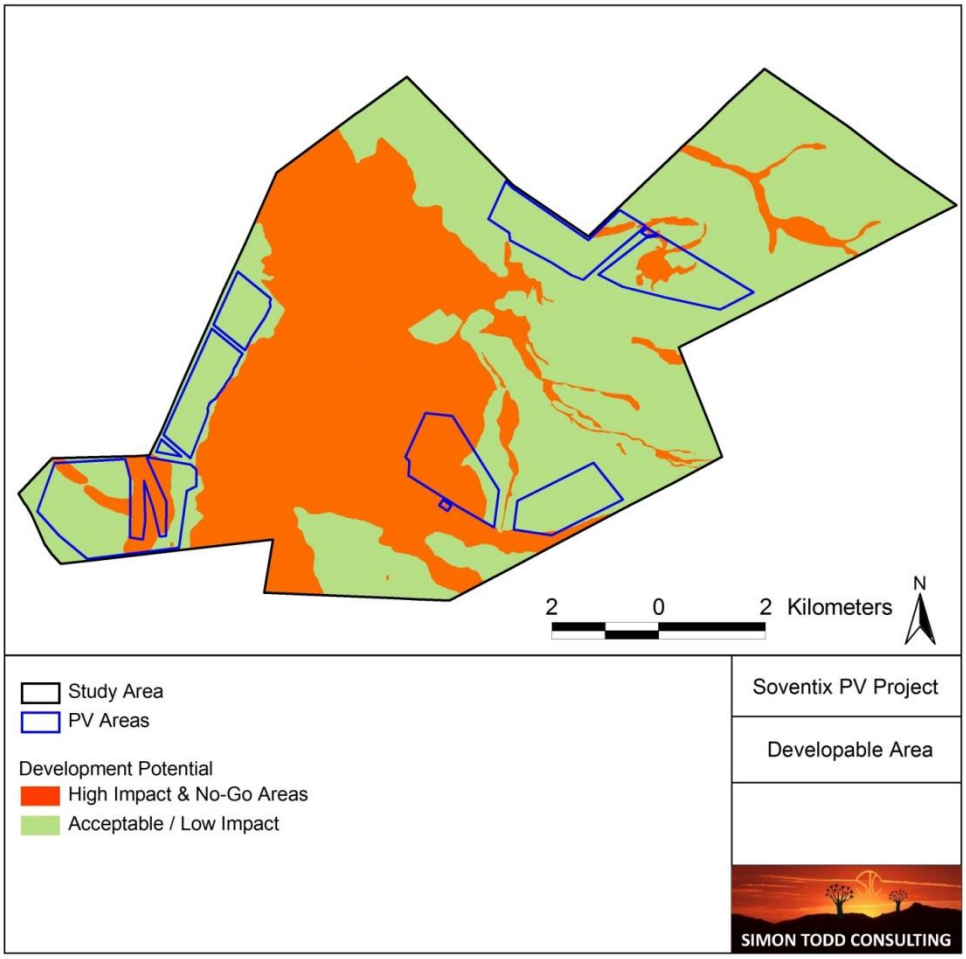

Figure 7. Map of areas which are considered suitable or unsuitable for development, which has been used to finalise the development footprint at the Soventix site. No PV infratructure has been located within the areas demarcated as High Impact and No-Go areas. This results in a significant reduction in the assessed impact of the development and is a key factor in bringing several potentially high impacts down to acceptable levels.

4 IDENTIFICATION & NATURE OF IMPACTS

In this section, the potential impacts and associated risk factors that may be generated by the development are identified. In order to ensure that the impacts identified are broadly applicable and inclusive, all the likely or potential impacts that may be associated with the development are listed. Each of the potential impacts identified above is explored in more detail with reference to the features and characteristics of the site and the likelihood that each impact would occur given the characteristics of the site and the extent and nature of the development.

Impacts on vegetation and protected plant species

Although their density is relatively low, there are some listed and protected plant species within the development footprint that would be impacted. In addition, vegetation clearing during construction will result to the loss of currently intact habitat within the development footprint and is an unavoidable consequence of the development. The extent of this impact would be equivalent to the footprint of the PV areas plus any major access roads that are required to access the site. As this impact is certain to occur it will be assessed for the construction phase of the facility.

Direct faunal impacts

Increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to fauna. Sensitive and shy fauna would move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed. Some impact on fauna is highly likely to occur during construction as well as operation and this impact will therefore be assessed for the construction phase and operational and decommissioning phases.

Soil erosion and associated degradation of ecosystems

The large amount of disturbance created during construction would potentially leave the site vulnerable to soil erosion, from both wind and water. Vegetation clearing, the panel arrays and access roads will all result in increased levels of runoff which will need to be managed and which would pose an erosion risk. Soil erosion and associated environmental degradation is therefore considered a likely potential impact and will be assessed for the construction, operational and decommissioning phases.

Alien Plant Invasion

The disturbance created during construction is likely to encourage the invasion of the disturbed areas by alien species. Although there were not a lot of alien species present in the area, problem species such as *Prosopis* are present in the area and it is possible that such species will colonise the disturbed areas if given the opportunity. This impact is deemed highly likely to occur and will be assessed as a likely impact associated with the development during the operational and decommissioning phases.

Impact on Critical Biodiversity Areas

The footprint potentially includes areas that have been demarcated as CBAs and the loss of habitat within the CBAs would potentially result in a loss of biodiversity as well

as a potential loss in ecosystem function within the CBA, with negative consequences for biodiversity maintenance in the long-term. This is primarily a problem with PV1 as the other PV areas are not within CBAs. As the total footprint within CBAs is low, this impact will be of local significance only. This impact will be assessed for the operational phase.

Impact on broad-scale ecological processes

Transformation of intact habitat on a cumulative basis would contribute to the fragmentation of the landscape and would potentially disrupt the connectivity of the landscape for fauna and flora and impair their ability to respond to environmental fluctuations. Due to the presence of a number of other renewable energy developments in the area, this is a potential cumulative impact of the development that is assessed as a cumulative impact.

4.2 ASSESSMENT METHODOLOGY

Direct, indirect and cumulative impacts of the issues identified above, are assessed according to the following standard methodology:

- The **nature** which shall include a description of what causes the effect what will be affected and how it will be affected.

- The **extent** wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):

- The **duration** wherein it will be indicated whether:

    - the lifetime of the impact will be of a very short duration (0- 1 years).
    - the lifetime of the impact will be of a short duration (2-5 years).
    - medium-term (5-15 years).
    - long term (> 15 years); or
    - permanent

- The **magnitude** quantified as small and will have no effect on the environment, minor and will not result in an impact on processes, low and will cause a slight impact on processes, moderate and will result in processes continuing but in a modified way, high (processes are altered to the extent that they temporarily cease) and very high and results in complete destruction of patterns and permanent cessation of processes.

- The **probability** of occurrence, which shall describe the (likelihood of the impact actually occurring. Probability will be estimated as very improbable (probably will

not happen), improbable (some possibility, but of low likelihood), probable (distinct possibility), highly probable (most likely) and definite (impact will occur regardless of any prevention measures).

The **significance** which shall be determined through a synthesis of the characteristics described above and will be assessed as follows:

- **No significance**: the impacts do not influence the proposed development and/or environment in any way.
- **Low significance**: the impacts will have a minor influence on the proposed development and/or environment. These impacts require some attention to modification of the project design where possible, or alternative mitigation.
- **Moderate significance**: the impacts will have a moderate influence on the proposed development and/or environment. The impact can be ameliorated by a modification in the project design or implementation of effective mitigation measures.
- **High significance**: the impacts will have a major influence on the proposed development and/or environment and will result in the "no-go" option on the development or portions of the development regardless of any mitigation measures that could be implemented. This level of significance must be well motivated.

and;
the status, which will be described as either positive, negative or neutral.
the degree to which the impact can be reversed.
the degree to which the impact may cause irreplaceable loss of resources.
the degree to which the impact can be mitigated.

5 ASSESSMENT OF IMPACTS

The following assessed impacts are for the planning and construction, operational and decommissioning phases of the development. The assessment is based on the final 'mitigated' layouts provided by the developer and the post-mitigation significance levels are based on these layouts compared to the original unmitigated layouts which do not take the ecological sensitivities into account.

Planning & Construction Phase

Nature of impact	Option	Mitigation	Spatial Extent	Duration	Magnitude	Probability	Mitigation Potential	Significance and Status
Impacts on vegetation and listed plant species	PV1	Before Mitigation	Local (2)	Long-Term (4)	Moderate (3)	Definite (4)	Low (2)	High(36) Negative
		Post-mitigation	Local (1)	Medium-Term (3)	Low (2)	Probable (3)	Low (2)	Low (18) Negative
	PV2	Before Mitigation	Local (2)	Long-Term (4)	Moderate (3)	Definite (4)	Low (2)	High(36) Negative
		Post-mitigation	Local (2)	Medium-Term (3)	Low (2)	Probable (3)	Low (2)	Medium (21) Negative
	PV3	Before Mitigation	Local (2)	Long-Term (4)	Moderate (3)	Definite (4)	Low (2)	High(36) Negative
		Post-mitigation	Local (2)	Medium-Term (3)	Low (2)	Probable (3)	Low (2)	Medium (21) Negative
Mitigation/Management Actions								
• The areas demarcated as high impact and no-go areas must be avoided in order to retain acceptable levels of impact. • Preconstruction walk-through of the facility in order to locate species of conservation concern that can be translocated as well as comply with the provincial and DAFF permit conditions. • Vegetation clearing to commence only after walk through has been conducted and necessary permits obtained. • Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc. • ECO to provide supervision and oversight of vegetation clearing activities within sensitive areas such as near drainage areas. • All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area. • Temporary lay-down areas should be located within previously transformed areas or areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use if they do not fall within the development footprint of the plant infrastructure.								

Nature of impact	Option	Mitigation	Spatial Extent	Duration	Magnitude	Probability	Mitigation Potential	Significance and Status
Direct Faunal Impacts During Construction	PV1	Before Mitigation	Local (2)	Medium-Term (3)	Moderate (3)	Probable (3)	Moderate (2)	Medium (24) Negative
		Post-mitigation	Local (2)	Short- Term (2)	Low (2)	Probable (3)	Moderate (2)	Low (18) Negative
	PV2	Before Mitigation	Local (2)	Medium-Term (3)	Moderate (3)	Probable (3)	Moderate (2)	Medium (24) Negative
		Post-mitigation	Local (2)	Short- Term (2)	Low (2)	Probable (3)	Moderate (2)	Low (18) Negative
	PV3	Before Mitigation	Local (2)	Medium-Term (3)	Moderate (3)	Probable (3)	Moderate (2)	Medium (24) Negative
		Post-mitigation	Local (2)	Short- Term (2)	Low (2)	Probable (3)	Moderate (2)	Low (18) Negative
Mitigation/Management Actions								
• All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often persecuted out of superstition. • Any fauna threatened by the construction activities should be removed to safety by the ECO or appropriately qualified environmental officer. • All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises. • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. • If trenches need to be dug for electrical cabling or other infrastructure, these should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are standing open should have places where there are soil ramps allowing fauna to escape the trench.								
Soil erosion and associated degradation of ecosystems during construction	PV1	Before Mitigation	Local (2)	Medium-term (3)	Moderate (3)	Probable (3)	Moderate (3)	Medium (24) Negative
		Post-mitigation	Local (2)	Short-term (2)	Low (2)	Improbable (2)	Moderate (3)	Low (12) Negative

Nature of impact	Option	Mitigation	Spatial Extent	Duration	Magnitude	Probability	Mitigation Potential	Significance and Status
	PV2	Before Mitigation	Local (2)	Medium-term (3)	Moderate (3)	Probable (3)	Moderate (3)	Medium (24) Negative
		Post-mitigation	Local (2)	Short-term (2)	Low (2)	Improbable (2)	Moderate (3)	Low (12) Negative
	PV3	Before Mitigation	Local (2)	Medium-term (3)	Moderate (3)	Probable (3)	Moderate (3)	Medium (24) Negative
		Post-mitigation	Local (2)	Short-term (2)	Low (2)	Improbable (2)	Moderate (3)	Low (12) Negative
Mitigation/Management Actions								
• Dust suppression and erosion management should be an integrated component of the construction approach. • Disturbance near to drainage lines should be avoided and any drainage areas near to access roads and construction activities should demarcated as no-go areas. • Regular monitoring for erosion problems along the access roads and other cleared areas. • Erosion problems should be rectified on a regular basis. • Sediment traps may be necessary to prevent erosion and soil movement if there are topsoil or other waste heaps present during the wet season. • A low cover of vegetation should be left wherever possible within the construction footprint to bind the soil, prevent erosion and promote post-disturbance recovery of an indigenous ground cover.								

Operational Phase

Nature of impact	Option	Mitigation	Spatial Extent	Duration	Magnitude	Probability	Mitigation Potential	Significance and Status
Alien Plant Invasion Risk During Operation	PV1	Before Mitigation	Local (2)	Long-term (4)	Moderate (3)	Probable (3)	High (4)	Medium (27) Negative
		Post-mitigation	Local (2)	Short-term (2)	Low (2)	Improbable (2)	High (4)	Low (12) Negative

Nature of impact	Option	Mitigation	Spatial Extent	Duration	Magnitude	Probability	Mitigation Potential	Significance and Status
	PV2	Before Mitigation	Local (2)	Long-term (4)	Moderate (3)	Probable (3)	High (4)	Medium (27) Negative
		Post-mitigation	Local (2)	Short-term (2)	Low (2)	Improbable (2)	High (4)	Low (12) Negative
	PV3	Before Mitigation	Local (2)	Long-term (4)	Moderate (3)	Probable (3)	High (4)	Medium (27) Negative
		Post-mitigation	Local (2)	Short-term (2)	Low (2)	Improbable (2)	High (4)	Low (12) Negative
Mitigation/Management Actions								
• Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species. • The recovery of the indigenous vegetation should be encouraged through leaving some areas intact through the construction phase to create a seed source for adjacent cleared areas. • Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem on parts of the site and a long-term alien control plan will need to be implemented. • Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as these are also likely to be prone to invasion problems. • Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.								
Soil erosion and associated degradation of ecosystems	PV1	Before Mitigation	Local (2)	Medium-term (3)	Moderate (3)	Probable (3)	Moderate (3)	Medium (24) Negative
		Post-mitigation	Local (2)	Short-term (2)	Low (2)	Improbable (2)	NA	Low (12) Negative
	PV2	Before Mitigation	Local (2)	Medium-term (3)	Moderate (3)	Probable (3)	Moderate (3)	Medium (24) Negative

Nature of impact	Option	Mitigation	Spatial Extent	Duration	Magnitude	Probability	Mitigation Potential	Significance and Status
		Post-mitigation	Local (2)	Short-term (2)	Low (2)	Improbable (2)	NA	Low (12) Negative
	PV3	Before Mitigation	Local (2)	Medium-term (3)	Moderate (3)	Probable (3)	Moderate (3)	Medium (24) Negative
		Post-mitigation	Local (2)	Short-term (2)	Low (2)	Improbable (2)	NA	Low (12) Negative
Mitigation/Management Actions								
• All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. • Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance. • All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • All cleared areas should be revegetated with indigenous perennial grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.								
Faunal impacts during operation	PV1	Before Mitigation	Local (2)	Moderate (3)	Low (2)	Probable (3)	High (4)	Medium (21) Negative
		Post-mitigation	Local (2)	Low (2)	Low (2)	Improbable (2)	NA	Low (12) Negative
	PV2	Before Mitigation	Local (2)	Moderate (3)	Low (2)	Probable (3)	High (4)	Medium (21) Negative
		Post-mitigation	Local (2)	Low (2)	Low (2)	Improbable (2)	NA	Low (12) Negative
	PV3	Before Mitigation	Local (2)	Moderate (3)	Low (2)	Probable (3)	High (4)	Medium (21) Negative
		Post-mitigation	Local (2)	Low (2)	Low (2)	Improbable (2)	NA	Low (12) Negative

Nature of impact	Option	Mitigation	Spatial Extent	Duration	Magnitude	Probability	Mitigation Potential	Significance and Status
Mitigation/Management Actions								
• No unauthorized persons should be allowed onto the site. • Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. • The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. • If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects. • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. • All vehicles accessing the site should adhere to a low speed limit (30km/h max) to avoid collisions with susceptible species such as snakes and tortoises. • If the facility is to be fenced, then the electrified strands should be on the inside of the fence as some species such as tortoises are susceptible to electrocution from electric fences as they do not move away when electrocuted but rather adopt defensive behaviour by retreating into their shells and are killed by repeated shocks.								

Decommissioning Phase

Nature of impact	Option	Mitigation	Spatial Extent	Duration	Magnitude	Probability	Mitigation Potential	Significance and Status
Alien Plant Invasion Risk Following Decommissioning	PV1	Before Mitigation	Local (2)	Long-term (4)	Moderate (3)	Probable (3)	Moderate (3)	Medium (27) Negative
		Post-mitigation	Local (2)	Short-term (2)	Low (2)	Improbable (2)	Moderate (3)	Low (12) Negative
	PV2	Before Mitigation	Local (2)	Long-term (4)	Moderate (3)	Probable (3)	Moderate (3)	Medium (27) Negative
		Post-mitigation	Local (2)	Short-term (2)	Low (2)	Improbable (2)	Moderate (3)	Low (12) Negative
	PV3	Before Mitigation	Local (2)	Long-term (4)	Moderate (3)	Probable (3)	Moderate (3)	Medium (27) Negative

Nature of impact	Option	Mitigation	Spatial Extent	Duration	Magnitude	Probability	Mitigation Potential	Significance and Status
		Post-mitigation	Local (2)	Short-term (2)	Low (2)	Improbable (2)	NA	Low (12) Negative
Mitigation/Management Actions								
• The recovery of the indigenous vegetation should be encouraged after the closure of the development. • Regular alien clearing should be conducted throughout all project phases using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.								
Soil erosion and associated degradation of ecosystems	PV1	Before Mitigation	Local (2)	Long-term (4)	Moderate (3)	Probable (3)	Moderate (3)	Medium (27) Negative
		Post-mitigation	Local (2)	Short-term (2)	Low (2)	Improbable (2)	NA	Low (12) Negative
	PV2	Before Mitigation	Local (2)	Long-term (4)	Moderate (3)	Probable (3)	Moderate (3)	Medium (27) Negative
		Post-mitigation	Local (2)	Short-term (2)	Low (2)	Improbable (2)	NA	Low (12) Negative
	PV3	Before Mitigation	Local (2)	Long-term (4)	Moderate (3)	Probable (3)	Moderate (3)	Medium (27) Negative
		Post-mitigation	Local (2)	Short-term (2)	Low (2)	Improbable (2)	NA	Low (12) Negative
Mitigation/Management Actions								
• All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • All cleared areas should be revegetated with indigenous perennial grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.								
Faunal impacts during decommissioning	PV1	Before Mitigation	Local (2)	Short-term (2)	Low (2)	Probable (3)	High (4)	Low (18) Negative

Nature of impact	Option	Mitigation	Spatial Extent	Duration	Magnitude	Probability	Mitigation Potential	Significance and Status
		Post-mitigation	Local (2)	Short-term (2)	Low (2)	Improbable (2)	NA	Low (12) Negative
	PV2	Before Mitigation	Local (2)	Short-term (2)	Low (2)	Probable (3)	High (4)	Low (18) Negative
		Post-mitigation	Local (2)	Short-term (2)	Low (2)	Probable (3)	NA	Low (12) Negative
	PV3	Before Mitigation	Local (2)	Short-term (2)	Low (2)	Probable (3)	High (4)	Low (18) Negative
		Post-mitigation	Local (2)	Short-term (2)	Low (2)	Probable (3)	NA	Low (12) Negative
Mitigation/Management Actions								
• Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. • All vehicles accessing the site should adhere to a low speed limit (30km/h max) to avoid collisions with susceptible species such as snakes and tortoises.								

Cumulative Impacts

The following are the cumulative impacts that are assessed as being a likely consequence of the development.

Nature of impact	Option	Mitigation	Spatial Extent	Duration	Intensity	Probability	Mitigation Potential	Significance and Status
Impact on CBAs and biodiversity pattern and	PV1	Before Mitigation	Moderate (3)	Long-Term (4)	Moderate (3)	Probable (3)	Moderate (3)	High (30) Negative

Nature of impact	Option	Mitigation	Spatial Extent	Duration	Intensity	Probability	Mitigation Potential	Significance and Status
process within the CBAs		Post-mitigation	Local (2)	Long-Term (4)	Low (2)	Probable (3)	Moderate (3)	Medium (24) Negative
	PV2	Before Mitigation	Local (2)	Long-Term (4)	Low (2)	Improbable (2)	Moderate (3)	Low (16) Negative
		Post-mitigation	Local (2)	Long-Term (4)	Low (2)	Improbable (2)	Moderate (3)	Low (14) Negative
	PV3	Before Mitigation	Local (2)	Long-Term (4)	Low (2)	Improbable (2)	Moderate (3)	Low (16) Negative
		Post-mitigation	Local (2)	Long-Term (4)	Low (2)	Improbable (2)	Moderate (3)	Low (14) Negative
Mitigation/Management Actions								
• Minimise the development footprint as far as possible and buffer the Brak River from impact as much as possible. • The facility should be fenced off in a manner which allows fauna to pass through the facility as easily as possible. This implies not fencing-in large areas of intact vegetation into the facility and only the developed area should be fenced. This should be a single and not a double fence and should be electrified on the inside only.								
Impact on broad-scale ecological processes	PV1	Before Mitigation	Regional (3)	Long-Term (4)	Moderate (3)	Probable (3)	Moderate (3)	High (30) Negative
		Post-mitigation	Local (2)	Long-Term (4)	Low (2)	Low (2)	Moderate (3)	Low (16) Negative
	PV2	Before Mitigation	Local (3)	Long-Term (4)	Low (2)	Probable (3)	Moderate (3)	Medium (27) Negative
		Post-mitigation	Local (3)	Long-Term (4)	Low (2)	Low (2)	Moderate (3)	Low (18) Negative
	PV3	Before Mitigation	Local (3)	Long-Term (4)	Low (2)	Probable (3)	Moderate (3)	Medium (27) Negative

Nature of impact	**Option**	**Mitigation**	**Spatial Extent**	**Duration**	**Intensity**	**Probability**	**Mitigation Potential**	**Significance and Status**
		Post-mitigation	Local (3)	Long-Term (4)	Low (2)	Low (2)	NA	Low (18) Negative
	Mitigation/Management Actions							
•	• Minimise the development footprint as far as possible and allow the retention of some natural vegetation between the rows of panels or trackers. • The facility should be fenced off in a manner which allows fauna to pass by the facility as easily as possible. This implies not fencing-in large areas of intact vegetation into the facility and only the developed area should be fenced.							

6 IDENTIFICATION OF THE PREFERRED ALTERNATIVE

There are currently three alternatives, although after mitigation, their original extent has been significantly reduced in some cases. As a result it is no longer possible to support the full required footprint within the original areas and the footprint has been expanded into other adjacent low sensitivity areas to provide a consolidated footprint or 510ha that can accommodate the full 225MW footprint. This is considered acceptable and does not significantly increase the impacts compared to three separate plants and the original footprint areas. The main mitigation measure, which was avoidance of the high sensitivity features of the site is considered a key strategy in this regard and development of the lower sensitivity plains is not likely to generate significant long-term impacts or irreplaceable loss of biodiversity. The development of a consolidated footprint to accommodate the full 225MW plant is considered a favourable option and is supported.

7 CONCLUSION & RECOMMENDATIONS

The Soventix site consists of areas of contrasting sensitivity, which is driven by the presence of the Brak River system at the site and a series of dolerite outcrops which are considered high sensitivity in comparison with the open plains of the site which are comparatively low sensitivity. This pattern is the main driver of the sensitivity of the site and the consequent development potential of the PV target areas. The major sensitive feature of the broader site is the Brak River system which has extensive silty floodplains that are occasionally inundated. Within each PV area there are also some dolerite ridges and outcrops which are considered sensitive and unsuitable for development. These occupy different proportions of each PV area and will have the greatest impact on the PV1 development area. The low-lying plains in the west of PV3 are also considered sensitive due to the movement of water through this area and its function as a seasonal wetland and area of high productivity. These constraints will result in the loss of up to half of the proposed development footprint of each facility.

Compared to the initial layouts, the final layouts provided for the assessment were significantly reduced in extent to accommodate the identified sensitivities and as a result, the final layouts are considered to represent 'mitigated' layouts which significantly reduce or avoid impact to the sensitive features of the site. This avoidance is considered a key mitigated instrumental in reducing potentially significant impacts down to an acceptable level and as a direct result of this avoidance, there are no impacts which are considered fatal flaws or likely to remain high after mitigation.

The abundance of fauna and flora species of conservation concern within the final development areas is low and impacts would be of a local nature only. Development of the

PV facilities in these lower sensitivity areas would generate low impacts which are considered acceptable. These impacts can be reduced to low significance through the recommended mitigation and avoidance measures. As a direct result of the fact that the development has been restricted to the medium and lower sensitivity parts of the site, the the development of the three PV plants at the Soventix site would generate low impacts of a local nature and of an acceptable magnitude. As such, development of the lower sensitivity parts of the site can be supported from a terrestrial ecological perspective.

8 REFERENCES

Alexander, G. & Marais, J. 2007. *A Guide to the Reptiles of Southern Africa*. Struik Nature, Cape Town.

Branch W.R. 1998. *Field guide to snakes and other reptiles of southern Africa*. Struik, Cape Town.

Du Preez, L. & Carruthers, V. 2009. *A Complete Guide to the Frogs of Southern Africa*. Struik Nature., Cape Town.

Marais, J. 2004. *Complete Guide to the Snakes of Southern Africa*. Struik Nature, Cape Town.

Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A., Hill, L., Van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L. and Nienaber, S. (2011). Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.

Mucina L. & Rutherford M.C. (eds) 2006. *The Vegetation of South Africa, Lesotho and Swaziland*. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Skinner, J.D. & Chimimba, C.T. 2005. The mammals of the Southern African Subregion. Cambridge University Press, Cambridge.

Threatened Ecosystems in South Africa: Descriptions and Maps (available on BGIS website: http://bgis.sanbi.org.

ANNEX 1. LIST OF TERRESTRIAL MAMMALS

List of mammals which are known or likely to occur in the vicinity (QDS 3024) of the Soventix PV site. Habitat notes and distribution records are based on Skinner & Chimimba (2005) and from the MammalMAP ADU database, while conservation status is from the IUCN Red Lists 2016. IUCN-listed species are highlighted. Confirmed species are those that have been observed in the QDS, as indicated by MammalMap data records.

Scientific Name	Common Name	Status	Habitat	Likelihood
Macroscledidea (Elephant Shrews):				
Macroscelides proboscideus	Round-eared Elephant Shrew	LC	Species of open country, with preference for shrub bush and sparse grass cover, also occur on hard gravel plains with sparse boulders for shelter, and on loose sandy soil provided there is some bush cover	High
Elephantulus rupestris	Western Rock Elephant Shrew	LC	Rocky koppies, rocky outcrops or piles of boulders where these offer sufficient holes and crannies for refuge.	High
Elephantulus myurus	Eastern Rock Elephant Shrew	LC	Confined to rocky koppies and piles of boulders	Moderate
Tubulentata:				
Orycteropus afer	Aardvark	LC	Wide habitat tolerance, being found in open woodland, scrub and grassland, especially associated with sandy soil	High
Hyracoidea (Hyraxes)				
Procavia capensis	Rock Hyrax	LC	Outcrops of rocks, especially granite formations and dolomite intrusions in the Karoo. Also erosion gullies	High
Lagomorpha (Hares and Rabbits):				
Lepus capensis	Cape Hare	LC	Dry, open regions, with palatable bush and grass	High
Lepus saxatilis	Scrub Hare	LC	Common in agriculturally developed areas, especially in crop-growing areas or in fallow lands where there is some bush development.	High
Pronologus saundersiae	Hewitt's Red Rock Rabbit	LC	Closely confined to rocky koppies, rocky kloofs and gorges.	High
Rodentia (Rodents):				
Cryptomys hottentotus	African Mole Rat	LC	Wide diversity of substrates, from sandy soils to heavier compact substrates such as decomposed schists and stony soils	High
Hystrix africaeaustralis	Cape Porcupine	LC	Catholic in habitat requirements.	High
Pedetes capensis	Springhare	LC	Occur widely on open sandy ground or sandy scrub, on overgrazed grassland, on the fringes of vleis and dry river beds.	High
Xerus inauris	South African Ground Squirrel	LC	Open terrain with a sparse bush cover and a hard substrate	High
Graphiurus ocularis	Spectacled Dormouse	LC	Associated with sandstones of Cape Fold mountains, which have many vertical and horizontal crevices.	High
Graphiurus murinus	Woodland Dormouse	LC	Woodland, rocky areas and shrubland within grassland areas	Low
Rhabdomys pumilio	Four-striped Grass Mouse	LC	Essentially a grassland species, occurs in wide variety of habitats where there is good grass cover.	High
Mus minutoides	Pygmy Mouse	LC	Wide habitat tolerance	High
Mastomys coucha	Southern Multimammate Mouse	LC	Wide habitat tolerance.	High
Aethomys namaquensis	Namaqua Rock Mouse	LC	Catholic in their habitat requirements, but where there are rocky koppies, outcrops or boulder-strewn hillsides they use these preferentially	High
Aethomys granti	Grant's Rock Mouse	LC	Restricted to the karoo where they are associated with rocky terrain.	High

Parotomys brantsii	Brants' Whistling Rat	LC	Associated with a dry sandy substrate in more arid parts of the Nama-karoo and Succulent Karoo. Species selects areas of low percentage of plant cover and areas with deep sands.	High
Parotomys littledalei	Littledale's Whistling Rat	LC	Riverine associations or associated with Lycium bushes or Psilocaulon absimile	Low
Otomys auratus	Southern African Vlei Rat	LC	Shrub and fynbos associations in areas with rocky outcrops Tend to avoid damp situations but exploit the semi-arid Karoo through behavioural adaptation.	High
Otomys saundersiae	Saunders' Vlei Rat	LC	Subtropical or tropical dry shrubland, Mediterranean-type shrubby vegetation, or subtropical or tropical high-altitude grassland.	High
Desmodillus auricularis	Cape Short-tailed Gerbil	LC	Tend to occur on hard ground, unlike other gerbil species, with some cover of grass or karroid bush	High
Gerbillurus paeba	Hairy-footed Gerbil	LC	Gerbils associated with Nama and Succulent Karoo preferring sandy soil or sandy alluvium with a grass, scrub or light woodland cover	High
Steatomys krebsii	Kreb's African Fat Mouse	LC	Prefer a sandy substrate.	High
Saccostomus campestris	Pouched Mouse	LC	Catholic habitat requirements, commoner in areas where there is a sandy substrate.	High
Mystromys albicaudatus	African White-tailed Rat	VU	Variable vegetation, but live in cracks or burrows in the soil	High
Malacothrix typica	Gerbil Mouse	LC	Found predominantly in Nama and Succulent Karoo biomes, in areas with a mean annual rainfall of 150-500 mm.	High
Primates:				
Papio ursinus	Chacma Baboon	LC	Can exploit fynbos, montane grasslands, riverine courses in deserts, and simply need water and access to refuges.	High
Chlorocebus pygerythrus	Vervet Monkey	Not Listed	Most abundant in and near riparian vegetation of savannahs	High
Eulipotyphla (Shrews):				
Crocidura cyanea	Reddish-Grey Musk Shrew	DDT	Occurs in relatively dry terrain, with a mean annual rainfall of less than 500 mm. Occur in karroid scrub and in fynbos often in association with rocks.	High
Crocidura fuscomurina	Bicolored Musk Shrew	DDT	Dense vegetation usually near water	High
Suncus varilla	Lesser Dwarf Shrew	DDT	Often associated with termitaria, little else known	High
Erinaceomorpha (Hedgehog)				
Atelerix frontalis	South African Hedgehog	NT	Generally found in semi-arid and subtemperate environments with ample ground cover	High
Carnivora:				
Proteles cristata	Aardwolf	LC	Common in the 100-600mm rainfall range of country, Nama-Karoo, Succulent Karoo Grassland and Savanna biomes	High
Hyaena brunnea	Brown Hyaena	NT	Nama and Succulent Karoo and the drier parts of the Grassland and Savanna Biomes	High
Caracal caracal	Caracal	LC	Caracals tolerate arid regions, occur in semi-desert and karroid conditions	High
Felis silvestris	African Wild Cat	LC	Wide habitat tolerance.	High
Felis nigripes	Black-footed cat	VU	Associated with arid country with MAR 100-500 mm, particularly areas with open habitat that provides some cover in the form of tall stands of grass or scrub.	High
Genetta genetta	Small-spotted genet	LC	Occur in open arid associations	High
Leptailrus serval	Serval	NT	Adequate cover and water are essential habitat requirements	High
Pathera pardus	Leopard	LC	Wide habitat tolerance, associated with areas of rocky koppies and hills, mountain ranges and forest	High
Suricata suricatta	Meerkat	LC	Open arid country where substrate is hard and stony. Occur in Nama and Succulent Karoo but also fynbos	High

Cynictis penicillata	Yellow Mongoose	LC	Semi-arid country on a sandy substrate	High
Herpestes pulverulentus	Cape Grey Mongoose	LC	Wide habitat tolerance	High
Vulpes chama	Cape Fox	LC	Associated with open country, open grassland, grassland with scattered thickets and coastal or semi-desert scrub	High
Canis mesomelas	Black-backed Jackal	LC	Wide habitat tolerance, more common in drier areas.	High
Otocyon megalotis	Bat-eared Fox	LC	Open country with mean annual rainfall of 100-600 mm	High
Poecilogale albinucha	African Striped Weasel	LC	Primarily a savanna species that have an annual rainfall of more than 600 mm, although they have been recorded from drier areas.	High
Ictonyx striatus	Striped Polecat	LC	Widely distributed throughout the sub-region	High
Mellivora capensis	Ratel/Honey Badger	LC	Catholic habitat requirements	High
Chitoptera (Bats):				
Tadarida aegyptica	Egyption Free-tailed Bat	LC	In arid areas. often associated with water sources	High
Neoromicia capensis	Cape Serotine	LC	Wide habitat tolerances, but often found near open water	High
Scotophilus dinganii	Yellow-bellied House Bat	LC	Savanna woodland species	High
Rumanantia (Antelope):				
Tragelaphus strepsiceros	Greater Kudu	LC	Broken, rocky terrain with a cover of woodland and a nearby water supply.	High
Sylvicapra grimmia	Common Duiker	LC	Presence of bushes is essential	High
Redunca fulvorufula	Mountain Reedbuck	LC	Dry grass-covered stony slopes hills and mountains.	High
Pelea capreolus	Grey Rhebok	LC	Associated with rocky hills, rocky mountainsides, mountain plateaux with good grass cover.	High
Antidorcas marsupialis	Springbok	LC	Arid regions and open grassland.	High
Raphicerus campestris	Steenbok	LC	Inhabits open country,	High
Oreotragus oreotragus	Klipspringer	LC	Closely confined to rocky habitat.	High

ANNEX 3. LIST OF REPTILES

List of reptiles which are likely to occur at the proposed Soventix PV site. The list is based on those which may occur at the site according to distribution maps in Branch (1998) and Alexander and Marais (2007), as well as those known from the degree square 3024 according to the SARCA database (http://vmus.adu.org.za). Status is according to the SARCA 2014 Assessment (Bates 2014).

Family	Genus	Species	Subspecies	Common name	Red list category
Agamidae	*Agama*	*aculeata*	*aculeata*	Common Ground Agama	Least Concern
Agamidae	*Agama*	*atra*		Southern Rock Agama	Least Concern
Amphisbaenidae	*Monopeltis*	*capensis*		Cape Worm Lizard	Least Concern
Colubridae	*Boaedon*	*capensis*		Brown House Snake	Least Concern
Colubridae	*Lycophidion*	*capense*	*capense*	Cape Wolf Snake	Least Concern
Colubridae	*Psammophis*	*notostictus*		Karoo Sand Snake	Least Concern
Colubridae	*Psammophis*	*trinasalis*		Fork-marked Sand Snake	Least Concern
Colubridae	*Pseudaspis*	*cana*		Mole Snake	Least Concern
Cordylidae	*Karusasaurus*	*polyzonus*		Karoo Girdled Lizard	Least Concern
Elapidae	*Aspidelaps*	*lubricus*	*lubricus*	Coral Shield Cobra	Not listed
Elapidae	*Naja*	*nivea*		Cape Cobra	Least Concern
Gekkonidae	*Chondrodactylus*	*bibronii*		Bibron's Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*capensis*		Cape Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*mariquensis*		Marico Gecko	Least Concern
Gekkonidae	*Ptenopus*	*garrulus*	*garrulus*	Common Barking Gecko	Least Concern
Lacertidae	*Pedioplanis*	*laticeps*		Karoo Sand Lizard	Least Concern
Lacertidae	*Pedioplanis*	*lineoocellata*	*lineoocellata*	Spotted Sand Lizard	Least Concern
Lacertidae	*Pedioplanis*	*lineoocellata*	*pulchella*	Common Sand Lizard	Least Concern
Lacertidae	*Pedioplanis*	*namaquensis*		Namaqua Sand Lizard	Least Concern
Leptotyphlopidae	*Leptotyphlops*	*scutifrons*	*scutifrons*	Peters' Thread Snake	Not listed
Pelomedusidae	*Pelomedusa*	*subrufa*		Marsh Terrapin	Least Concern
Scincidae	*Trachylepis*	*capensis*		Cape Skink	Least Concern
Scincidae	*Trachylepis*	*occidentalis*		Western Three-striped Skink	Least Concern
Scincidae	*Trachylepis*	*sulcata*	*sulcata*	Western Rock Skink	Least Concern
Scincidae	*Trachylepis*	*variegata*		Variegated Skink	Least Concern
Testudinidae	*Homopus*	*femoralis*		Greater Padloper	Least Concern
Testudinidae	*Psammobates*	*tentorius*	*verroxii*	Verrox's Tent Tortoise	Not listed
Testudinidae	*Stigmochelys*	*pardalis*		Leopard Tortoise	Least Concern
Typhlopidae	*Rhinotyphlops*	*lalandei*		Delalande's Beaked Blind Snake	Least Concern
Varanidae	*Varanus*	*albigularis*	*albigularis*	Rock Monitor	Least Concern
Viperidae	*Bitis*	*arietans*	*arietans*	Puff Adder	Least Concern

ANNEX 4. LIST OF AMPHIBIANS

List of amphibians which are likely to occur in the vicinity of the Soventix PV site. Habitat notes and distribution records are based on Du Preez and Carruthers (2009) and the FrogMap database, while conservation status is from the IUCN Red Lists 2014.

Family	Genus	Species	Common name	Red list category
Brevicepitidae	*Breviceps*	*adspersus*	Bushveld Rain Frog	Least Concern
Bufonidae	*Poyntonophrynus*	*vertebralis*	Southern Pygmy Toad	Least Concern
Bufonidae	*Vandijkophrynus*	*gariepensis*	Karoo Toad	Least Concern
Hyperoliidae	*Kassina*	*senegalensis*	Bubbling Kassina	Least Concern
Pipidae	*Xenopus*	*laevis*	Common Platanna	Least Concern
Pyxicephalidae	*Amietia*	*angolensis*	Common or Angola River Frog	Least Concern
Pyxicephalidae	*Amietia*	*fuscigula*	Cape River Frog	Least Concern
Pyxicephalidae	*Cacosternum*	*boettgeri*	Common Caco	Least Concern
Pyxicephalidae	***Pyxicephalus***	***adspersus***	**Giant Bull Frog**	**Near Threatened**
Pyxicephalidae	*Tomopterna*	*cryptotis*	Tremelo Sand Frog	Least Concern
Pyxicephalidae	*Tomopterna*	*tandyi*	Tandy's Sand Frog	Least Concern