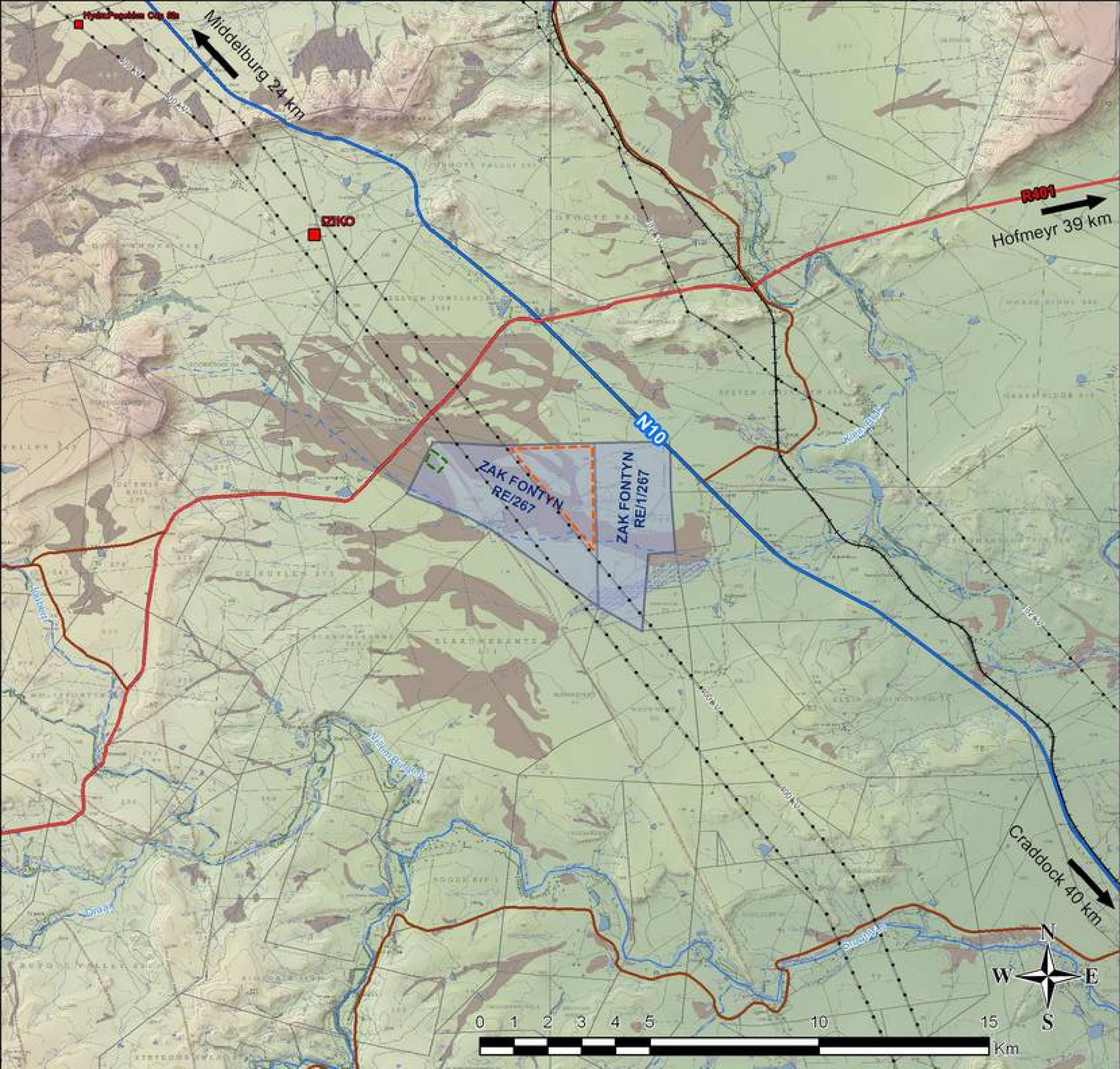
Appendix A:
Site Plan

RODICON SOLAR ENERGY FACILITY

Locality Map



Legend

- National Road
- Regional Road
- Secondary Road
- Railway Line
- Perennial River
- Non-perennial River
- Power Line
- Distribution Substation
- Transmission Substation
- Farm portions
- Iziko Solar Energy Facility
- Rodicon Solar Energy Facility

Savannah ENVIRONMENTAL (PTY) LTD

MetroGIS

Appendix B:
Photo Record(s)

PLATE 01: EAST OF THE R401

PLATE 02: NORTH EAST OF THE R401

PLATE 03: NORTH WEST OF THE R401

PLATE 04: NORTH OF THE R401

PLATE 05: SOUTH EAST OF THE R401

PLATE 06: SOUTH WEST OF THE R401

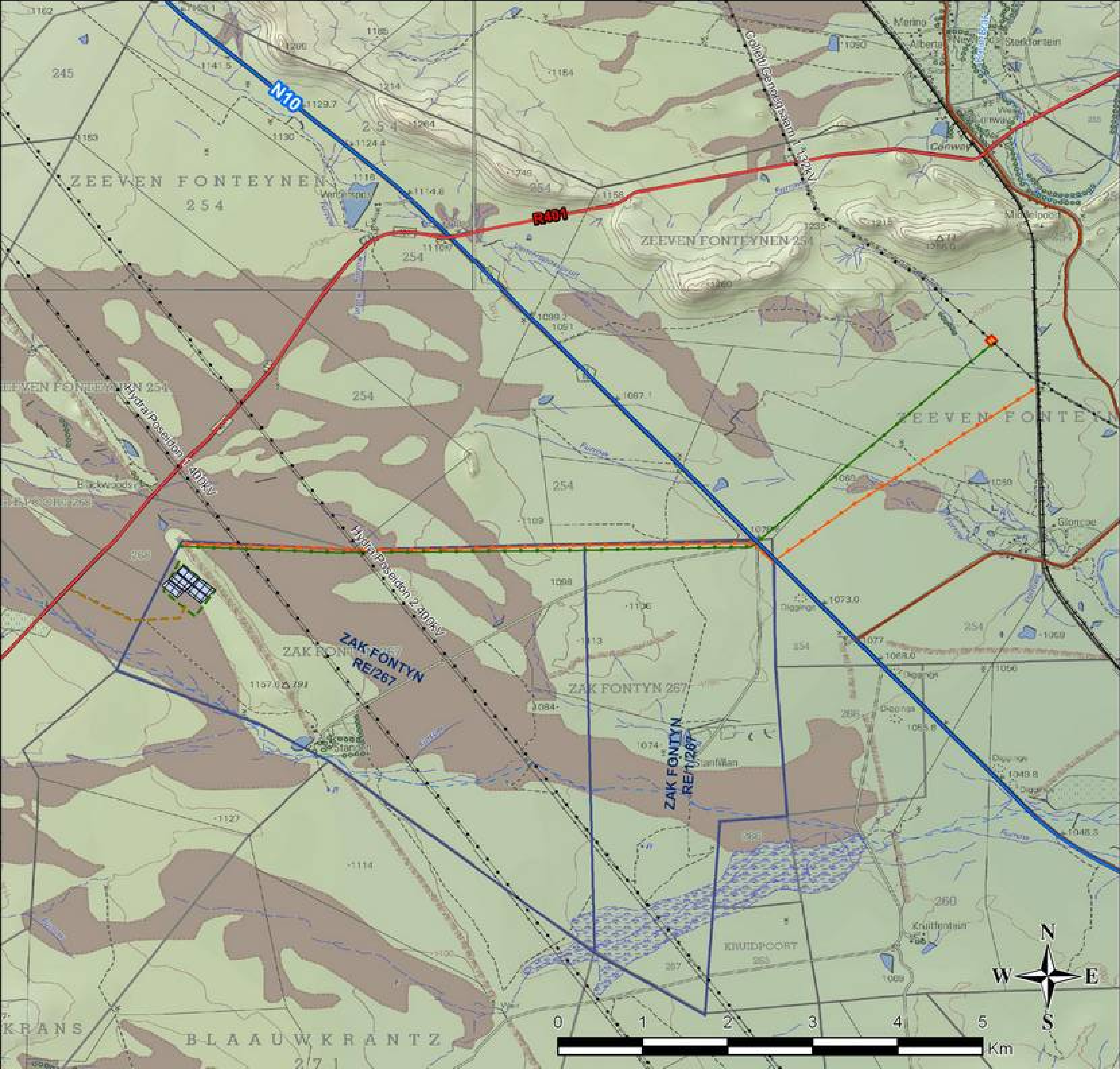
PLATE 07: SOUTH OF THE R401

PLATE 08: WEST OF THE R401

Appendix C:
Facility Illustration(s)

Rodicon Solar Energy Facility

Layout Map



Legend

- National Road
- Regional Road
- Secondary Road
- Railway Line
- Perennial River
- Non-perennial River
- Existing Power Line
- Farm portions

Layout

- 132kV preferred connection
- 132kV alternative connection
- Access road
- Eskom Genoegsaam substation (132kV)
- PV arrays
- Rodicon Solar Energy Facility

Appendix D: Specialist Studies

Appendix D1: Ecology Study
Appendix D2: Agricultural Potential Study
Appendix D3: Heritage Resources Study
Appendix D4: Visual Aesthetics Study

Appendix D1:

Ecology Study

BY

Ecotrust cc

Dr Gretel van Rooyen, Helga van der Merwe & Noel van Rooyen

BASIC ASSESSMENT REPORT:

SPECIALIST ECOLOGICAL STUDY FOR THE PROPOSED RODICON SOLAR ENERGY FACILITY SOUTHEAST OF MIDDELBURG, EASTERN CAPE

Ekotrust cc

CK 90/10465/23

Drs Gretel van Rooyen, Helga van der Merwe
&
Noel van Rooyen

23 April 2012

EXECUTIVE SUMMARY

Ecotrust CC has been appointed by Savannah Environmental (Pty) Ltd to conduct an ecological assessment for the proposed Rodicon Solar Energy facility on a portion of the farm Zak Fontyn 267, which is located approximately 40 km southeast of Middelburg in the Eastern Cape. The proposed photovoltaic (PV) solar facility lies in the northwestern corner of the property and covers approximately 20 hectares. The location of the proposed substation (if applicable), route from the site to the existing power lines and access road were not provided.

A site visit was conducted in April 2012. The approximately 20 ha area on which the proposed development is to take place was surveyed in detail as well as the area assumed to be associated with the additional infrastructure such a substation, power line and access road.

The study site falls into the Eastern Upper Karoo vegetation type but the Tarkastad Montane Shrubland, Karoo Escarpment Grassland and Southern Karoo Riviere (Mucina & Rutherford, 2006) are also found in the vicinity of the proposed site for the Rodicon Solar Energy facility. All four vegetation types have a Least Threatened status with between 1 and 3% transformed. The April 2012 field survey revealed that four plant communities could be differentiated on site and another community on the dolerite ridge next to the site. Community 4, the *Eriocephalus ericoides — Sporobolus fimbriatus* mixed grassland, is situated on the slopes of the dolerite ridge in the east of the site and is the only section of the site which is regarded as sensitive. The communities on the flat terrain are not rated as sensitive and most of the plant species occurring within these communities are common for the region.

Species lists generated for the 3125CC quarter degree grid for plant and animal species were supplemented with data from other relevant sources including Red Data and CITES lists. These lists indicated that various species of conservation significance occurred in this quarter degree grid. No protected trees were encountered on the site, and the only TOPS listed plant species/CITES II listed plant species was an *Euphorbia* sp. (*Euphorbia* cf. *rectirama)*. Animal species that could potentially occur on the Rodicon Solar Energy site with a threatened Red Data status or CITES listing included: black-footed cat (VU, CITES II), African wild cat (CITES II), white-tailed mouse (EN), leopard (NT, CITES I), aardwolf (CITES III), blue crane (VU, CITES II), tawny eagle (CITES II), Verreaux's eagle (CITES II), black stork (CITES II), black harrier (VU), blue bustard (NT), lesser kestrel (CITES II), rock kestrel (CITES II), greater kestrel (CITES II), martial eagle (NT) and secretary bird (VU).

Generally, the proposed solar facility site is not located in a highly sensitive area and the vegetation and habitat of the site extends into the surrounding environment. The sensitive community on the slope of the dolerite ridge could easily be avoided by a slight re-positioning of the eastern part of the site. The duplex soils found in the area are highly erodible, thus if the vegetation is removed or disturbed during construction due care will have to be taken to prevent erosion. It is suggested that a re-vegetation plan is compiled to ensure the return of an indigenous vegetation cover as soon as possible.

The strict adherence to the suggested mitigation measures should limit impacts on the environment and limit the development footprint of the proposed Rodicon solar facility. These mitigating measures will reduce the impact of the development on the natural vegetation and faunal component as well as reduce the impact of declared weedy and alien invasive species establishing on disturbed or denuded sites. The most crucial mitigation measures would be: (1) to minimise large-scale clearance of the natural vegetation and disturbance at the proposed 20 ha site; (2) to relocate the site slightly so as to avoid disturbing the vegetation on the dolerite ridge; (3) to use existing and dedicated access roads to limit disturbance of the natural vegetation; (4) minimise damage to the natural vegetation during the construction of the substation (if applicable), power lines and access road; (5) re-vegetate the disturbed areas as soon as possible with indigenous vegetation; (6) prevent soil erosion from the site; (7) monitor and control the spread of declared weedy and alien invasive plant species; (8) mark power lines clearly with 'flappers' during the construction phase; and (9) prevent any negative impact on the drainage system and hydrological processes in the area.

TABLE OF CONTENTS

GENERAL INFORMATION

Project:

Proposed Rodicon Solar Energy Facility (Pty) Ltd

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The *Curriculum Vitae* and summary of expertise of the compilers are attached as Appendices C, D and E in the document.

Affiliation (Gretel van Rooyen):

- South African Association of Botanists

Affiliation (Helga van der Merwe):

- South African Council for Natural Scientific Professions (SACNASP) (Pr.Sci.Nat; Registration no. 400193/10).

- Golden Key International Honour Society – Membership upon invitation, granted to the 15% of academic achievers in their field of study. Membership number – 6790927.
- South African Association of Botanists
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Affiliation (N van Rooyen):

- South African Council for Natural Scientific Professions (SACNASP) (Pr.Sci.Nat; Registration no. 401430/83).
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- South African Wildlife Management Association (SAWMA)

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on behalf of:

Rodicon Solar Energy Facility (Pty) Ltd

REGULATIONS GOVERNING THIS REPORT

In terms of the EIA Regulations under the National Environmental Management Act, (Act No. 107 of 1998 (NEMA) the proposed development is governed by this legislation. A Basic Assessment study was commissioned in accordance with Chapter 3: Regulation 22 (Government Notice GN R543 of 2010).

Appointment of specialist

Savannah Environmental (Pty) Ltd appointed Ekotrust cc to conduct an ecological assessment for the proposed Rodicon Solar Energy facility to be erected on a portion of the farm Zak Fontyn 267, which is located approximately 40 km southeast of Middelburg in the Eastern Cape. The consulting services comprise an assessment of the potential impacts of the proposed facility on the environment, vegetation and fauna and specialist input for inclusion in the draft Environmental Management Plan.

Company profile:

Name of Company: Ekotrust cc
(Registration number: CK90/05465/23)
Sole Member: Dr Noel van Rooyen
Founding date: 1990

Ekotrust cc specializes in habitat evaluation, vegetation classification and mapping, floristic diversity assessments, rare species assessments, alien plant assessment and management, wildlife management, wildlife production and economic assessments, veld condition assessment, bush encroachment, fire management, carrying capacity, wildlife species numbers and ratios. More than 270 assignments and reports have been completed over a period of more than 30 years.

Declaration of independence

A signed declaration of independence for Drs Gretel van Rooyen, Helga van der Merwe and Noel van Rooyen are attached as Appendix F, G and H.

Indemnity and conditions relating to this report

The observations, findings, recommendations and conclusions provided in the current report are based on the compilers' best scientific and professional knowledge and other available information. If new information should become available the compilers reserve the right to modify aspects of the report. This report (hard copy and/or electronic) must not be amended or extended without the prior written consent of the authors. Furthermore, any recommendations, statements or conclusions drawn from or based on this report must make reference to the report. If these recommendations, statements or conclusions form part of a main report relating to the current investigation, this report must be included in its entirety.

Although the compilers have exercised due care in preparing this report, they accept no liability, and by receiving this document, the client indemnifies Ekotrust cc and the compilers of the report against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, and by the use of the information contained in this document.

Scope and purpose of report

The scope and purpose of the report are summarised in the "Terms of Reference" section of this report.

TERMS OF REFERENCE

The terms of reference were to conduct an ecological assessment of the vegetation, fauna and environment on the proposed Rodicon Solar Energy facility and associated infrastructure on a portion of the farm Zak Fontyn 267, which is located approximately 40 km south of Middelburg in the Eastern Cape. The report must include:

- 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;
- An explanation of assumptions, uncertainties and gaps in knowledge;
- Methodology used in determining the significance of the potential environmental impacts;
- A description and evaluation of all environmental issues that were identified (i.e. direct, indirect and cumulative impacts of the identified issues);
- An assessment of the significance of direct, indirect and cumulative impacts in terms of given criteria;
- If applicable, a description and comparative assessment of all alternatives identified;
- Recommendations regarding practical mitigation measures for potentially significant impacts for inclusion in the Environmental Management Programme; and
- An environmental impact statement reflecting the key findings, the positive and negative implications of the proposed activity or possible alternatives.

1. INTRODUCTION

Ecotrust CC has been appointed by Savannah Environmental (Pty) Ltd to conduct an ecological assessment for the proposed Rodicon Solar Energy facility on a portion of the farm Zak Fontyn 267, which is located approximately 40 km southeast of Middelburg in the Eastern Cape. The proposed activity is for the establishment of a photovoltaic (PV) solar energy facility (on approximately 20 hectares) and associated infrastructure.

A site visit was conducted by Drs Gretel van Rooyen and Helga van der Merwe in April 2012. An approximately 20 ha area on which the proposed facility is to be constructed was surveyed in detail as well as the area assumed to be associated with the additional infrastructural development such as the power line and access road. This report, prepared for Savannah Environmental (Pty) Ltd on behalf of Rodicon Solar Energy (Pty) Ltd, presents the findings of the field survey and desktop study as well as an assessment of the significance of the impacts of the proposed activity on the environment.

2. ASSUMPTIONS

The following assumptions, limitations or uncertainties are listed regarding the ecological assessment of the proposed Rodicon Solar Energy facility

- The Rodicon Solar Energy site on which the photovoltaic panels will be constructed covers an area of approximately 20 ha.
- The approximate corners of the 20 ha site were derived from the satellite image supplied by Savannah Environmental (Pty) Ltd and were taken as:

Northwest S 31° 46′ 54.66″; E 25° 13′ 01.47″
Northeast S 31° 46′ 43.42″; E 25° 13′ 07.49″
Southwest S 31° 47′ 03.41″; E 25° 13′ 13.61″
Southeast S 31° 46′ 54.49″; E 25° 13‘ 21.25″

- The farm boundaries were not provided. It was assumed that the development would be on a portion of the farm Zak Fontyn 267.
- The location of an existing substation, or whether one is to be erected on site, was not available at the time of the field surveys or while compiling the report.
- The transect along which the power line will run from the facility to the existing Eskom power line to the east of the site or to an existing substation was not communicated to us.
- The exact location of the access road to the proposed Rodicon site was not indicated. It is presumed that the access road will be from the R701 along the already existing farm track leading to the site.
- Likewise, the exact location of the workshop area was not provided. It was presumed that it would be contained within the 20 ha site.
- It is furthermore assumed that the vegetation will be cleared and the soil levelled in order to construct the necessary foundations on which the photovoltaic panels will be mounted.
- Rare and threatened plant and animal species are generally uncommon and/or localised and the once-off survey may fail to locate such species. However, suitable habitat for such species in the area could be indicated.
- It is assumed that the dominant plant species present on the proposed 20 ha Rodicon development site would be encountered in the once-off field survey in April 2012 since April is considered an appropriate time of the year in which to conduct field surveys in this part of the Nama Karoo.
- The assumptions made and constraints that were prevalent did not have any significant negative implications on the study.

3. METHODOLOGY

3.1 Field surveys

3.1.1 Vegetation

Available information on the vegetation and flora in the vicinity of the 20 ha Rodicon Solar Energy facility as well as environmental parameters, such as climate, topography, drainage, geology, land types and soils, were collected as part of a desktop study. This information was used to guide the methods used to conduct the study.

The Google Earth satellite image of the proposed approximately 20 ha site was stratified into relatively homogeneous physiographic units on the basis of the vegetation cover and topography using the colour and texture of the image to aid the stratification. This stratification was used to determine the position and number of sample plots, and is the basis for identifying habitat types and to produce a vegetation map. Vegetation surveys were conducted throughout the ≈20 ha site in the different homogeneous stratified units. All identifiable plant species encountered at these sampling sites were recorded. Physical habitat features, e.g. geology, topography, soil colour and texture, and rock cover, were noted. A preliminary plant species checklist for the site was compiled which was used to determine the conservation status of the species in the area and to formulate recommendations. Alien plant species were also included in the list.

3.1.2 Fauna

During the field surveys faunal species were noted. Checklists of fauna that could potentially occur in the study site were assembled from various databases such as SIBIS:SABIF Integrating Biodiversity Information, SABAP lists and Red Data lists. Additionally, relevant literature was consulted.

3.2 Data analysis

A classification of the vegetation data was done with the TURBOVEG and MEGATAB computer programmes (Hennekens & Schaminee, 2001), which includes the TWINSPAN (Hill, 1979) divisive clustering technique. A differential table was compiled and the different plant communities were described and mapped. All plant species recorded in the sample plots are listed in the differential table. An additional plant species checklist of the 3125CC quarter degree grid was obtained from the SIBIS database of the South African National Biodiversity Institute.

The conservation status of each species on the provisional plant species checklist and fauna checklists was determined using various methods. Gazetted legislation as well as Red Data lists were consulted for species of conservation importance. These lists include the Red Data lists of southern African plants compiled by Hilton-Taylor (1996a, 1996b, 1997), the Southern African Plant Red Data list of Golding (2002), the Red List of South African Plants (Raimondo *et al.* 2009), the IUCN Red List of Threatened Species (Version 2011.2, downloaded 10 April 2012). Gazetted legislation consulted included the protected trees according to the National Forests Act (Act no. 84 of 1998), the threatened and protected species list (TOPS list) of the National Environmental Management: Biodiversity Act, (Act No. 10 of 2004) (NEMA:BA), CITES appendices, Government Notice No. 1002 of 2011 (Draft National list of ecosystems that are threatened and in need of protection, GNR 151 (Critically endangered, vulnerable and protected species list) and GNR 1187 (Amendment of critically endangered, endangered, vulnerable and protected species list). Declared weedy and alien invasive plant species were classified in terms of the Conservation of Agricultural Resources Act (Act 43 of 1983) and its amendments and NEMA:BA.

3.3 Methodology for impact assessment

The Environmental Impact Assessment methodology assists in the evaluation of the overall effect of a proposed activity on the environment. This includes an assessment of the significant direct, indirect, cumulative and residual impacts. The significance of environmental impacts is to be assessed by means of the criteria of extent (scale), duration, magnitude (severity), probability (certainty) and direction (negative, neutral or positive).

3.3.1 Nature

The nature of the impact refers to the causes of the effect, what will be affected and how it will be affected.

3.3.2 Extent (E) of impact

Two different states are recognized:

Local (site or surroundings)

Regional (provincial)

Rating = 1 (low) to 5 (high).

3.3.3 Duration (D)

The rating for duration (D) is awarded as follows:

Whether the life-time of the impact will be:

- Rating = 1: Very short term – up to 1 year
- Rating = 2: Short term – >1 – 5 years

- Rating = 3: Medium term - >5 – 15 years
- Rating = 4: Long term – >15 years
  The impact will occur during the operational life of the activity, and recovery may occur with mitigation (restoration and rehabilitation).
- Rating = 5: Permanent
  The impact will destroy the ecosystem functioning and mitigation (restoration and rehabilitation) will not contribute in such a way or in such a time span that the impact can be considered transient.

*3.3.4 **Magnitude (M)** (severity):*

A rating for Magnitude (M) is awarded to each impact as follows:

- Rating = 0: Small impact – the ecosystem pattern, process and functioning are not affected.
- Rating = 2: Minor impact - a minor impact on the environment and processes will occur.
- Rating = 4: Low impact - slight impact on ecosystem pattern, process and functioning.
- Rating = 6: Moderate intensity – valued, important, sensitive or vulnerable systems or communities are negatively affected, but ecosystem pattern, process and functions can continue albeit in a slightly modified way.
- Rating = 8: High intensity – environment affected to the extent that the ecosystem pattern, process and functions are altered and may even temporarily cease. Valued, important, sensitive or vulnerable systems or communities are substantially affected.
- Rating = 10: Very high intensity – environment affected to the extent that the ecosystem pattern, process and functions are completely destroyed and may permanently cease.

*3.3.5 **Probability (P)** (certainty):*

The probability (P) describes the probability or likelihood of the impact actually occurring, and is rated as follows:

- Rating = 1: Very improbable – where the impact will not occur, either because of design or historic experience.
- Rating = 2: Improbable – where the impact is unlikely to occur (some possibility), either because of design or historic experience.

- Rating = 3: Probable - there is a distinct probability that the impact will occur (<50% chance of occurring).
- Rating = 4: Highly probable - most likely that the impact will occur (50 – 90% chance of occurring).
- Rating = 5: Definite – the impact will occur regardless of any prevention or mitigating measures (>90% chance of occurring).

3.3.6 Significance (S)

The rating can be low, medium or high. The significance is determined through a synthesis of the characteristics described above where:

S = (E+D+M)*P

The **significance weighting** should influence the development project as follows:

- Low significance (significance weighting: <30 points)

If the negative impacts have little real effects it should not have an influence on the decision to proceed with the project. In such circumstances there is a significant capacity of the environmental resources in the area to respond to change and withstand stress and they will be able to return to their pre-impacted state within the short-term.

- Medium significance (significance weighting: 30 – 60 points)

If the impact is negative it implies that the impact is real and sufficiently important to require mitigation and management measures before the proposed project can be approved. In such circumstances there is a reduction in the capacity of the environmental resources in the area to withstand stress and to return to their pre-impacted state within medium to long-term.

- High significance (significance weighting: >60 points)

The environmental resources will be destroyed in the area leading to the collapse of the ecosystem pattern, process and functioning. The impact strongly influences the decision whether or not to proceed with the project. If mitigation cannot be effectively implemented, the proposed activity should be terminated.

4. LEGISLATION

In the context of this basic assessment the following acts were relevant.

4.1 National Environmental Management Act (NEMA)(Act No. 107 of 1998)

NEMA requires that measures be taken that ”prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.” In addition NEMA requires that: (1) that the disturbance of ecosystems and loss of biological diversity are avoided, or where they cannot be altogether avoided, are minimised and remedied, (2) that a risk–averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions, and (3) sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

NEMA states that the environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people’s common heritage.

Section 53 of NEMA:BA lists the **terrestrial ecosystems** which are threatened and Section 56 of NEM:BA makes provision for the listing of **species** that are of such high conservation value, national importance or threatened that they need protection, e.g. critically endangered species, endangered species, vulnerable species and protected species.

4.2 Environment Conservation Act (ECA) (No 73 of 1989 Amendment Notice No. R1183 of 1997)

This Act provides for the effective protection and controlled utilisation of the environment. This Act has been largely repealed by NEMA, but certain provisions remain, in particular provisions relating to environmental impact assessments. The ECA requires that developers must undertake Environmental Impact Assessments (EIA) for all projects listed as a Schedule 1 activity in the EIA regulations. Such activities will only be permitted with written authorisation from a competent authority.

4.3 National Environmental Management Act: Biodiversity Act (NEM:BA) (Act No. 10 of 2004) and amendments

NEMBA places the responsibility on the developer for (1) the conservation of endangered ecosystems and restricts activities according to the categorisation of an area, (2) promotes the appropriate use of environmental management tools to ensure that development is sustainable and protects biodiversity, and (3) limits further loss of biodiversity and conserves endangered ecosystems. Activities are restricted in terms of threatened and protected species while invasive species must be controlled and eradicated.

4.4 Draft National list of ecosystems that are threatened and in need of protection (Government Notice No. 1002 of 2011)

The list provides for the listing of threatened or protected ecosystems based on national criteria and dictates environmental authorisation required.

4.5 National Forests Act (NFA) (Act No. 84 of 1998) and amendments

This law states that no person may cut, disturb, damage or destroy (or remove) any protected tree listed as protected, except under a licence granted by the Minister. The NFA also makes provision for the declaration of specially protected areas, forest nature reserves, forest wilderness areas and protected woodlands. A list of Protected Trees is provided in the act.

4.6 National Veld and Forest Fire Act (Act No. 101 of 1998)

This act aims to prevent veld fires through firebreaks and requires fire-fighting measures to be implemented.

4.7 Conservation of Agricultural Resources Act (CARA) (Act No. 43 of 1983) and amendments

CARA provides for the conservation of the natural agricultural resources by the maintenance of the production potential of the land, by combating and prevention of erosion and weakening or destructing the water resources, and by protecting the vegetation and combating weeds and invader plants. This act classifies alien species into three categories. Category 1 plants may not occur on any land or inland water surface other than in biological control reserves, while Category 2 plants may not occur on any land or inland water surface other than a demarcated area or in a biological control reserve. A permit has to be obtained for keeping Category 2 plant species in a demarcated area. Category 3 includes ornamental plants that may no longer be planted but existing plants may remain (except within the flood line of water courses and wetlands) provided that all reasonable steps are taken to prevent the spreading thereof.

4.8 National Water Act (NWA) (Act No. 36 of 1998) and amendments

Wetlands, riparian zones and water courses are defined as water resources by the Water Act and any activities that are contemplated that could affect the wetlands require authorisation.

4.9 National Environmental Management Act: Protected Areas Act (NEM:PAA) (Act No. 57 of 2003)

This act aims to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; for the establishment of a national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards; for intergovernmental co-operation and public consultation in matters concerning protected areas; and for matters in connection therewith.

5. STUDY AREA

5.1 Locality

The proposed Rodicon Solar Energy photovoltaic (PV) facility is located on a portion of the farm Zak Fontyn 267, which is situated approximately 40 km southeast of Middelburg in the Eastern Cape. The site is located west of the N10 linking Middelburg and Cradock and southeast of the R701. The proposed solar facility lies in the northwestern corner of the property (Figure 1). The GPS coordinates of the corners of the site were:

Northwest	S 31° 46′ 54.66″; E 25° 13′ 01.47″
Northeast	S 31° 46′ 43.42″; E 25° 13′ 07.49″
Southwest	S 31° 47′ 03.41″; E 25° 13′ 13.61″
Southeast	S 31° 46′ 54.49″; E 25° 13‵ 21.25″

Figure 1. Location of the Rodicon Solar Energy site (indicated in white) on the farm Zak Fontyn 267 (indicated in red).

5.2 Topography

Level plains with some relief dominate the entire landscape in the environs of the proposed solar energy facility and the region falls in the Q14E tertiary catchment. The Rodicon site lies predominantly on level terrain, but the eastern portion of the site lies at the foot of a low dolerite ridge and has a slight slope with a westerly aspect (Figures 1 & 2). The site and surrounding environment drains into a stream/wetland system located to the west of the site (Figures 1 & 2). A farm track leads up to the southwestern corner of the site where a windmill and dam are located (Figure 3).

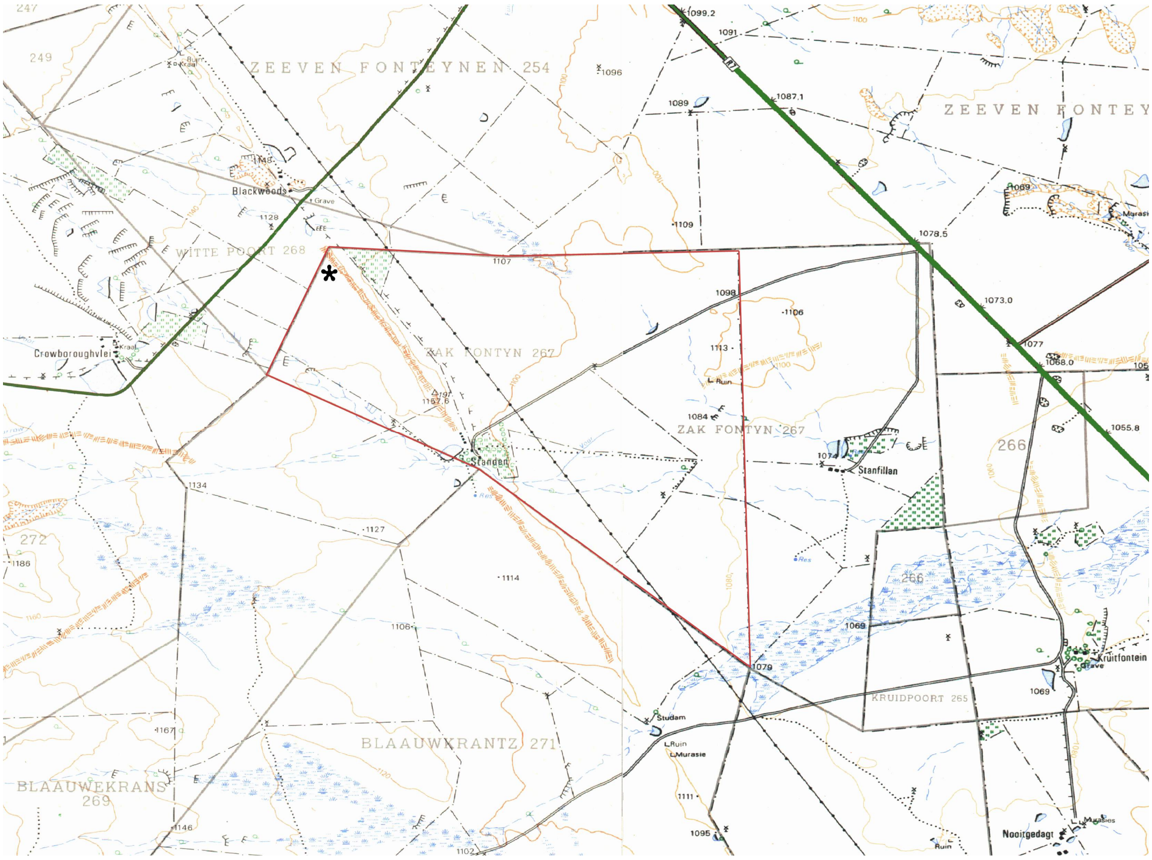

Figure 2. A map indicating the general topography of the Rodicon Solar Energy site (marked with a black star) and surrounding environment.

Figure 3. Detail of the ≈20 ha site for the proposed Rodicon Solar Energy facility. Note the dolerite ridge to the east of the site.

5.3 Geology, land types and soils

Geologically, the region is underlain by sedimentary rocks. The proposed Rodicon Solar Energy site lies on a transition between Quaternary alluvial deposits, and red, purple, grey and bluegreen mudstone and subordinate sandstone of the Adelaide Subgroup, Beaufort Group, Karoo Supergroup. A dolerite intrusion occurs to the east of the site (Figure 4).

Land Type Da dominates on the entire farm and on the proposed site (Figure 5). Within the Da Land type duplex soils with red B horizons comprise more than half of the area. Due to the high clay content the soils at the site were not well drained. These duplex soils are highly erodible, thus if the vegetation is removed or disturbed during construction due care will have to be taken to prevent erosion.

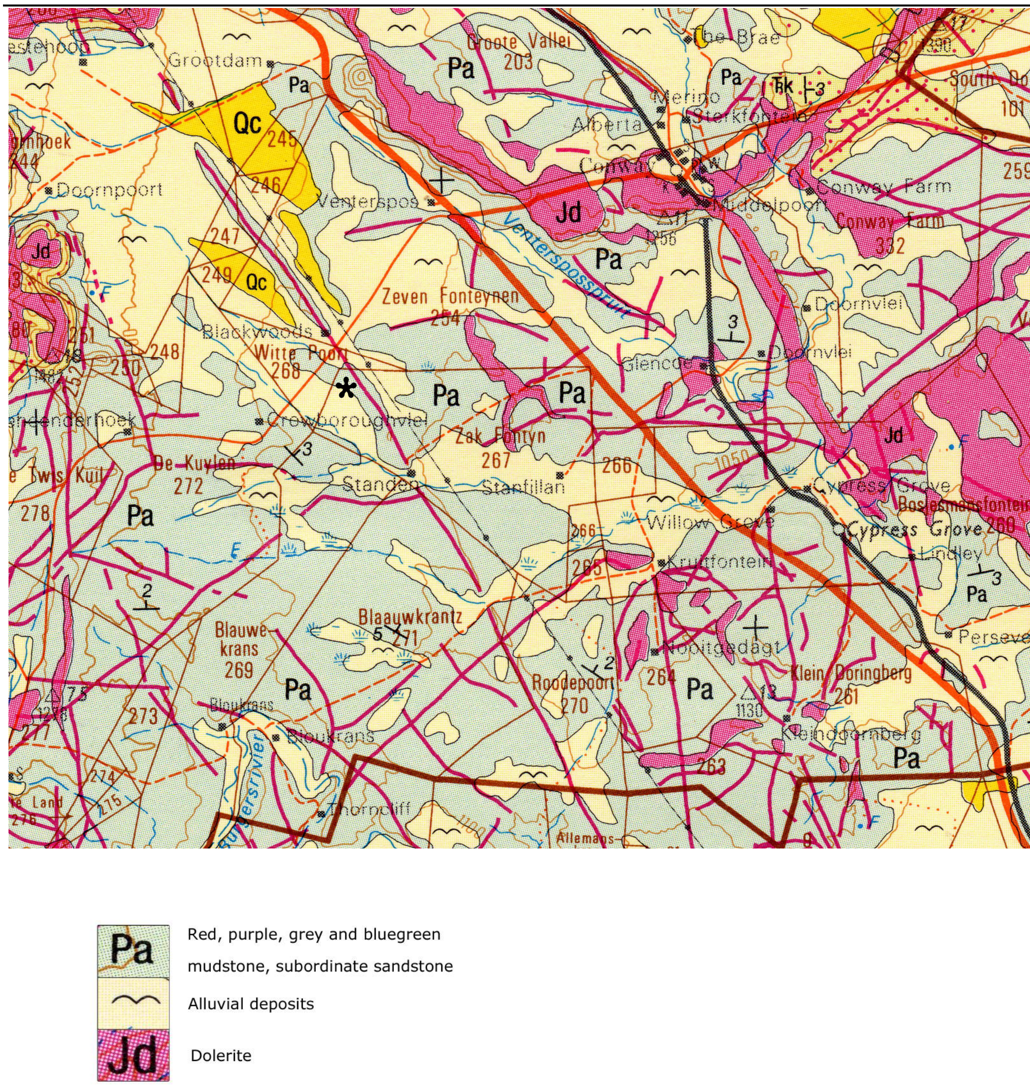

Figure 4. The geology in the environment of the proposed Rodicon Solar Energy facility (marked with a black star).

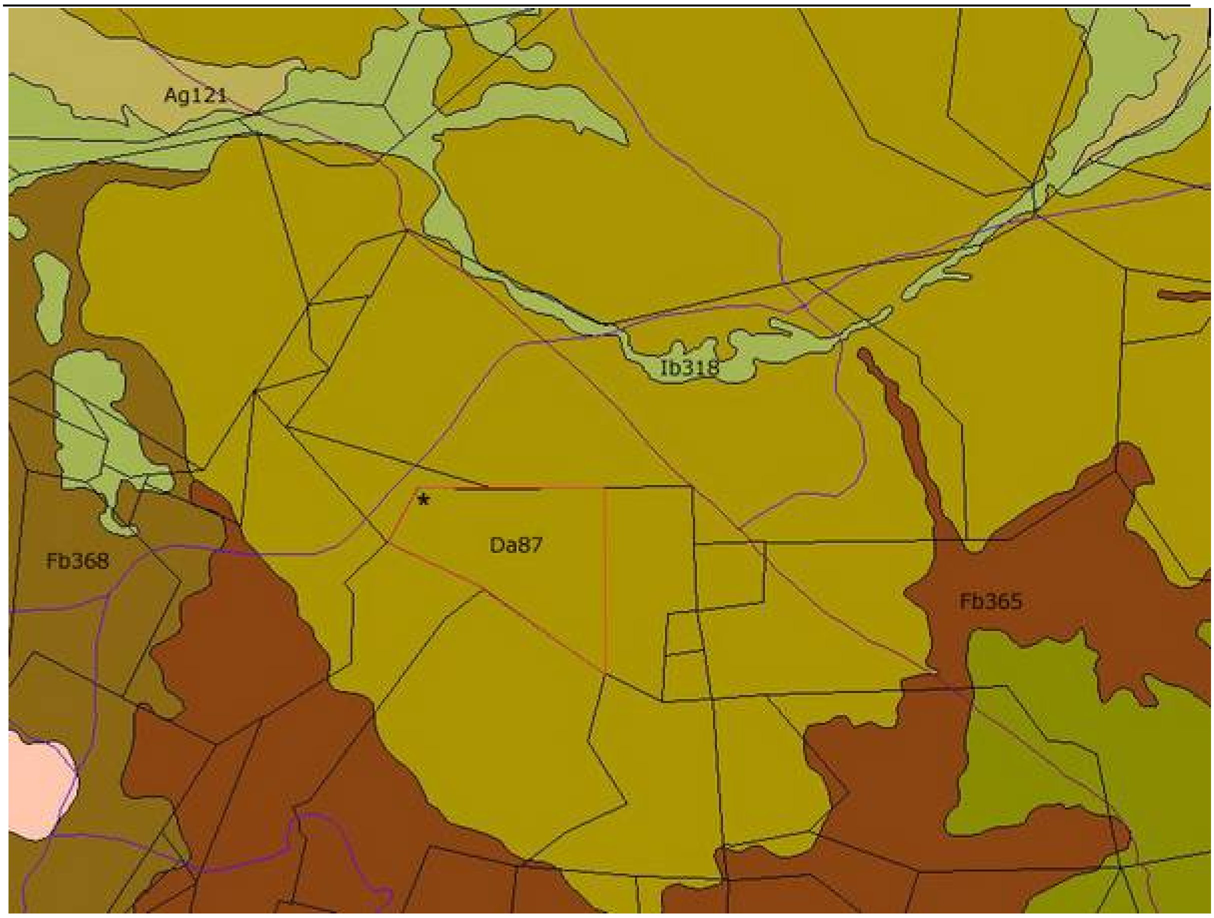

Figure 5. Land types found on the proposed site of the Rodicon Solar Energy facility (indicated with a black star).

5.4 Climate

The proposed Rodicon Solar Energy site falls in the summer rainfall region. Rains fall mainly in summer and autumn with the rainfall peaking in February and March (Figure 6, Table 1). Mean annual precipitation ranges from 372 mm at Grootfontein Agricultural Station to 458 mm at Hillside (Table 1). The maximum rainfall recorded at Grootfontein Agricultural Station in 24 hours was in March (93 mm), while the highest monthly maximum recorded for that station was 178 mm, recorded in January (Table 2). Mean maximum temperature for the Grootfontein Agricultural Station (Table 3) is 30.4°C for the warmest month, January, and a mean minimum temperature of 0.1°C for the coldest month, July. The extreme maximum of 38.8°C was recorded in January and an extreme minimum of -10.3°C was recorded in August (Table 3).

Table 1. Rainfall (mm) at a number of rainfall stations in the vicinity of Middelburg

Months	1	2	3	4	5	Mean
Jan	47	65	55	47	69	56.5
Feb	53	76	95	76	56	71.2
Mar	67	84	77	74	79	76.2
Apr	33	56	52	47	35	44.6
May	14	30	27	20	20	22.2
Jun	13	18	14	12	10	13.4
Jul	13	13	8	8	5	9.4
Aug	17	22	14	20	9	16.4
Sep	11	7	7	10	24	11.8
Oct	27	30	29	32	20	27.6
Nov	38	22	25	27	61	34.6
Dec	39	33	35	33	70	42.0
Year	372	456	438	406	458	426.0

1 = Grootfontein (31° 29′ S, 25° 02′ E; 1270 m) (1961 - 1990)
2 = Platokamp (31° 5′ S, 25° 43′ E; 1582 m) (1965 – 1975)
3 = Gariep Dam (30° 37′ S, 25° 30′ E; 1212 m) (1964 – 1990)
4 = Oviston (30° 42′ S, 25° 46′ E; 1294 m) (1864 – 1981)
5 = Hillside (30° 15′ S, 25° 8′ E; 1514 m) (1953 – 1958)

Table 2. Maximum rainfall (mm) in 24 hours, highest maximum and lowest monthly minimum rainfall at Grootfontein (31° 29′ S, 25° 02′ E; 1270 m) (1961 - 1990)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
*Max	51	51	93	41	29	33	34	69	38	28	50	41	93
*High	178	157	143	108	63	57	56	89	85	93	95	129	569
*Low	1	0	5	2	0	0	0	0	0	0	2	1	235
*Mean	47	53	67	33	14	13	13	17	11	27	38	39	372

*Maximum = maximum rainfall recorded in 24 hours (mm)
*High = highest monthly maximum rainfall (mm)
*Low = lowest monthly maximum rainfall (mm)
*Mean = mean monthly and annual rainfall (mm)

Table 3. Temperature data (°C) for Grootfontein (31° 29′ S, 25° 02′ E; 1270 m) (1961 - 1990)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Max	30.4	28.9	26.4	22.4	19.0	16.0	16.5	18.5	22.1	24.3	27.0	29.4	23.4
*Max	38.8	38.0	35.9	32.5	28.9	25.3	24.5	28.1	34.3	35.3	36.0	38.1	38.8
Min	13.1	12.9	11.1	7.1	3.4	0.6	0.1	1.7	4.4	6.9	9.4	11.5	6.9
*Min	4.2	1.2	-0.4	-4.0	-7.8	-10.0	-10.2	-10.3	-6.9	-5.5	-0.9	1.3	-10.3
Mean	21.7	20.9	18.8	14.8	11.2	8.3	8.3	10.1	13.3	15.6	18.2	20.4	15.1

Max = mean daily maximum temperature for the month (°C)
*Max = extreme maximum temperature recorded per month (°C)
Min = mean daily minimum temperature for the month (°C)
*Min = extreme minimum temperature recorded per month (°C)

The Walter climate diagram for the Grootfontein Agricultural Station, which is situated close to the proposed site of the solar facility, indicates the dry period from approximately May to December and the wet period from January to April with a peak in March (Figure 6).

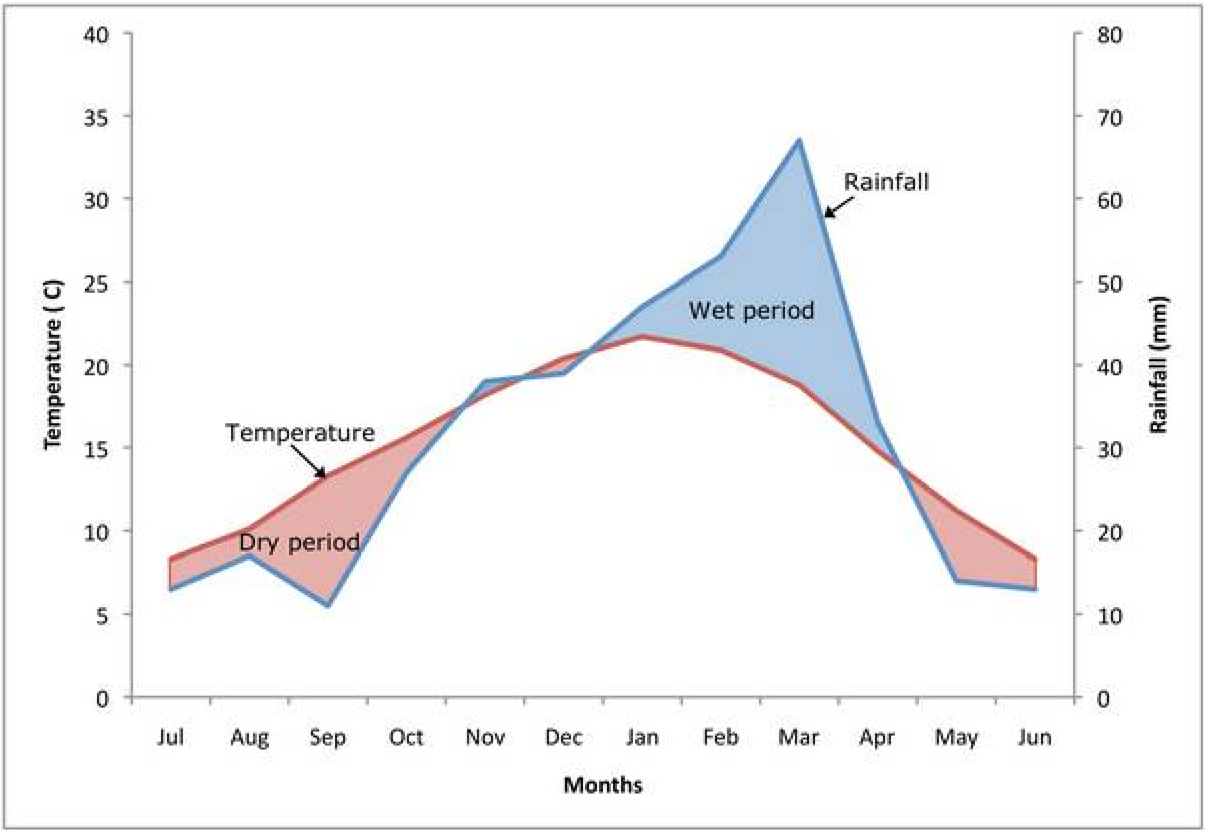

Figure 6. Walter climate diagram indicating climate data collected at the Grootfontein Agricultural Station.

5.5 Land use

Commercial livestock farming, mainly with sheep and goats, is the primary land use in the region. These areas have been farmed for more than 100 years and the natural vegetation is reported to be in various stages of degradation. Acocks (1953) described the conversion of the grassland in this region to eroded Karoo as a national disaster.

5.6 Vegetation types

At a broad scale, the vegetation found in the study area falls within the Eastern Upper Karoo (NKu4) of the Nama Karoo Biome (Mucina & Rutherford, 2006) (Figure 7). The vegetation is dominated by dwarf microphyllous (small-leaved) shrubs and grasses. The most important taxa include *Lycium* spp. (tall shrubs), *Eriocephalus* spp. (dwarf shrubs), *Pentzia* spp. (dwarf shrubs), *Helichrysum* spp. (dwarf shrubs), *Aristida* spp. (grasses), *Eragrostis* spp. (grasses) and *Tragus* spp. (grasses). The Eastern Upper Karoo, vegetation type has the largest mapped area of all the vegetation types (49821 km^2) in South Africa. The conservation status of the vegetation type is listed as Least Threatened with a 21% conservation target. About 2% of the land surface has been transformed, largely due to the building of dams. The vegetation type is formally conserved in the Oviston, Commando Drift, Rolfontein and Gariep Dam Nature Reserves.

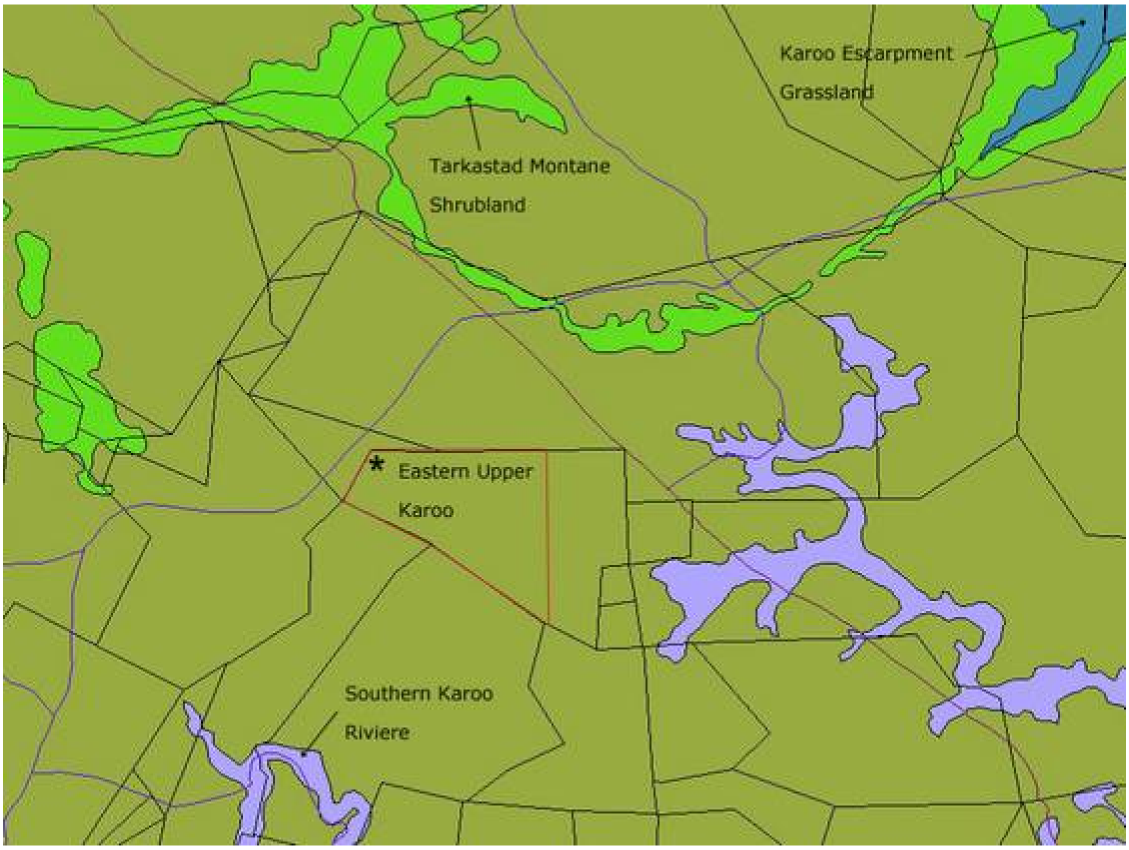

Figure 7. The Rodicon Solar Energy site (indicated with a black star) located within the Eastern Upper Karoo vegetation type (Mucina & Rutherford (2006).

The Tarkastad Montane Shrubland (Gs17) occurs further to the north of the proposed Rodicon Solar Energy site. This vegetation type is characterised by ridges, hills and isolated mountain slopes which are covered with low, semi-open, mixed shrubland. Prominent species include: *Diospyros austro-africana, Euryops annae, Aristida* spp., *Cynodon incompletus* and *Eragrostis* spp. The Tarkastad Montane Shrubland covers an area of 107 km^2 and is regarded as Least Threatened with about 1-2% being statutorily conserved and about 2% transformed by cultivation or the building of dams.

Further to the northeast of the property the Karoo Escarpment Grassland (Gh1) is found (Mucina & Rutherford 2006). The vegetation type occurs primarily on mountain summits, low mountains and hills and consists of wiry, tussock grasslands, usually dominated by *Merxmuellera disticha*. An important dwarf shrub component is always present in this vegetation type. This vegetation type occurs across a wide geographical area and consequently shows large floristic variability. The Karoo Escarpment Grassland covers 943 km^2 and is regarded as Least Threatened with about 3% being statutorily conserved.

The Southern Karoo Riviere (Azi6) vegetation type occurs more to the east and south of the proposed solar energy site at Rodicon. The vegetation type is typical of the narrow riverine flats and supports a complex of *Acacia karroo* or *Tamarix usneoides* and is often fringed by a tall *Salsola*-dominated shrubland. Elements of this vegetation type are visible in the drainage line close to the Rodicon site. The Southern Karoo Riviere has a Least Threatened status with approximately 12% of the area transformed by the building of dams and agriculture. The frequent disturbance associated with this habitat (such as floods and severe grazing pressure) makes this habitat vulnerable to the invasion by alien woody as well as herbaceous species.

6. FINDINGS OF THE ASSESSMENT

6.1 Vegetation

The vegetation at the proposed Rodicon Solar Energy site had a grassland structure (Figure 8) although many dwarf shrubs were also present. The vegetation of the approximately 20 ha studied at the proposed site for the Rodicon facility could be classified into four communities (Figure 9) with the fifth community occurring on the steeper slopes of the dolerite ridge to the east of the site. The classification of the vegetation is provided in Table 4. This table serves as a provisional species checklist of the site (Table 4).

Figure 8. View across the proposed Rodicon Solar Energy site with the low dolerite ridge to the right.

The following four communities were identified on the 20 ha site:

- Community 1 (*Chloris virgata* — *Aristida adscensionis* grassland) occurred primarily in the southwestern section of the site (Figure 9). The community showed signs of severe disturbance which was probably associated with the watering point.
- Community 2 (*Aristida congesta* subsp. *barbicollis* — *Eragrostis chloromelas* grassland) covered the largest portion of the site, mainly in the northwestern section of the site (Figure 9). The most prominent dwarf shrubs in this community were *Eriocephalus* spp., *Phymaspermum parvifolium, Osteospermum leptolobum* and *Chrysocoma ciliata*.

- Community 3 (*Helichrysum zeyheri — Eragrostis chloromelas* grassland) occurred as a band on the footslope of the dolerite ridge (Figure 9). The community was a mixed-grassland with dwarf shrubs making a larger contribution to total vegetation cover than in the first two communities.
- Community 4 (*Eriocephalus ericoides — Sporobolus fimbriatus* mixed grassland) is a small community on the slopes of the dolerite ridge in the east of the site (Figure 9). Although the grass component dominated the vegetation unit, many dwarf shrub species were encountered such as *Eriocephalus* spp., *Helichrysum* spp., *Pentzia incana* and *Osteospermum leptolobum.*
- Community 5 (*Searsia undulata — Cymbopogon posposchilii* grassland) was not found on the site, but occurred on the steeper slopes of the dolerite ridge east of the site (Figure 10). A number of species were only found in this community, several of them being tall shrubs, e.g. *Searsia undulata.*

Figure 9. The vegetation of the approximately 20 ha proposed Rodicon Solar Energy facility site was classified and mapped into four plant communities. Many bare patches with hardly any vegetation on them were noted in the site.

Table 4. The differential table of the vegetation on the proposed Rodicon Solar Energy site

Community number	1		2			3		4		5
Plot number	1	10	2	8	9	7	6	3	5	4
Species group A										
Geigeria ornativa	+	+	.	.	.	.	.	.	.	.
Chloris virgata	+	+	.	.	.	.	.	.	.	.
Euphorbia cf. *rectirama*	+	+	.	+	.	+	.	.	.	.
Asparagus capensis	+	+	.	.	.	.	+	.	.	.
Species group B										
Aristida congesta subsp. *barbicollis*	1	a	+	a	a	.	.	.	+	.
Oxalis cf. depressa	+	+	+	+	.	.	.	.	.	+
Chrysocoma ciliata	+	+	+	+	.	.	.	.	+	.
Mestoklema tuberosum	+	+	.	+	+	.	+	.	.	.
Aptosimum procumbens	+	+	.	.	+	.	.	.	.	.
Asparagus retrofractus	+	.	.	+	+	.	.	.	.	.
Rosenia humilis	+	+	.	.	+	.	.	.	.	.
Melolobium canescens	.	+	+	.	.	.	.	.	.	.
Eragrostis curvula	+	.	.	+	.	.	.	.	.	.
Sporobolus africanus	.	+	+	.	.	.	.	.	.	.
Species group C										
Aristida adscensionis	1	+	+	.	+	+	+	.	.	.
Thesium hystrix	.	+	+	+	+	+	.	.	.	+
Lycium sp.	+	+	.	.	+	+	.	.	.	.
Melolobium candicans	.	+	+	.	.	+	.	.	.	.
Species group D										
Crassula setulosa	.	.	.	.	.	.	.	+	+	.
Sporobolus fimbriatus	.	.	+	.	.	.	.	+	+	.
Species group E										
Hermannia cuneifolia	.	.	.	.	.	.	.	.	.	+
Hermannia filifolia	.	.	.	.	.	.	.	.	.	+
Bulbine sp.	.	.	.	.	.	.	.	.	.	+
Lepidium bonariense	.	.	.	.	.	.	.	.	.	+
Cheilanthus sp.	.	.	.	.	.	.	.	.	.	+
Pelargonium sp.	.	.	.	.	.	.	.	.	.	+
Searsia undulata	.	.	.	.	.	.	.	.	.	+
Species group F										
Chaenostoma halimifolia	.	.	+	.	.	+	+	+	+	+
Helichrysum dregeanum	+	.	.	.	.	.	+	+	+	+
Cymbopogon pospischilii	.	.	.	.	.	.	+	+	+	1
Cyperus rupestris	.	.	.	.	.	+	+	+	+	.
Sutera sp.	.	+	.	.	.	.	+	+	+	.
Helichrysum zeyheri	.	.	+	.	.	+	+	.	+	.
Cucumis zeyheri	.	+	.	.	.	+	.	+	.	.
Digitaria eriantha	.	.	.	.	.	.	.	+	.	+
Nenax microphylla	.	.	.	.	.	.	+	+	.	.
Species group H										

Trichodiadema pomeridianum	+	+	:	+	+	+	:	+	+	:	+	+	:	+
Eragrostis chloromelas	1	.	:	1	+	+	:	1	+	:	+	+	:	+
Eriocephalus ericoides	+	.	:	+	+	+	:	+	1	:	1	1	:	1
Tragus koelerioides	+	.	:	+	+	+	:	+	+	:	+	+	:	+
Phymaspermum parvifolium	.	+	:	+	+	+	:	+	+	:	+	+	:	+
Felicia muricata	+	+	:	+	+	.	:	+	+	:	+	+	:	.
Wahlenbergia nodosa	+	+	:	+	+	.	:	+	+	:	+	.	:	+
Indigofera alternans	+	+	:	+	+	+	:	+	.	:	+	+	:	.
Eragrostis obtusa	+	+	:	1	+	+	:	+	.	:	+	+	:	.
Heteropogon contortus	+	.	:	+	+	+	:	.	.	:	+	+	:	.
Osteospermum leptolobum	+	.	:	+	+	+	:	+	.	:	+	+	:	.
Pentzia incana	.	+	:	.	+	+	:	1	.	:	+	+	:	+
Selago saxatilis	+	.	:	.	+	.	:	+	+	:	+	+	:	+
Aristida diffusa	.	.	:	+	+	.	:	.	1	:	+	1	:	+
Commelina africana	.	+	:	+	.	.	:	+	.	:	.	+	:	.
Acanthopsis sp.	.	+	:	.	+	.	:	+	+	:	+	+	:	.
Eragrostis trichophora	+	.	:	.	+	.	:	.	+	:	.	.	:	+
Eriocephalus decussatus	+	.	:	.	.	+	:	+	.	:	+	.	:	.
Felicia filifolia	.	.	:	.	.	+	:	.	.	:	.	.	:	+
Hermannia coccocarpa	+	.	:	.	.	+	:	.	+	:	.	.	:	.
Lotononis laxa	.	+	:	.	.	+	:	.	+	:	.	+	:	.
Ruschia intricata	.	+	:	+	+	.	:	+	.	:	.	+	:	.
Infrequent species			:				:			:			:	
Bulbostylis burchellii	.	.	:	+	.	.	:	.	.	:	.	+	:	.
Selago albida	+	.	:	.	.	.	:	.	.	:	.	+	:	.
Eriospermum sp.	+	.	:	.	.	.	:		.	:		.	:	.
Lycium cinereum	+	.	:	.	.	.	:	.	.	:	.	.	:	.
Albuca sp.	+	.	:	.	.	.	:	.	.	:	.	.	:	.
Pentzia sp.	+	.	:	.	.	.	:	.	.	:	.	.	:	.
Salsola tuberculata	+	.	:	.	.	.	:	.	.	:	.	.	:	.
Xanthium spinosum	+	.	:	.	.	.	:	.	.	:	.	.	:	.
Massonia sp.	.	+	:	.	.	.	:	.	.	:	.	.	:	.
Selago geniculata	.	+	:	.	.	.	:	.	.	:	.	.	:	.
Pteronia paniculata	.	+	:	.	.	.	:	.	.	:	.	.	:	.
Rabiea sp.	.	+	:	.	.	.	:	.	.	:	.	.	:	.
Convolvulus sagittatus	.	+	:	.	.	.	:	.		:	.	.	:	
Empodium plicatum	.	+	:	.	.	.	:	.	.	:	.	.	:	.
Crassula cf. *capitella*	.	.	:	+	.	.	:	.	.	:	.	.	:	.
Melica decumbens	.	.	:	+	.	.	:	.	.	:	.	.	:	.
Stachys sp.	.	.	:	+	.	.	:	.	.	:	.	.	:	.
Eragrostis lehmanniana	.	.	:	.	+	.	:	.	.	:	.	.	:	.
Aristida canescens	.	.	:	.	+	.	:	.	.	:	.	.	:	.
Helichrysum asperum	.	.	:	.	+	.	:	.	.	:	.	.	:	.
Eragrostis gummiflua	.	.	:	.	.	.	:	.	+	:	.	.	:	.
Cynodon incompletus	.	.	:	.	.	+	:	.	.	:	.	.	:	.
Hypertelis salsoloides	.	.	:	.	.	+	:	.	.	:	.	.	:	.
Pterothrix spinescens	.	.	:	.	.	+	:	.	.	:	.	.	:	.
Gnidia polycephala	.	.	:	.	.	.	:	.	+	:	.	.	:	.
Euphorbia inaequilatera	.	.	:	.	.	.	:	.	.	:	+	.	:	.
Monsonia burkeana	.	.	:	.	.	.	:	+	.	:	.	.	:	.
Rumex sagittatus	.	.	:	.	.	.	:	+	.	:	.	.	:	.

No protected trees or threatened Red Data plant species were encountered on the site, however, the succulent *Euphorbia* spp. are listed as CITES II. Therefore *Euphorbia* cf. *rectirama* which was recorded on site is a CITES II species as well as TOPS species.

Vegetation data of species collected in the quarter degree grid (3125CC) was downloaded from the SIBIS:SABIF Integrating Biodiversity Information website and is included as an appendix (Appendix A). Since a quarter degree is substantially larger than the 20 ha sampled at the Rodicon site, this list of species includes many species found in vegetation types and habitats not present on the Rodicon site. The species with a IUCN Red Data stutus occurring within the quarter degree grid were:

- *Aloe longistyla* Data Deficient, CITES II
- *Aloe broomii* var. *broomii* CITES II
- *Aloe striatula* var. *caesia* CITES II
- *Boophone disticha* Declining
- *Brunsvigia radulosa* Vulnerable
- *Euphorbia rectirama* CITES II
- *Gnaphalium declinatum* Near Thratened
- *Pelargonium sidoides* Declining
- *Salvia repens* var. *keiensis* Data Deficient

6.2 Fauna (mammals, reptiles, amphibians, invertebrates and avifauna)

The faunal survey involved a field survey by means of direct observation whilst traversing the area by vehicle and on foot and consulting of available databases and relevant literature to determine the diversity, ecological status and distribution of relevant faunal species.

The SIBIS:SABIF Integrating Biodiversity Information website was used to generate lists of fauna that could potentially occur on the proposed Rodicon site. Since these data are generated for a quarter degree grid (3125CC), not all the species would be found at the site since the habitat on site would not necessarily be suitable for all these species. The SIBIS:SABIF Integrating Biodiversity Information lists were supplemented using other databases e.g. SABAP2 and relevant literature sources such as Skinner and Chimimba (2005), Branch (1998), Branch (2008), Carruthers (2001), Friedman and Daly (2004) and the latest Red Data Lists (IUCN 2011).

During the April field survey blue crane were sighted in the vicinity of the Rodicon site. A complete list of possible fauna species that could occur on the site is attached as an appendix (Appendix B) together with their IUCN Red Data status and CITES listing. Species are listed in CITES and trade in these species is regulated. The reason for including these species is that they are considered to be of conservation significance internationally and thus are important species at a local scale. Table 5 indicates those species with a threatened IUCN Red Data status and those listed in one of the appendices of CITES.

Table 5. Animals species that could potentially occur on the Rodicon Solar Energy site with a threatened Red Data status or CITES listing

Scientific Name	**Common name**	**Red data status**	**CITES**
MAMMALS			
Felis nigripes	Black-footed cat	VULNERABLE	II
Felis sylvestris	African wild cat	NOT ASSESSED	II
Mystromys albicaudatus	White-tailed mouse	ENDANGERED	
Panthera pardus	Leopard	NEAR THREATENED	I
Proteles cristata	Aardwolf	LEAST CONCERN	III
BIRDS			
Grus paradisea	Blue crane	VULNERABLE	II
Aquila rapax	Tawny eagle	LEAST CONCERN	II
Aquila verreauxii	Verreaux's eagle	LEAST CONCERN	II
Ciconia nigra	Black stork	LEAST CONCERN	II
Circus maurus	Black harrier	VULNERABLE	
Eupodotis caerulescens	Blue bustard	NEAR THREATENED	
Falco naumanni	Lesser kestrel	LEAST CONCERN	II
Falco rupicolus	Rock kestrel	LEAST CONCERN	II
Falco rupicoloides	Greater kestrel	LEAST CONCERN	II
Polemaetus bellicosus	Martial eagle	NEAR THREATENED	
Sagittarius serpentarius	Secretary bird	VULNERABLE	

6.3 Water courses, drainage lines and wetlands

No perennial streams or rivers were noted in the approximately 20 ha study area. However there is a stream to the west of the site (Figure 1O). Many of these water courses already show signs of severe disturbance with an abundance of weedy species present.

Figure 10. Drainage lines close to the Rodicon Solar Energy site.

6.4 Sensitive areas

The proposed Rodicon Solar Energy site does not fall within a protected area and the status of the vegetation type in which it is contained is Least Threatened. In general, the proposed solar facility site is not located in a highly sensitive area since the vegetation and habitat of the site is representative of the larger surrounding environment. The duplex soils found in the area are highly erodible, thus if the vegetation is removed or disturbed during construction due care will have to be taken to prevent erosion. Due to the high clay content the soils on the site are also not well drained. It is suggested that a re-vegetation plan is compiled to ensure the return of a vegetation cover as soon as possible. The access road and power line could be located such that they do not affect the drainage lines or the ridge.

Currently the eastern corner of the site lies almost on the midslope of the dolerite ridge. It is recommended that the site is slightly re-orientated so as to align the long axis with the ridge. The vegetation of the ridge is the most sensitive and contains many species not occurring on the adjacent plains (Figure 11).

Figure 11. Sensitivity map of the Rodicon site and immediate surrounds.

7. IMPACT ASSESSMENT

7.1 Description of potential impacts of the proposed development

Potential impacts of the proposed development were identified for the 20 ha site, the power line, and the access road. For the 20 ha site the potential impacts were evaluated separately for the construction and operational phases of project implementation.

7.1.1 Construction phase: 20 ha site

- Impact on the natural vegetation

The construction of the panel foundations and the workshop area will lead to a direct loss of vegetation. Removal of vegetation and the associated loss of habitat impacts on all plant species, i.e. the common, endemic and Red Data species. However, the footprint of the proposed development in relation to the surrounding environment is small. Furthermore, no protected trees, or threatened plant species were found at the proposed Rodicon site, supporting an overall small impact on the vegetation. However, a number of plant species with an IUCN Red Data status occur within the quarter degree grid. Overall, the development of the site will not have a major effect on the functioning and processes in the vegetation in the region, because the vegetation type in which it is located (Eastern Upper Karoo) is a very large unit.

- Impact on the spread of declared weedy and alien invasive plant species

Declared weeds and invasive plant species are found in the environment surrounding the proposed solar facility site such as *Datura* spp., *Xanthium spinosum* and *Cirsium vulgare*. Other weedy species include, for example, *Salsola kali*, *Amaranthus* spp. and *Chenopodium* spp. The removal of the natural vegetation on the site and the associated disturbance of natural habitats during construction of the facility provide an ideal opportunity for declared weeds and invasive species to establish. Species listed in the Conservation of Agricultural Resources Act as Category 1 & 2 species will have to be controlled during the construction phase to limit their establishment and spread during the operational phase.

- Impact on fauna

Impacts on the fauna populations on site relate to a loss of habitat and disturbance during the construction phase. Since the surrounding environment contains the same habitat, the mobile animal species are expected to disperse into these surrounding areas during construction. If some areas of natural vegetation are left intact within the proposed development site, it is expected that some of the faunal components will return to the site once the construction phase has been completed. There are some threatened or CITES listed bird species, e.g. blue crane, lesser kestrel, martial and tawny eagle and Ludwig’s bustard that utilise habitats in the surrounding environment. These species will avoid the area during the construction phase.

- Impact on the drainage lines

Care should be taken to prevent any impact of the proposed development on the drainage line to the west and south of the Rodicon site. Drainage lines to the east of the dolerite ridge will not be impacted by the 20 ha site. This will imply that measures need to be implemented to prevent erosion from occurring where the vegetation has been removed for the construction of the panels.

7.1.2 Operational phase: 20 ha site

- Impact on the natural vegetation

Natural vegetation should gradually begin to recolonise the denuded areas following the construction phase. Although naturally occurring indigenous species will re-establish, invasive weedy species will also colonise the area and may threaten the re-establishment of the natural vegetation. The rate at which the indigenous species re-establish will differ amongst the species and will depend on the extent of the initial disturbance and the amount and types of seeds present in the seed bank. An active re-vegetation plan should be implemented to assist the return of the natural indigenous species. For this purpose seeds could be collected from the surrounding vegetation.

- Impact on the spread of declared weedy and alien invasive plant species

Disturbance during the construction phase will provide declared weedy and invader plant species an opportunity to establish on the disturbed/denuded areas, for example *Datura* spp. and *Xanthium spinosum.* Species listed in the Conservation of Agricultural Resources Act as Category 1 & 2 species will have to be controlled during the operational phase of the proposed solar facility.

- Impact on fauna

The return of the natural vegetation on denuded areas could create habitats that can be re-colonised by some faunal elements. Reflection from the solar panels will however, probably make the site unsuitable for most bird species. Vehicle movement and human activities may also make the site unsuitable.

- Impact on the drainage lines

Runoff from the Rodicon Solar Energy facility could affect the hydrological processes in the landscape, especially the drainage lines. The necessary mitigation measures, such as actively re-vegetating the site to avoid erosion, increased run-off and silt transportation will have to be taken in order to prevent damage to the drainage system.

7.1.3 Construction & operational phases: power line

- Impact on the natural vegetation

Construction of the power line will lead to a direct loss of vegetation at the footprint of the pylon sites. Removal of vegetation and the associated loss of habitat impacts on the common, endemic and Red Data species. Some disturbance of the vegetation, beyond the footprint of the powerline will also result during the construction phase. Although the loss of the natural vegetation at the footprint of these infrastructural components will be permanent, the area covered will be small in relation to the surrounding environment. It is presumed that the powerline will have to cross the low ridge which separates the site from the current power lines. The vegetation of the ridge differs from the surrounding plains and it is recommended that the vegetation on the ridge is not disturbed during the construction of the power lines and that the pylon sites are carefully selected not to affect the vegetation on the ridge.

- Impact on the spread of declared weed and alien invasive plant species

Declared weedy and invasive plant species are found in the environment surrounding the proposed solar facility site and on the route of the current overhead power lines. The removal of the natural vegetation on the pylon site and the associated disturbance of natural habitats provide an ideal opportunity for declared weeds and invasive species to establish. Species listed in the Conservation of Agricultural Resources Act as Category 1 & 2 species will have to be controlled during the construction and operational phases.

- Impact on fauna

Impacts on the fauna populations relate to a loss of habitat and disturbance during the construction phase. Since the surrounding environment contains the same habitat, the fauna is expected to move into these surrounding areas during construction. Because the loss of habitat at the pylon footprint is permanent no return of animal species is likely during the operational phase.

Bird collisions with overhead power lines are of great concern. Threatened bird species such as blue cranes, bustards, flamingo's and water birds are among the most affected species. This situation can be mitigated to a large degree by making the power lines more visible to the birds using various techniques. These mitigation measures need to be implemented from the construction phase.

- Impact on the drainage lines

The pylons for the overhead power lines should be located such that they do not impact the drainage system. If applicable, the necessary precautions to prevent erosion must be taken to limit the impact on the drainage lines.

7.1.4 Construction & operational phases: access road

- Impact on the natural vegetation

It was assumed that the access road would follow the same route as the current farm track. Nevertheless, the access road to the facilty will be broader than the current track and some loss of the natural indigenous vegetation will inevitably occur. The distance between the R701 and the facility is fairly short and the impact of the access road on the natural vegetation should be small.

- Impact on the spread of declared weedy and alien invasive plant species

Declared weedy and invasive plant species are already abundant along the farm roads. The broadening of the road will create an opportunity for declared weeds and invasive species to establish further. Species listed in the Conservation of Agricultural Resources Act as Category 1 & 2 species will have to be controlled during both the construction and operational phases.

- Impact on fauna

The construction of an access road (or broadening of the current farm track) will cause a permanent loss of habitat to animal species and may hamper movement across the road by burrowing animals.

- Impact on the drainage lines

The location of the access road should be such that there is no impact on the drainage system. The access road should therefore in no way hinder or change the flow of water. Run-off from the access road shuld also not negatively impact the drainage system. During construction the minimum disturbance of the surrounding environment should occur.

7.2 RATING OF POTENTIAL IMPACTS

The potential impacts identified include the impact on the natural vegetation, the impact on the spread of declared weedy and alien invasive species, impact on the fauna and the impact of the drainage lines situated in the vicinity of the proposed solar facility.

The rating of the potential impacts on the approximately 20 ha site has been separated into the construction phase and operational phase.

7.2.1 Construction phase: 20 ha site

Table 6. Summary of impacts of the proposed solar energy facility on the 20 ha Rodicon Solar Energy facility during the construction phase

A) Nature: Impact of the construction phase on the natural vegetation		
	Without mitigation	**With mitigation**
Extent (E)	Local (1)	Local (1)
Duration (D)	Long-term (4)	Medium-term (3)
Magnitude (M)	Moderate (6)	Low (4)
Probability (P)	Definite (5)	Highly probable (4)

Significance (S = E+D+M)*P	**Medium (55)**	**Medium (32)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources?	Partially irreplaceable	Partially irreplaceable
Can impacts be mitigated?	Low degree	
Mitigation: Development should be contained within the proposed footprint of the solar facility and unnecessary disturbance adjacent to the site should be avoided. The denuded and disturbed site should be re-vegetated with indigenous species as soon as possible.		
Cumulative impacts: Additional infrastructure development, for example, new power lines; the spread of alien invaders due to loss of natural vegetation; and increased water runoff leading to erosion will exacerbate the negative impact of the development on the vegetation and will lead to a loss of habitat for indigenous fauna and flora.		
Residual impacts: Despite mitigation measures some loss of the vegetation will occur. However, because the vegetation type is so large overall impact on the vegetation type will be small.		

B) Nature: Impact of the construction phase on the spread of declared weeds and alien invasive plant species		
	Without mitigation	**With mitigation**
Extent (E)	Site & surrounds (2)	Site & surrounds (2)
Duration (D)	Long-term (4)	Medium-term (3)
Magnitude (M)	Moderate (6)	Low (4)
Probability (P)	Highly probable (4)	Probable (3)
Significance (S = E+D+M)*P	**Medium (48)**	**Low (27)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Low degree	Low degree
Can impacts be mitigated?	High degree	
Mitigation: Development should be restricted to the proposed solar facility site and the disturbance to the surrounding vegetation be kept to a minimum. Rehabilitate disturbed areas as soon as possible following construction of the facility. Establish a monitoring program for the early detection and control of alien invasive plant species.		
Cumulative impacts: The establishment of declared weedy and alien invasive plant species could lead to their		

spread into the surrounding natural vegetation and onto neighbouring properties. Their presence may also slow down the recovery of the natural vegetation.
Residual impacts: Low residual impact if the declared weedy and alien invasive species are controlled.

C) Nature: Impact of the construction phase on the fauna		
	Without mitigation	**With mitigation**
Extent (E)	Local (1)	Local (1)
Duration (D)	Permanent (5)	Long-term (4)
Magnitude (M)	Moderate (6)	Low (4)
Probability (P)	Definite (5)	Highly probable (4)
Significance (S = E+D+M)*P	**Medium (60)**	**Medium (36)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources?	Partially irreplaceable	Partially irreplaceable
Can impacts be mitigated?	Low degree	
Mitigation: Limit disturbance to the proposed solar facility site and ensure that minimum disturbance takes place in the surrounding area. Rehabilitate disturbed areas as soon as possible following construction of the facility.		
Cumulative impacts: Loss and/or disturbance of the natural vegetation/habitat and an increase in declared weedy and alien invasive species could have a significantly negative impact on the faunal component.		
Residual impacts: Residual impacts depend on the intensity and permanence of the disturbance and the rate at which the natural vegetation returns. The degree to which the faunal component returns to the site will largely depend on the success of the re-vegetation of the site.		

D) Nature: Impact of the construction phase on the drainage lines		
	Without mitigation	**With mitigation**
Extent (E)	Local (1)	Local (1)
Duration (D)	Medium-term (3)	Medium-term (3)
Magnitude (M)	Low (4)	Low (4)
Probability (P)	Probable (3)	Improbable (2)
Significance (S = E+D+M)*P	**Medium (24)**	**Low (16)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Partially irreversible	High degree
Irreplaceable loss of resources?	Partially irreplaceable	Low degree
Can impacts be	High degree	

mitigated?		
Mitigation: Water runoff from the proposed site should be controlled to limit erosion damage to the surrounding areas, including the drainage lines. Ground water usage in the vicinity of the development should be limited as not to decrease water that should migrate to the drainage lines.		
Cumulative impacts: Soil erosion resulting from the changed/developed area will exacerbate the pressure on the hydrological processes in the region.		
Residual impacts: None, if mitigation takes place to limit/nullify the impact on the drainage lines/wetland.		

7.2.2 Operational phase: 20 ha site

Table 7. Summary of impacts of the proposed solar energy facility on the 20 ha Rodicon Solar Energy site during the operational phase

A) Nature: Impact of the operational phase on the natural vegetation		
	Without mitigation	**With mitigation**
Extent (E)	Local (1)	Local (1)
Duration (D)	Long-term (4)	Long-term (4)
Magnitude (M)	Low (4)	Minor (2)
Probability (P)	Definite (5)	Highly probable (4)
Significance (S = E+D+M)*P	**Medium (45)**	**Low (28)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources?	Partially irreplaceable	Partially irreplaceable
Can impacts be mitigated?	Low degree	
Mitigation: Disturbance should be contained within the proposed footprint of the solar facility (approximately 20 ha) and unnecessary disturbance adjacent to the site be avoided. Limit traffic and human activities during operation.		
Cumulative impacts: The spread of declared weeds and alien invasive species and increased water runoff leading to erosion will exacerbate the impact and lead to further loss of natural vegetation and habitat for indigenous fauna and flora.		
Residual impacts: Although some of the natural vegetation will return it is highly unlikely that it will contain the full diversity of species present on the site before the construction of the facility. During the operational phase the natural vegetation will have to be managed and large shrub species may be prevented from establishing. If mitigation is successful in restricting disturbance to the site the residual impacts should be low.		

B) Nature: Impact of the operational phase on the spread of declared weeds and alien invasive plant species		
	Without mitigation	**With mitigation**
Extent (E)	Site & surrounds (2)	Site & surrounds (2)
Duration (D)	Long-term (4)	Medium-term (3)
Magnitude (M)	Low (4)	Minor (2)
Probability (P)	Highly probable (4)	Probable (3)
Significance (S = E+D+M)*P	**Medium (40)**	**Low (21)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Low degree	Low degree
Can impacts be mitigated?	High degree	
Mitigation: Disturbance should be restricted to the proposed solar facility site and the disturbance to the surrounding vegetation be kept to a minimum. Implement a monitoring program for the early detection of declared weedy and alien invasive plant species. Implement a control program to combat declared weedy and alien invasive plant species.		
Cumulative impacts: The establishment of declared weedy and alien invasive plant species could lead to their spread into the surrounding natural vegetation and onto neighbouring properties.		
Residual impacts: Low residual impact if the declared weedy and alien invasive species are controlled.		

C) Nature: Impact of the operational phase on the fauna		
	Without mitigation	**With mitigation**
Extent (E)	Local (1)	Local (1)
Duration (D)	Long-term (4)	Long-term (4)
Magnitude (M)	Low (4)	Minor (2)
Probability (P)	Highly probable (4)	Probable (3)
Significance (S = E+D+M)*P	**Medium (36)**	**Low (21)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources?	Partially irreplaceable	Partially irreplaceable
Can impacts be mitigated?	Low degree	
Mitigation: Limit disturbance to the proposed solar facility site and ensure that minimum disturbance takes place in the surrounding area. Limit human activities and traffic during the operational phase		

Cumulative impacts: Disturbance of the surrounding natural vegetation and an increase in declared weedy and alien invasive species could have a significantly negative impact on the faunal component.
Residual impacts: The degree to which the faunal component returns to the site will largely depend on the success of the re-vegetation of the site and the management of the vegetation during the operational phase.

D) Nature: Impact of the operational phase on the drainage lines		
	Without mitigation	**With mitigation**
Extent (E)	Local (1)	Local (1)
Duration (D)	Medium-term (3)	Medium-term (3)
Magnitude (M)	Low (4)	Minor (2)
Probability (P)	Probable (3)	Improbable (2)
Significance (S = E+D+M)*P	**Medium (24)**	**Low (12)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Partially reversible	Medium degree
Irreplaceable loss of resources?	Partially irreplaceable	Low degree
Can impacts be mitigated?	High degree	
Mitigation: During the operational phase water runoff from the site should be controlled to limit erosion damage to the surrounding areas, including the drainage lines. Ground water usage in the vicinity of the development should be limited as not to decrease water that should migrate to the drainage lines/wetland.		
Cumulative impacts: Soil erosion originating from the solar facility will exacerbate the pressure on the hydrological processes in the region.		
Residual impacts: None if mitigation is successful.		

7.2.3 Construction & operational phases: substation (if necessary) and power line

Table 8. Summary of impacts of the proposed substation (if necessary) and power line (note exact localities not provided)

A) Nature: Impact of the construction and operational phases of substation (if necessary) and power line on the natural vegetation		
	Without mitigation	**With mitigation**
Extent (E)	Local (1)	Local (1)
Duration (D)	Permanent (5)	Permanent (5)
Magnitude (M)	Low (4)	Minor (2)

Probability (P)	Definite (5)	Highly probable (4)
Significance (S = E+D+M)*P	**Medium (50)**	**Medium (32)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Irreplaceable	Irreplaceable
Can impacts be mitigated?	Low degree	
Mitigation: Development should be contained in the proposed footprint of the pylons (and possibly substation) and unnecessary disturbance adjacent to the site be avoided. Power line should be placed with caution and minimum damage should occur along the route of the power line during the construction phase. Substation, if constructed (locality not provided for this assessment) should be placed with caution and minimum disturbance should occur during construction. No development or disturbance of the vegetation on the dolerite ridge should occur.		
Cumulative impacts: Additional infrastructure development, for example, access roads; the spread of alien invasive species due to loss of natural vegetation; and increased water runoff leading to erosion will exacerbate the impact and lead to a further loss of habitat for indigenous fauna and flora.		
Residual impacts: Despite mitigation measures the loss of vegetation at the substation site and pylon footprints will be permanent. However, because the vegetation type is so large overall loss will be small.		

B) Nature: Impact of the construction and operational phases of substation (if necessary) and power line on the spread of declared weeds and alien invasive plant species		
	Without mitigation	**With mitigation**
Extent (E)	Site & surrounds (2)	Site & surrounds (2)
Duration (D)	Long-term (4)	Medium-term (3)
Magnitude (M)	Moderate (6)	Minor (2)
Probability (P)	Highly probable (4)	Probable (3)
Significance (S = E+D+M)*P	**Medium (48)**	**Low (21)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Low degree	Low degree
Can impacts be mitigated?	High degree	
Mitigation: Development should be restricted to the substation site and pylon footprint and the		

disturbance to the surrounding vegetation be kept to a minimum. Rehabilitate disturbed areas as soon as possible following construction of the infrastructure. Establish a monitoring program for the early detection and control of alien invasive plant species.
Cumulative impacts: The establishment of declared weedy and alien invasive plant species could lead to their spread into the surrounding natural vegetation and onto neighbouring properties.
Residual impacts: Low residual impact if the declared weedy and alien invasive species are controlled.

C) Nature: Impact of the construction and operational phases of substation (if necessary) and power line on the fauna		
	Without mitigation	**With mitigation**
Extent (E)	Local (1)	Local (1)
Duration (D)	Permanent (5)	Long-term (4)
Magnitude (M)	Moderate (6)	Low (4)
Probability (P)	Highly probable (4)	Probable (3)
Significance (S = E+D+M)*P	**Medium (48)**	**Low (27)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Irreplaceable	Irreplaceable
Can impacts be mitigated?	Low degree	
Mitigation: Limit disturbance to the proposed substation site and ensure that minimum disturbance takes place in the surrounding area. Power line construction should take fauna into account, especially birds, and important mitigation measures must include 'flappers' to make the power lines more visible to the birds.		
Cumulative impacts: Loss and/or disturbance of the natural vegetation and an increase in declared weedy and alien invasive species will have a significantly negative impact on the faunal component.		
Residual impacts: Despite mitigation measures the loss of vegetation at the substation site will be permanent and the return of faunal elements negligible. Impact of the power lines on the fauna could be successfully mitigated.		

D) Nature: Impact of the construction and operational phases of substation (if necessary) and power line on the drainage lines		
	Without mitigation	**With mitigation**
Extent (E)	Local (1)	Local (1)
Duration (D)	Permanent (5)	Medium-term (3)
Magnitude (M)	Moderate (6)	Low (4)

Probability (P)	Probable (3)	Improbable (2)
Significance (S = E+D+M)*P	**Medium (36)**	**Low (16)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Partially reversible	High degree
Irreplaceable loss of resources?	Partially irreplaceable	Low degree
Can impacts be mitigated?	High degree	
Mitigation: Substation and power line construction should not affect the drainage lines if located wisely.		
Cumulative impacts: Soil erosion resulting from the changed/developed area will exacerbate the pressure on the hydrological processes in the region.		
Residual impacts: None, if mitigation takes place to limit/nullify the impact on the drainage lines/wetland.		

7.2.4 Construction & operational phases: access road

Table 9. Summary of impacts of the proposed access road (note exact route not provided)

A) Nature: Impact of the construction and operational phases of an access road on the natural vegetation		
	Without mitigation	**With mitigation**
Extent (E)	Local (1)	Local (1)
Duration (D)	Permanent (5)	Long-term (4)
Magnitude (M)	Low (4)	Minor (2)
Probability (P)	Definite (5)	Highly probable (4)
Significance (S = E+D+M)*P	**Medium (50)**	**Medium (28)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Irreplaceable	Irreplaceable
Can impacts be mitigated?	Low degree	
Mitigation: Disturbance should be contained in the footprint of the proposed access road and unnecessary disturbance adjacent to the route be restricted.		
Cumulative impacts: The spread of declared weeds and alien invaders and increased water runoff leading to erosion will exacerbate the impact and lead to further loss of natural vegetation and		

habitat for indigenous fauna and flora.
Residual impacts: Despite mitigation measures the loss of vegetation on the access road will be permanent. However, because the vegetation unit is so large overall loss will be small. Loss of vegetation adjacent to the road could be successfully mitigated.

B) Nature: Impact of the construction and operational phases of an access road on the spread of declared weeds and alien invasive plant species		
	Without mitigation	**With mitigation**
Extent (E)	Site & surrounds (2)	Site & surrounds (2)
Duration (D)	Long-term (4)	Medium-term (3)
Magnitude (M)	Low (4)	Minor (2)
Probability (P)	Highly probable (4)	Probable (3)
Significance (S = E+D+M)*P	**Medium (40)**	**Low (21)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Low degree	Low degree
Can impacts be mitigated?	High degree	
Mitigation: Disturbance should be restricted to the footprint of the proposed access road and the disturbance to the surrounding vegetation be kept to a minimum. Implement the monitoring program for the early detection of declared weeds and alien invasive plant species. Implement a program to control declared weeds and alien invasive plant species.		
Cumulative impacts: The establishment of declared weeds and alien invasive plant species could lead to their spread into the surrounding natural vegetation and onto neighbouring properties.		
Residual impacts: Low residual impact if the declared weedy and alien invasive species are controlled.		

C) Nature: Impact of the construction and operational phases of an access road on the fauna		
	Without mitigation	**With mitigation**
Extent (E)	Local (1)	Local (1)
Duration (D)	Permanent (5)	Long-term (4)
Magnitude (M)	Low (4)	Low (4)
Probability (P)	Highly probable (4)	Probable (3)
Significance (S = E+D+M)*P	**Medium (40)**	**Low (27)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Irreversible	Irreversible
Irreplaceable loss of	Irreplaceable	Irreplaceable

resources?		
Can impacts be mitigated?	Low degree	
Mitigation: Limit disturbance to the footprint of the proposed access road and ensure that minimum disturbance takes place in the surrounding area.		
Cumulative impacts: Disturbance of the surrounding natural vegetation and an increase in declared weeds and alien invasive species could have a significantly negative impact on the faunal component.		
Residual impacts: Despite mitigation measures the loss of habitat on the access road will be permanent. Residual impacts will furthermore depend on the intensity and permanence of disturbance adjacent to the access road as to whether the faunal component returns to these adjacent sites. Compaction of road surface may hamper the diffing of burrowing animals.		

D) Nature: Impact of the construction and operational phases of an access road on the drainage lines		
	Without mitigation	**With mitigation**
Extent (E)	Local (1)	Local (1)
Duration (D)	Permanent (5)	Medium-term (3)
Magnitude (M)	Moderate (6)	Low (4)
Probability (P)	Probable (3)	Improbable (2)
Significance (S = E+D+M)*P	**Medium (36)**	**Low (16)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Partially reversible	Medium degree
Irreplaceable loss of resources?	Irreplaceable	Low degree
Can impacts be mitigated?	High degree	
Mitigation: The access road should not interfere with the hydrological processes of the drainage lines if it is located wisely. The flow of water should not be impeded or changed, soil erosion and sit deposition must be controlled.		
Cumulative impacts: Soil erosion originating from the access road will exacerbate the pressure on the hydrological processes in the region.		
Residual impacts: None if the location of the access road is carefully chosen and mitigation is successful.		

8. MANAGEMENT PLAN

The measures proposed for the inclusion in the draft Environmental Management Plan are as follows:

Table 10. Measures for inclusion in draft Environmental Management Plan

A) OBJECTIVE: Mitigating disturbance or loss of the natural vegetation		
Project component/s	Any activity that could result in a disturbance or loss of the natural vegetation e.g. construction of solar facility infrastructure, access roads, substation and power lines.	
Potential impact	Disturbance or loss of indigenous vegetation during the construction and operational phase results in a loss of biodiversity and habitat, increases declared weedy and alien invasive plant species and soil erosion; and disrupts natural faunal populations.	
Activity/risk source	Construction and operational phases.	
Mitigation: target/objective	Target: Minimise loss and disturbance of natural vegetation. Re-vegetate denuded and disturbed areas as soon as possible Time period: Construction and operational phases.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
1. Minimise large-scale clearance of natural vegetation and disturbance to the proposed 20 ha site. 2. Use existing and dedicated access roads to limit disturbance of the natural vegetation. 3. Minimise damage to natural vegetation beyond the 20 ha site during the construction of the substation (if applicable), power line and access road. 4. Re-vegetate disturbed areas as soon as possible after construction. 5. Prevent soil erosion from the site. 6. Prevent any disturbance to the ridge vegetation.	Construction team Project management Environmental Control Officer.	Duration of construction and operational phases.
Performance indicator	Minimal loss of natural vegetation in and around the Rodicon Solar Energy facility. Vehicles drive on dedicated roads with no disturbance of the surrounding natural vegetation. Damage to the natural vegetation is minimised during the	

	construction of substation (if applicable), power line and access roads. No disturbance to the ridge vegetation.
Monitoring	Construction site should be clearly demarcated and construction should be restricted to this area. Existing and dedicated roads should be clearly marked and only those roads utilised by vehicles. Power line and access road placement and construction should limit disturbance to the natural vegetation. The Environmental Control Officer should monitor and report to the Environmental Assessment Practitioner as to whether the construction is contained within these boundaries and that the surrounding natural vegetation has not been negatively affected.

B) OBJECTIVE: Control declared weedy and alien invasive plant species		
Project component/s	Any activity that could result in a disturbance or loss of natural vegetation e.g. construction of solar facility infrastructure, access roads, substation (if applicable) and power lines.	
Potential impact	Disturbance or loss of indigenous vegetation during construction and operational phases results in a loss of biodiversity and habitat, increases declared weedy and alien invasive plant species and soil erosion; and disrupts natural faunal populations.	
Activity/risk source	Construction and operational phases.	
Mitigation: target/objective	Target: Minimise loss or disturbance of natural vegetation. Re-vegetate denuded and disturbed areas as soon as possible. Early detection of declared weedy and alien invasive species. Control of declared weedy and alien invasive species. Time period: Construction and operational phases.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
1. Minimise large-scale clearance of natural vegetation and disturbance to the proposed site. 2. Use existing and dedicated access roads to limit disturbance of the natural vegetation. 3. Minimise damage to natural vegetation during the construction of substation (if applicable) and power lines. 4. Re-vegetate the disturbed areas as soon as possible with indigenous vegetation. 5. Monitor and control declared weedy and alien invasive species. 5. Prevent soil erosion from	Construction team Project management Environmental Control Officer.	Duration of construction and operational phases.

the site.		
Performance indicator	No (or a small number of) declared weedy and alien invasive species present on the solar facility site or along roads and power lines or in the surrounding area.	
Monitoring	Regular surveys of the extent of declared weedy and alien invasive plant species and the implementation of control measures according to legislation. Monitoring should continue from the construction phase throughout the lifespan of the facility. The surrounding natural vegetation should also be monitored for the spread of invasive species.	

C) OBJECTIVE: Mitigating loss of faunal component		
Project component/s	Any activity that could result in a disturbance or loss of the natural vegetation and loss of habitat e.g. construction of solar facility infrastructure, access roads, power lines.	
Potential impact	Disturbance or loss of indigenous vegetation during the construction and operational phases results in a loss of biodiversity and habitat, increases declared weedy and alien invasive plant species and soil erosion; and disrupts natural faunal populations.	
Activity/risk source	Construction and operational phases.	
Mitigation: target/objective	Target: Minimise loss or disturbance of natural vegetation/habitat. Re-vegetate denuded and disturbed areas as soon as possible thereby creating faunal habitat. Time period: Construction and operational phases.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
1. Minimise large-scale clearance of natural vegetation and disturbance to the proposed site. 2. Use existing and dedicated access roads to limit disturbance of the natural vegetation. 3. Minimise damage to natural vegetation during the construction of the substation (if applicable), power lines and access road. 4. Re-vegetate the disturbed areas as soon as possible with indigenous vegetation. 5. Prevent soil erosion from the site. 6. Power lines should be provided with markers/	Construction team Project management Environmental Control Officer	Duration of construction and operation

flappers when constructed. 7. Minimise human activity during operational phase.		
Performance indicator	Minimum loss of the faunal component in and around the solar facility, substation along roads and power lines.	
Monitoring	Record bird, reptile and mammal species on site before and after construction in order to determine the scale of changes that have occurred. Power lines should be clearly marked to prevent bird collisions. Bird collisions with power lines should be monitored and additional mitigation measures applied where necessary.	

D) OBJECTIVE: Prevent damage to the drainage lines		
Project component/s	Any activity that could result in a disturbance or loss of natural vegetation and change in soil properties e.g. construction of solar facility infrastructure, access roads, substation and power lines.	
Potential impact	Disturbance or loss of indigenous vegetation during the construction and operational phases results in a loss of biodiversity and habitat, increases declared weedy and alien invasive plant species and soil erosion; and disrupts natural faunal populations.	
Activity/risk source	Construction and operational phases.	
Mitigation: target/objective	Target: Minimise loss or disturbance of natural vegetation/habitat in order to limit influence on soil properties. Re-vegetate denuded and disturbed areas as soon as possible. Time period: Construction and operational phases.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
1. Minimise large-scale clearance of natural vegetation and disturbance to the proposed site. 2. Use existing and dedicated access roads to limit disturbance of the natural vegetation. 3. The location of the substation (if applicable), access road and power lines are critical. 4. Re-vegetate the disturbed areas as soon as possible with indigenous vegetation. 5. Prevent soil erosion from the site. 6. The access road should be	Construction team Project management Environmental Control Officer	Duration of construction and operation

elevated above the surrounding terrain to avoid the road from becoming a drainage line. 7. Regular run-off channels should be made to ensure good drainage of the road and water run-off speed into the surrounding areas should be controlled. 8. A speed limit should apply on the access road.		
Performance indicator	Minimal/no impact on drainage system.	
Monitoring	Yearly monitoring of the areas on foot to ensure that the hydrological system is functioning correctly. The areas should include the area between the solar facility (and substation, if applicable) and the drainage lines as well as the areas along the access roads and power lines and the drainage lines in the region.	

9. DISCUSSION AND CONCLUSIONS

The proposed Rodicon Solar Energy photovoltaic (PV) facility is located on a portion of the farm Zak Fontyn 267, which is located approximately 40 km south of Middelburg in the Eastern Cape. The site is located west of the N10 linking Middelburg and Cradock and southeast of the R701. The proposed solar facility lies in the northwestern corner of the property. The location of the proposed substation (if applicable), and route of the new power lines from the site to the existing power lines and access road were not provided.

Four vegetation types can be found in the vicinity of the proposed site for the Rodicon Solar Energy facility, i.e. Eastern Upper Karoo, Tarkastad Montane Shrubland, Karoo Escarpment Grassland and Southern Karoo Riviere (Mucina & Rutherford, 2006). The study site falls into the mapped Eastern Upper Karoo vegetation type but in the surrounding environment elements of some of the other vegetation types occur. All four vegetation types have a Least Threatened status with between 1 and 3% transformed. The April 2012 field survey revealed that four plant communities could be recognised on site and another community on the dolerite ridge next to the site. Community 4, the *Eriocephalus ericoides — Sporobolus fimbriatus* mixed grassland, is situated on the slopes of the dolerite ridge in the east of the site and is the only section of the site which is regarded as sensitive. The communities on the flat terrain are not rated as sensitive and most of the plant species occurring within these communities are common in the region.

Species lists generated for the 3125CC quarter degree grid for plant and animal species were supplemented with data from other relevant sources including Red Data lists. These lists indicated the presence of various species of conservation significance in this quarter degree grid. No protected trees were encountered on the site, and the only TOPS listed plant species/CITES II listed plant species was *Euphorbia* cf. *rectirama*.

Animals species that could potentially occur on the Rodicon Solar Energy site with a threatened Red Data status or CITES listing included: black-footed cat (VU, CITES II), African wild cat (CITES II), white-tailed mouse (EN), leopard (NT, CITES I), aardwolf (CITES III), blue crane (VU, CITES II), tawny eagle (CITES II), Verreaux's eagle (CITES II), black stork (CITES II), black harrier (VU), blue bustard (NT), lesser kestrel (CITES II), rock kestrel (CITES II), greater kestrel (CITES II), martial eagle (NT) and secretary bird (VU).

Generally, the proposed solar facility site is not located in a highly sensitive area and the vegetation and habitat of the site occurs in the surrounding environment. The sensitive community on the slope of the dolerite ridge could easily be avoided by a slight re-positioning of the eastern part of the site. Nevertheless, disturbance and loss of vegetation should be minimised and contained in demarcated areas such as the construction site. Furthermore, the impact on the environment should be kept to a minimum by utilising (and upgrading) existing roads in order to limit additional impacts. These mitigating measures will reduce the impact of the development on the natural vegetation and faunal component as well as reduce the impact of declared weedy and alien invasive species establishing on disturbed or denuded sites. The duplex soils found in the area are highly erodible, thus if the vegetation is removed or disturbed during construction due care will have to be taken to prevent erosion. It is suggested that a re-vegetation plan is compiled to ensure the return of an indigenous vegetation cover as soon as possible.

Care will have to be taken not to negatively impact on the drainage system to the west of the site. Run-off from the site will have to be controlled as not to cause soil erosion or increase or decrease seepage to the drainage system or silt transportation, thereby affecting the hydrological processes in the environment.

10. RECOMMENDATIONS

The strict adherence to the suggested mitigation measures should limit impacts on the environment and limit the development footprint of the proposed Rodicon solar facility. The most crucial mitigation measures would be: (1) to minimise large-scale clearance of the natural vegetation and disturbance at the proposed 20 ha site; (2) to relocate the site slightly so as to avoid disturbing the vegetation on the dolerite ridge; (3) to use and upgrade existing and dedicated access roads to limit disturbance of the natural vegetation; (4) minimise damage to the natural vegetation during the construction of the substation (if applicable), power lines and access road; (5) re-vegetate the disturbed areas as soon as possible with indigenous vegetation; (6) prevent soil erosion from the site; (7) monitor and control the spread of declared weedy and alien invasive plant species; and (8) mark power lines clearly with 'flappers' during the construction phase.

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12. APPENDICES

Appendix A. Plant species found in the quarter degree grid (3125CC) downloaded from the SIBIS:SABIF Integrating Biodiversity Information website

ScientificName	Family	IUCN
Abutilon sonneratianum	MALVACEAE	LC
Acacia karroo	FABACEAE	LC
Achyranthes aspera var. *aspera*	AMARANTHACEAE	NE
Adromischus trigynus	CRASSULACEAE	LC
Agrostis lachnantha var. *lachnantha*	POACEAE	LC
Albuca setosa	HYACINTHACEAE	LC
Aloe broomii var. *broomii*	ASPHODELACEAE	LC
Aloe longistyla	ASPHODELACEAE	DDD
Aloe striatula var. *caesia*	ASPHODELACEAE	LC
Alternanthera pungens	AMARANTHACEAE	NE
Amaranthus hybridus subsp. *hybridus* var. *hybridus*	AMARANTHACEAE	NE
Amaranthus thunbergii	AMARANTHACEAE	LC
Ammocharis coranica	AMARYLLIDACEAE	LC
Amphiglossa triflora	ASTERACEAE	LC
Aptosimum elongatum	SCROPHULARIACEAE	LC
Arctotheca calendula	ASTERACEAE	LC
Argemone mexicana forma *mexicana*	PAPAVERACEAE	NE
Argemone ochroleuca subsp. *ochroleuca*	PAPAVERACEAE	NE
Aristida adscensionis	POACEAE	LC
Aristida canescens subsp. *canescens*	POACEAE	LC
Aristida congesta subsp. *barbicollis*	POACEAE	LC
Aristida diffusa subsp. *burkei*	POACEAE	LC
Artemisia afra var. *afra*	ASTERACEAE	LC
Asparagus aethiopicus	ASPARAGACEAE	LC
Asparagus africanus	ASPARAGACEAE	LC
Asparagus burchellii	ASPARAGACEAE	LC
Asparagus concinnus	ASPARAGACEAE	LC
Asparagus denudatus	ASPARAGACEAE	LC
Asparagus exuvialis forma *exuvialis*	ASPARAGACEAE	LC
Asparagus mucronatus	ASPARAGACEAE	LC
Asparagus racemosus	ASPARAGACEAE	LC
Asparagus retrofractus	ASPARAGACEAE	LC
Asparagus striatus	ASPARAGACEAE	NE
Asplenium cordatum	ASPLENIACEAE	LC
Aster squamatus	ASTERACEAE	NE
Atriplex semibaccata var. *appendiculata*	CHENOPODIACEAE	LC
Atriplex suberecta	CHENOPODIACEAE	LC
Ballota africana	LAMIACEAE	LC
Becium burchellianum	LAMIACEAE	
Berkheya annectens	ASTERACEAE	LC
Berula erecta subsp. *thunbergii*	APIACEAE	LC
Bidens bipinnata	ASTERACEAE	NE
Bidens pilosa	ASTERACEAE	NE
Blepharis capensis	ACANTHACEAE	LC

Blepharis mitrata	ACANTHACEAE	LC
Boophone disticha	AMARYLLIDACEAE	DECLINING
Brachiaria eruciformis	POACEAE	LC
Bromus catharticus	POACEAE	NE
Brunsvigia radulosa	AMARYLLIDACEAE	VU
Buddleja glomerata	BUDDLEJACEAE	LC
Buddleja salviifolia	BUDDLEJACEAE	LC
Bulbine frutescens	ASPHODELACEAE	LC
Bulbine narcissifolia	ASPHODELACEAE	LC
Bulbostylis humilis	CYPERACEAE	LC
Cadaba aphylla	CAPPARACEAE	LC
Capsella bursa-pastoris	BRASSICACEAE	NE
Carissa bispinosa	APOCYNACEAE	LC
Cheilanthes bergiana	PTERIDACEAE	LC
Cheilanthes deltoidea	PTERIDACEAE	LC
Cheilanthes hirta	PTERIDACEAE	LC
Chenopodium ambrosioides	CHENOPODIACEAE	NE
Chenopodium glaucum	CHENOPODIACEAE	NE
Chenopodium multifidum	CHENOPODIACEAE	NE
Chenopodium murale var. *murale*	CHENOPODIACEAE	NE
Chenopodium schraderianum	CHENOPODIACEAE	NE
Chloris virgata	POACEAE	LC
Chrysocoma ciliata	ASTERACEAE	LC
Cineraria lyratiformis	ASTERACEAE	LC
Cissampelos capensis	MENISPERMACEAE	LC
Clematis brachiata	RANUNCULACEAE	LC
Clutia pulchella var. *pulchella*	EUPHORBIACEAE	LC
Commelina africana var. *africana*	COMMELINACEAE	LC
Convolvulus dregeanus	CONVOLVULACEAE	LC
Convolvulus sagittatus	CONVOLVULACEAE	LC
Conyza bonariensis	ASTERACEAE	NE
Conyza podocephala	ASTERACEAE	LC
Cotula anthemoides	ASTERACEAE	LC
Cotula coronopifolia	ASTERACEAE	LC
Crassula capitella subsp. *capitella*	CRASSULACEAE	LC
Crassula corallina subsp. *corallina*	CRASSULACEAE	LC
Crassula dependens	CRASSULACEAE	LC
Crassula lanceolata subsp. *lanceolata*	CRASSULACEAE	LC
Crassula lanuginosa var. *lanuginosa*	CRASSULACEAE	LC
Crassula muscosa var. *muscosa*	CRASSULACEAE	LC
Crassula vaillantii	CRASSULACEAE	NE
Cucumis heptadactylus	CUCURBITACEAE	LC
Cucumis myriocarpus subsp. *leptodermis*	CUCURBITACEAE	LC
Cussonia paniculata subsp. *paniculata*	ARALIACEAE	LC
Cymbopogon pospischilii	POACEAE	NE
Cynodon incompletus	POACEAE	LC
Cyperus capensis	CYPERACEAE	LC
Cyperus congestus	CYPERACEAE	LC
Cyperus laevigatus	CYPERACEAE	LC
Cyperus longus var. *longus*	CYPERACEAE	LC
Cyperus marginatus	CYPERACEAE	LC
Cyperus usitatus	CYPERACEAE	LC
Cyphia triphylla	LOBELIACEAE	LC

Datura stramonium	SOLANACEAE	NE
Delosperma multiflorum	MESEMBRYANTHEMACEAE	LC
Dianthus caespitosus subsp. *caespitosus*	CARYOPHYLLACEAE	LC
Diascia capsularis	SCROPHULARIACEAE	LC
Dicerothamnus rhinocerotis	ASTERACEAE	LC
Digitaria eriantha	POACEAE	LC
Digitaria sanguinalis	POACEAE	NE
Dimorphotheca zeyheri	ASTERACEAE	LC
Diospyros austro-africana var. *rubriflora*	EBENACEAE	LC
Diospyros lycioides subsp. *lycioides*	EBENACEAE	LC
Diospyros pallens	EBENACEAE	LC
Diospyros scabrida var. *cordata*	EBENACEAE	LC
Dipcadi gracillimum	HYACINTHACEAE	LC
Dipcadi viride	HYACINTHACEAE	LC
Dolichos angustifolius	FABACEAE	LC
Drimia anomala	HYACINTHACEAE	LC
Drimia intricata	HYACINTHACEAE	LC
Drimia macrantha	HYACINTHACEAE	LC
Drimia uniflora	HYACINTHACEAE	LC
Drosanthemum lique	MESEMBRYANTHEMACEAE	LC
Echinochloa crus-galli	POACEAE	LC
Ehretia rigida subsp. *rigida*	BORAGINACEAE	LC
Ehrharta calycina	POACEAE	LC
Ehrharta erecta var. *erecta*	POACEAE	LC
Ehrharta melicoides	POACEAE	LC
Emex australis	POLYGONACEAE	NE
Empodium plicatum	HYPOXIDACEAE	LC
Enneapogon desvauxii	POACEAE	LC
Enneapogon scoparius	POACEAE	LC
Eragrostis bicolor	POACEAE	LC
Eragrostis chloromelas	POACEAE	LC
Eragrostis cilianensis	POACEAE	LC
Eragrostis curvula	POACEAE	LC
Eragrostis homomalla	POACEAE	LC
Eragrostis lehmanniana var. *chaunantha*	POACEAE	LC
Eragrostis obtusa	POACEAE	LC
Eragrostis procumbens	POACEAE	LC
Eragrostis remotiflora	POACEAE	LC
Eragrostis tef	POACEAE	NE
Eriocephalus ericoides subsp. *ericoides*	ASTERACEAE	LC
Eriocephalus spinescens	ASTERACEAE	LC
Eucomis regia	HYACINTHACEAE	LC
Eumorphia dregeana	ASTERACEAE	LC
Euphorbia inaequilatera var. *inaequilatera*	EUPHORBIACEAE	LC
Euphorbia rectirama	EUPHORBIACEAE	LC
Euryops annae	ASTERACEAE	LC
Eustachys paspaloides	POACEAE	LC
Exomis microphylla var. *axyrioides*	CHENOPODIACEAE	LC
Felicia filifolia subsp. *filifolia*	ASTERACEAE	LC
Felicia muricata subsp. *cinerascens*	ASTERACEAE	LC
Fingerhuthia africana	POACEAE	LC
Fingerhuthia sesleriiformis	POACEAE	LC
Fockea sinuata	APOCYNACEAE	LC

Freesia andersoniae	IRIDACEAE	LC
Galenia secunda	AIZOACEAE	LC
Galinsoga parviflora	ASTERACEAE	NE
Galium capense subsp*. capense*	RUBIACEAE	LC
Galium tomentosum	RUBIACEAE	LC
Garuleum latifolium	ASTERACEAE	LC
Garuleum pinnatifidum	ASTERACEAE	LC
Gazania krebsiana subsp. *krebsiana*	ASTERACEAE	LC
Gerbera piloselloides	ASTERACEAE	LC
Gladiolus permeabilis subsp. *edulis*	IRIDACEAE	LC
Gnaphalium declinatum	ASTERACEAE	NT
Gnidia microphylla	THYMELAEACEAE	LC
Gnidia polycephala	THYMELAEACEAE	LC
Gomphocarpus fruticosus subsp. *fruticosus*	APOCYNACEAE	LC
Gomphocarpus tomentosus subsp. *tomentosus*	APOCYNACEAE	LC
Gomphostigma virgatum	BUDDLEJACEAE	LC
Gymnosporia capitata	CELASTRACEAE	LC
Hebenstretia dentata	SCROPHULARIACEAE	LC
Helichrysum asperum var. *albidulum*	ASTERACEAE	LC
Helichrysum dregeanum	ASTERACEAE	LC
Helichrysum hamulosum	ASTERACEAE	LC
Helichrysum lucilioides	ASTERACEAE	LC
Helichrysum niveum	ASTERACEAE	LC
Helichrysum nudifolium var. *nudifolium*	ASTERACEAE	LC
Helichrysum pentzioides	ASTERACEAE	LC
Helichrysum zeyheri	ASTERACEAE	LC
Heliophila suavissima	BRASSICACEAE	LC
Hermannia coccocarpa	MALVACEAE	LC
Hermannia cuneifolia var. *glabrescens*	MALVACEAE	LC
Hermannia erodioides	MALVACEAE	LC
Hermannia filifolia var. *filifolia*	MALVACEAE	LC
Hermannia leucantha	MALVACEAE	LC
Hermannia linearifolia	MALVACEAE	LC
Hermannia pulchella	MALVACEAE	LC
Hermannia pulverata	MALVACEAE	LC
Hermannia vestita	MALVACEAE	LC
Hertia pallens	ASTERACEAE	LC
Heteromorpha arborescens var. *arborescens*	APIACEAE	LC
Heteropogon contortus	POACEAE	LC
Hibiscus pusillus	MALVACEAE	LC
Hibiscus trionum	MALVACEAE	NE
Hyparrhenia poecilotricha	POACEAE	LC
Hypertelis salsoloides var. *salsoloides*	MOLLUGINACEAE	LC
Hypoxis argentea var. *argentea*	HYPOXIDACEAE	LC
Indigastrum argyraeum	FABACEAE	LC
Indigofera alternans var*. alternans*	FABACEAE	LC
Indigofera sessilifolia	FABACEAE	LC
Ipomoea oenotheroides	CONVOLVULACEAE	LC
Jamesbrittenia atropurpurea subsp. *atropurpurea*	SCROPHULARIACEAE	LC
Juncus exsertus subsp. *exsertus*	JUNCACEAE	LC
Juncus inflexus	JUNCACEAE	LC

Karroochloa purpurea	POACEAE	LC
Kedrostis capensis	CUCURBITACEAE	LC
Kiggelaria africana	ACHARIACEAE	LC
Kleinia longiflora	ASTERACEAE	LC
Koeleria capensis	POACEAE	LC
Lactuca dregeana	ASTERACEAE	LC
Lantana rugosa	VERBENACEAE	LC
Lappula capensis	BORAGINACEAE	LC
Lappula heteracantha	BORAGINACEAE	NE
Lasiopogon glomerulatus	ASTERACEAE	LC
Lasiospermum bipinnatum	ASTERACEAE	LC
Ledebouria undulata	HYACINTHACEAE	LC
Lepidium africanum subsp. *africanum*	BRASSICACEAE	LC
Lepidium capense	BRASSICACEAE	LC
Lepidium desertorum	BRASSICACEAE	LC
Lessertia pauciflora var. *pauciflora*	FABACEAE	LC
Limeum aethiopicum subsp. *aethiopicum var. aethiopicum*	MOLLUGINACEAE	
Limeum aethiopicum subsp. *aethiopicum var. intermedium*	MOLLUGINACEAE	LC
Limosella grandiflora	SCROPHULARIACEAE	LC
Lobelia thermalis	LOBELIACEAE	LC
Lotononis calycina	FABACEAE	LC
Lycium cinereum	SOLANACEAE	LC
Lycium oxycarpum	SOLANACEAE	LC
Lycium pilifolium	SOLANACEAE	LC
Malva parviflora var. *parviflora*	MALVACEAE	NE
Marsilea macrocarpa	MARSILEACEAE	LC
Gymnosporia buxifolia	CELASTRACEAE	LC
Maytenus undata	CELASTRACEAE	LC
Medicago laciniata var. *laciniata*	FABACEAE	NE
Melianthus comosus	MELIANTHACEAE	LC
Melica decumbens	POACEAE	LC
Melica racemosa	POACEAE	LC
Melinis nerviglumis	POACEAE	LC
Melolobium candicans	FABACEAE	LC
Melolobium microphyllum	FABACEAE	LC
Mentha longifolia subsp. *capensis*	LAMIACEAE	LC
Merxmuellera disticha	POACEAE	LC
Mesembryanthemum aitonis	MESEMBRYANTHEMACEAE	LC
Mestoklema tuberosum	MESEMBRYANTHEMACEAE	LC
Microchloa caffra	POACEAE	LC
Microloma armatum var. *armatum*	APOCYNACEAE	LC
Miscanthus capensis	POACEAE	LC
Mollugo cerviana var. *cerviana*	MOLLUGINACEAE	LC
Monsonia burkeana	GERANIACEAE	LC
Moraea crispa	IRIDACEAE	LC
Moraea pallida	IRIDACEAE	LC
Moraea polystachya	IRIDACEAE	LC
Moraea simulans	IRIDACEAE	LC
Myrsine africana	MYRSINACEAE	LC
Nemesia fruticans	SCROPHULARIACEAE	LC
Nenax microphylla	RUBIACEAE	LC

Nicotiana glauca	SOLANACEAE	NE
Olea europaea subsp. *africana*	OLEACEAE	LC
Oligomeris dregeana	RESEDACEAE	LC
Opuntia ficus-indica	CACTACEAE	NE
Orbea verrucosa	APOCYNACEAE	LC
Ornithogalum juncifolium var. *juncifolium*	HYACINTHACEAE	LC
Ornithogalum tenuifolium subsp. *tenuifolium*	HYACINTHACEAE	LC
Oropetium capense	POACEAE	LC
Osteospermum leptolobum	ASTERACEAE	LC
Osteospermum muricatum subsp. *longiradiatum*	ASTERACEAE	LC
Osyris compressa	SANTALACEAE	LC
Oxalis bifurca var. *angustiloba*	OXALIDACEAE	LC
Oxalis corniculata	OXALIDACEAE	NE
Oxalis depressa	OXALIDACEAE	LC
Oxalis smithiana	OXALIDACEAE	LC
Panicum gilvum	POACEAE	LC
Panicum stapfianum	POACEAE	LC
Papaver aculeatum	PAPAVERACEAE	LC
Paspalum dilatatum	POACEAE	NE
Pegolettia retrofracta	ASTERACEAE	LC
Pelargonium abrotanifolium	GERANIACEAE	LC
Pelargonium alchemilloides	GERANIACEAE	LC
Pelargonium aridum	GERANIACEAE	LC
Pelargonium dichondrifolium	GERANIACEAE	LC
Pelargonium minimum	GERANIACEAE	LC
Pelargonium sidoides	GERANIACEAE	DECLINING
Pennisetum clandestinum	POACEAE	NE
Pennisetum macrourum	POACEAE	NE
Pennisetum sphacelatum	POACEAE	LC
Pentzia dentata	ASTERACEAE	LC
Pentzia globosa	ASTERACEAE	LC
Pentzia incana	ASTERACEAE	LC
Pentzia sphaerocephala	ASTERACEAE	LC
Phragmites australis	POACEAE	LC
Phyllanthus maderaspatensis	PHYLLANTHACEAE	LC
Phymaspermum parvifolium	ASTERACEAE	LC
Physalis angulata	SOLANACEAE	NE
Plantago major	PLANTAGINACEAE	NE
Plinthus karooicus	AIZOACEAE	LC
Poa annua	POACEAE	NE
Pollichia campestris	CARYOPHYLLACEAE	LC
Polygala gracilenta	POLYGALACEAE	LC
Polygala seminuda	POLYGALACEAE	LC
Polygala virgata var. *decora*	POLYGALACEAE	LC
Polygonum aviculare	POLYGONACEAE	LC
Polypogon monspeliensis	POACEAE	LC
Portulaca oleracea	PORTULACACEAE	LC
Portulaca quadrifida	PORTULACACEAE	LC
Pseudognaphalium luteo-album	ASTERACEAE	LC
Pseudognaphalium undulatum	ASTERACEAE	LC
Psilocaulon articulatum	MESEMBRYANTHEMACEAE	LC
Psilocaulon coriarium	MESEMBRYANTHEMACEAE	LC

Pteronia glauca	ASTERACEAE	LC
Pteronia tricephala	ASTERACEAE	LC
Putterlickia saxatilis	CELASTRACEAE	LC
Ranunculus multifidus	RANUNCULACEAE	NE
Rhamnus prinoides	RHAMNACEAE	LC
Rhigozum obovatum	BIGNONIACEAE	LC
Searsia burchellii	ANACARDIACEAE	LC
Searsia divaricata	ANACARDIACEAE	LC
Searsia dregeana	ANACARDIACEAE	LC
Searsia lancea	ANACARDIACEAE	LC
Searsia longispina	ANACARDIACEAE	LC
Searsia lucida forma *lucida*	ANACARDIACEAE	LC
Searsia pyroides var. *gracilis*	ANACARDIACEAE	LC
Rhynchosia totta var. *totta*	FABACEAE	LC
Rosenia humilis	ASTERACEAE	LC
Rosenia oppositifolia	ASTERACEAE	LC
Rubia petiolaris	RUBIACEAE	LC
Rumex lanceolatus	POLYGONACEAE	LC
Ruschia vulvaria	MESEMBRYANTHEMACEAE	
Salsola calluna	CHENOPODIACEAE	LC
Salsola kali	CHENOPODIACEAE	LC
Salvia repens var. *keiensis*	LAMIACEAE	DDD
Salvia stenophylla	LAMIACEAE	
Salvia verbenaca	LAMIACEAE	LC
Schismus barbatus	POACEAE	LC
Schkuhria pinnata	ASTERACEAE	NE
Schoenoplectus paludicola	CYPERACEAE	LC
Schoenoxiphium sparteum	CYPERACEAE	LC
Selago brevifolia	SCROPHULARIACEAE	LC
Selago fruticosa	SCROPHULARIACEAE	LC
Selago paniculata	SCROPHULARIACEAE	LC
Selago saxatilis	SCROPHULARIACEAE	LC
Senecio achilleifolius	ASTERACEAE	LC
Senecio burchellii	ASTERACEAE	LC
Senecio crassiusculus	ASTERACEAE	LC
Senecio incomptus	ASTERACEAE	LC
Senecio leptophyllus	ASTERACEAE	LC
Sesamum capense	PEDALIACEAE	LC
Setaria verticillata	POACEAE	LC
Silene undulata	CARYOPHYLLACEAE	LC
Sisymbrium burchellii var. *burchellii*	BRASSICACEAE	LC
Sisymbrium capense	BRASSICACEAE	LC
Sisymbrium orientale	BRASSICACEAE	NE
Solanum nigrum	SOLANACEAE	NE
Solanum supinum var. *supinum*	SOLANACEAE	LC
Solanum tomentosum var. *coccineum*	SOLANACEAE	LC
Solanum tomentosum var. *tomentosum*	SOLANACEAE	LC
Sonchus oleraceus	ASTERACEAE	NE
Sporobolus discosporus	POACEAE	LC
Sporobolus fimbriatus	POACEAE	LC
Sporobolus ioclados	POACEAE	LC
Stachys aethiopica	LAMIACEAE	LC
Stachys grandifolia	LAMIACEAE	LC

Stachys hyssopoides	LAMIACEAE	LC
Stachys rugosa	LAMIACEAE	LC
Stapelia grandiflora var. *grandiflora*	APOCYNACEAE	LC
Stellaria media	CARYOPHYLLACEAE	NE
Stipa dregeana var. *elongata*	POACEAE	LC
Chaenostoma halimifolia	SCROPHULARIACEAE	LC
Syringodea bifucata	IRIDACEAE	LC
Talinum arnotii	PORTULACACEAE	LC
Tarchonanthus camphoratus	ASTERACEAE	LC
Tetragonia arbuscula	AIZOACEAE	LC
Tetragonia echinata	AIZOACEAE	LC
Themeda triandra	POACEAE	LC
Thesium hystrix	SANTALACEAE	LC
Trachyandra saltii var. *oatesii*	ASPHODELACEAE	LC
Tragus berteronianus	POACEAE	LC
Tragus koelerioides	POACEAE	LC
Tragus racemosus	POACEAE	LC
Tribulus terrestris	ZYGOPHYLLACEAE	LC
Trichodiadema pomeridianum	MESEMBRYANTHEMACEAE	LC
Tripteris aghillana var. *integrifolia*	ASTERACEAE	LC
Troglophyton capillaceum subsp. *capillaceum*	ASTERACEAE	LC
Urochloa panicoides	POACEAE	NE
Ursinia nana subsp. *leptophylla*	ASTERACEAE	LC
Urtica dioica	URTICACEAE	NE
Urtica urens	URTICACEAE	NE
Veronica anagallis-aquatica	SCROPHULARIACEAE	LC
Viscum capense	VISCACEAE	LC
Viscum rotundifolium	VISCACEAE	LC
Wahlenbergia albens	CAMPANULACEAE	LC
Wahlenbergia neorigida	CAMPANULACEAE	LC
Wahlenbergia undulata	CAMPANULACEAE	LC
Withania somnifera	SOLANACEAE	LC
Xanthium spinosum	ASTERACEAE	
Xysmalobium gomphocarpoides var. *gomphocarpoides*	APOCYNACEAE	LC
Zygophyllum incrustatum	ZYGOPHYLLACEAE	

IUCN Red data list categories are as follows: Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Endangered (EN), Critically Endangered (CR), Extinct in the Wild (EW) and Extinct (EX). These categories indicate the conservation importance of a species based on an expert evaluation of the species.

Appendix B. Complete list of fauna that could possibly occur in the Rodicon Solar Energy facility (compiled from various sources) and their conservation significance

MAMMALS

Scientific name	Common name	Red data status	CITES
Aethomys granti	Grant's rock mouse	LC	
Aethomys namaquensis	Namaqua rock mouse	LC	
Antidorcas marsupialis	Springbok	LC	
Aonyx capensis	African clawless otter	LC	
Atelerix frontalis	Southern African hedgehog	LC	
Canis mesomelas	Black-backed jackal	LC	
Caracal caracal	Caracal	LC	
Cercopithecus pygerythrus	Vervet monkey	LC	
Connochaetes gnou	Black wildebeest	LC	
Crocidura cyanea	Reddish-grey musk shrew	LC	
Cryptomys hottentotus	African mole rat	LC	
Cynictis penicillata	Yellow mongoose	LC	
Desmodillus auricularis	Cape short-tailed gerbil	LC	
Elephantulus rupestris	Western rock elephant-shrew	LC	
Felis nigripes	Black-footed cat	VU	II
Felis sylvestris	African wild cat	NOT ASSESSED	II
Galerella pulverulenta	Cape grey mongoose	LC	
Genetta genetta	Small-spotted genet	LC	
Gerbillus paeba	Hairy-footed gerbil	NOT ASSESSED	
Graphiurus murinus	Woodland dormouse	LC	
Graphiurus ocularis	Spectacled dormouse	LC	
Hystrix africaeaustralis	Cape porcupine	LC	
Ichneumia albicauda	White-tailed mongoose	LC	
Lepus saxatilis	Scrub hare	LC	
Macroscelides proboscideus	Round-eared elephant-shrew	LC	
Malacothrix typica	Gerbil mouse	LC	
Mastomys coucha	Southern multimammate mouse	LC	
Mellivora capensis	Honey badger		
Mus minutoides	Pygmy mouse	LC	
Mystromys albicaudatus	White-tailed mouse	EN	
Nycteris thebaica	Egyptian slit-faced bat	LC	
Oreotragus oreotragus	Klipspringer	LC	
Orycteropus afer	Aardvark	LC	
Oryx gazella	Gemsbok	LC	
Otocyon megalotis	Bat-eared fox	LC	
Otomys unisulcatus	Bush vlei rat	LC	
Panthera pardus	Leopard	NT	I
Papio hamadryas	Chacma baboon	LC	
Pedetis capensis	Springhare	NOT ASSESSED	
Pelea capreolus	Grey rhebuck	LC	
Pipistrellus capensis	Cape serotine bat	LC	

Poecilogale albinucha	African striped weasel	LC	
Procavia capensis	Rock hyrax	LC	
Pronolagus rupestris	Smith's red rock rabbit	LC	
Proteles cristata	Aardwolf	LC	III
Raphicerus campestris	Steenbok	LC	
Redunca fulvorufula	Mountain reedbuck	LC	
Rhabdomys pumilio	Four-striped grass mouse	LC	
Saccostomus campestris	Pouched mouse	LC	
Suricata suricatta	Suricate	LC	
Sylvicapra grimmia	Common duiker	LC	
Tadarida aegyptiaca	Egyptian free-tailed bat	LC	
Tragelaphus oryx	Eland	LC	
Tragelaphus strepsiceros	Greater kudu		
Vulpes chama	Cape fox	LC	
Xerus inauris	South African ground squirrel	LC	

Tortoises, terrapins and turtles

Scientific name	**Common name**	**Red data status**	**CITES**
Homopus femoralis	Karoo padloper	NOT ASSESSED	
Pelomedusa subrufa	Leopard tortoise	NOT ASSESSED	
Stigmochelys pardalis	African helmeted turtle	NOT ASSESSED	

Frogs

Scientific name	**Common name**	**Red data status**	**CITES**
Cacosternum boettgeri	Boettger's dainty frog	LC	
Pyxicephalus adspersus	African bullfrog	LC	

Herpetofauna

Scientific name	**Common name**	**Red data status**	**CITES**
Acontias gracilicauda	Thin-tailed legless skink	LC	
Agama aculeata	Ground agama	NOT ASSESSED	
Agama atra	Southern rock agama	NOT ASSESSED	
Aspidelaps lubricus	Coral cobra	NOT ASSESSED	
Bitis arietans	Puff adder	NOT ASSESSED	
Cordylus cordylus	Cape girdled lizard	NOT ASSESSED	II
Cordylus polyzonus	Karoo girdled lizard	NOT ASSESSED	II
Crotaphopeltis hotamboeia	Red-lipped snake	NOT ASSESSED	
Dasypeltis scabra	Common egg-eating snake	LC	
Lamprophis fulginosus	African house snake	NOT ASSESSED	
Lamprophis guttatus	Spotted house snake	NOT ASSESSED	
Leptotyphlops conjunctus	Cape thread snake	NOT ASSESSED	
Lycophidion capense	Common/Cape wolf snake	NOT ASSESSED	
Mabuya capensis	Cape skink	NOT ASSESSED	
Naja nivea	Cape cobra	NOT ASSESSED	
Pachydactylus bibronii	Bibron's gecko	NOT ASSESSED	
Pachydactylus capensis	Cape thick-toed gecko	NOT ASSESSED	

Pachydactylus mariquensis	Marico gecko	NOT ASSESSED
Pedioplanis burchelli	Burchell's sand lizard	NOT ASSESSED
Pedioplanis lineoocellata	Spotted sand lizard	NOT ASSESSED
Prosymna sundevallii	Sundevall's shovel-snout	NOT ASSESSED
Psammophis crucifer	Cross-marked sand snake	NOT ASSESSED
Psammophis notostictus	Karoo sand snake	NOT ASSESSED
Psammophylax rhombeatus	Spotted skaapsteker/grass snake	NOT ASSESSED
Pseudaspis cana	Mole snake	NOT ASSESSED
Rhinotyphlops lalandei	Delalande's beaked blind snake	NOT ASSESSED
Varanus albigularis	White-throated monitor	NOT ASSESSED

BIRDS

Scientific name	**Common name**	**Red data status**	**CITES**
Alcedo cristata	Malachite kingfisher	LC	
Alopochen aegyptiaca	Egyptian goose	LC	
Amadina erythrocephala	Red-headed finch	LC	
Anas capensis	Cape teal	LC	
Anas sparsa	African black duck	LC	
Anas undulata	Yellow-billed duck	LC	
Anthus cinnamomeus	African pipit		
Anthus crenatus	Yellow-tufted pipit	LC	
Anthus leucophrys	Plain-backed pipit	LC	
Anthus similis	Long-billed pipit	LC	
Apus barbatus	African black swift	LC	
Apus caffer	White-rumped swift	LC	
Apus horus	Horus swift	LC	
Aquila pennatus	Booted eagle	LC	
Aquila rapax	Tawny eagle	LC	II
Aquila verreauxii	Verreaux's eagle	LC	II
Ardea cinerea	Grey heron	LC	
Ardea goliath	Goliath heron	LC	
Ardea melanocephala	Black-headed heron	LC	
Ardeotis kori	Kori bustard	LC	
Batis molitor	Chinspot batis	LC	
Bostrychia hagedash	Hadeda ibis	LC	
Bradornis infuscatus	Chat flycatcher	LC	
Bubo africanus	Spotted eagle-owl	LC	
Bubulcus ibis	Cattle egret	LC	
Burhinus capensis	Water thick-knee	LC	
Buteo rufofuscus	Jackal buzzard	LC	
Buteo vulpinus	Steppe buzzard	LC	
Caprimulgus pectoralis	Fiery-necked nightjar	LC	
Caprimulgus rufigena	Rufous-cheeked nightjar	LC	
Cercomela familiaris	Familiar chat	LC	
Cercomela schlegelii	Karoo chat	LC	
Cercomela sinuata	Sickle-winged chat	LC	

Cercotrichas coryphoeus	Karoo scrub-robin	LC	
Certhilauda curvirostris	Cape long-billed lark	LC	
Ceryle rudis	Pied kingfisher	LC	
Chalcomitra amethystina	Amethyst sunbird	LC	
Charadrius tricollaris	Three-banded plover	LC	
Chersomanes albofasciata	Spike-heeled lark	LC	
Chrysococcyx caprius	Didric cuckoo	LC	
Ciconia ciconia	White stork	LC	
Ciconia nigra	Black stork	LC	II
Cinnyris chalybeus	Southern double-collated sunbird	LC	
Cinnyris fuscus	Dusky sunbird	LC	
Circus maurus	Black harrier	VU	
Cisticola aridulus	Desert cisticola	LC	
Cisticola fulvicapilla	Neddicky	LC	
Cisticola subruficapilla	Grey-black cisticola	LC	
Cisticola textrix	Tink-tink cisticola	LC	
Cisticola tinniens	Levaillant's cisticola	LC	
Clamator glandarius	Great spotted cuckoo	LC	
Clamator jacobinus	Pied cuckoo	LC	
Colius colius	White-backed mousebird	LC	
Colius striatus	Speckled mousebird	LC	
Columba guinea	Speckled pigeon	LC	
Corvus albicollis	White-necked raven	LC	
Corvus albus	Pied crow	LC	
Corvus capensis	Cape crow	LC	
Cossypha caffra	Cape robin-chat	LC	
Creatophora cinerea	Wattled starling	LC	
Crithagra albogularis	White-throated canary	LC	
Crithagra flaviventris	Yellow canary	LC	
Crithagra gularis	Streaky-headed seedeater	LC	
Delichon urbicum	Common house-martin	LC	
Dendrocygna viduata	White-faced whistling duck	LC	
Dendropicos fuscescens	Cardinal woodpecker	LC	
Dicrurus adsimilis	Fork-tailed drongo	LC	
Elanus caeruleus	Black shouldered kite	LC	
Emberiza capensis	Cape bunting	LC	
Emberiza flaviventris	African golden-breasted bunting	LC	
Emberiza impetuani	Lark-like bunting	LC	
Emberiza tahapisi	Cinnamon-breasted bunting	LC	
Eremomela icteropygialis	Yellow-billed eremomela	LC	
Eremopterix verticalis	Grey-backed sparrow-lark	LC	
Estrilda astrild	Common waxbill	LC	
Euplectes afer	Yellow-crowned bishop	LC	
Euplectes orix	Red bishop	LC	
Eupodotis afra	Black bustard	LC	
Eupodotis caerulescens	Blue bustard	NT	
Eupodotis vigorsii	Karoo bustard	LC	
Falco naumanni	Lesser kestrel	LC	II

Falco rupicolis	Rock kestrel	LC	II
Falco rupicoloides	Greater kestrel	LC	II
Fulica cristata	Red-knobbed coot	LC	
Galerida magnirostris	Large-billed lark	LC	
Halcyon albiventris	Brown-hooded kingfisher	LC	
Grus paradisea	Blue crane	VU	II
Hirundo abyssinica	Lesser striped=swallow	LC	
Hirundo albigularis	White-throated swallow	LC	
Hirundo cucullata	Greater striped swallow	LC	
Hirundo dimidiata	Pearl-breasted swallow	LC	
Hirundo fuligula	Rock martin	LC	
Hirundo rustica	Barn swallow	LC	
Indicator indicator	Greater honeyguide	LC	
Indicator minor	Lesser honeyguide	LC	
Lanius collaris	Common fiscal	LC	
Macronyx capensis	Cape longclaw	LC	
Malcorus pectoralis	Rufous-eared warbler	LC	
Megaceryle maximus	Giant kingfisher	LC	
Melierax canorus	Southern pale chanting goshawk	LC	
Melierax gabar	Gabar goshawk	LC	
Merops apiaster	European bee-eater	LC	
Mirafra apiata	Cape clapper lark	LC	
Motacilla capensis	Cape wagtail	LC	
Myrmecocichla formicivora	Anteating chat	LC	
Nectarinia famosa	Malachite sunbird	LC	
Neotis ludwigii	Ludwig’s bustard	EN	II
Netta erythrophthalma	Southern pochard	LC	
Numida meleagris	Helmeted guineafowl	LC	
Oena capensis	Namaqua dove	LC	
Oenanthe monticola	Mountain wheatear	LC	
Onychognathus morio	Red winged starling	LC	
Onychognathus nabouroup	Pale-winged starling	LC	
Ortygospiza atricollis	Quailfinch	LC	
Parisoma layardi	Layard’s tit-babler	LC	
Parisoma subcaeruleum	Chestnut-vented tit-babbler	NOT ASSESSED	
Parus afer	Grey tit	LC	
Passer diffusus	Southern grey-headed sparrow	LC	
Passer domesticus	House sparrow	LC	
Passer melanurus	Cape sparrow	LC	
Petronia superciliaris	Yello-throated petronia	LC	
Phalacrocorax africanus	Reed cormorant	LC	
Phalacrocorax lucidus	White-breasted cormorant	NOT ASSESSED	
Phragmacia substriata	Namaqua warbler	LC	
Platalea alba	African spoonbill	LC	
Plectropterus gambensis	Spur-winged goose	LC	
Plocepasser mahali	White-browed sparrow-weaver	LC	
Ploceus velatus	Southern masked weaver	LC	
Polemaetus bellicosus	Martial eagle	NT	

Polyboroides typus	African harrier-hawk	LC
Prinia hypoxantha	Drakensberg prinia	LC
Pycnonotus nigricans	African red-eyed bulbul	NOT ASSESSED
Quelea quelea	Red-billed quelea	LC
Riparia paludicola	Brown throated martin	LC
Sagittarius serpentarius	Secretary bird	VU
Saxicola torquatus	African stonechat	LC
Scleroptila africanus	Grey-wing francolin	NOT ASSESSED
Scopus umbretta	Hamerkop	LC
Serinus alario	Black-headed canary	LC
Serinus canicollis	Cape canary	LC
Sigelus silens	Fiscal flycatcher	LC
Spizocorys conirostris	Pink-billed lark	LC
Sporopipes squamifrons	Scaly weaver	LC
Spreo bicolor	Pied starling	LC
Stenostira scita	Fairy flycatcher	LC
Streptopelia capicola	Cape turtle-dove	LC
Streptopelia semitorquata	Red-eyed turtle-dove	LC
Streptopelia senegalensis	Laughing dove	NOT ASSESSED
Struthio camelus	Ostrich	LC
Sylvietta rufescens	Cape crombec	LC
Tadorna cana	Southern African shelduck	LC
Telophorus zeylonus	Bokmakierie	LC
Terpsiphone viridis	African paradise-flycatcher	LC
Threskiornis aethiopicus	African sacred ibis	LC
Tricholaema leucomelas	Acacia pied barbet	LC
Tringa nebularia	Green sandpiper	LC
Turdus olivaceus	Olive thrush	LC
Upupa africana	African hoopoe	NOT ASSESSED
Urocolius indicus	Red-faced mouse bird	LC
Vanellus armatus	Blacksmith lapwing	LC
Vanellus coronatus	Crowned lapwing	LC
Vidua macroura	Pin-tailed whydah	NOT ASSESSED
Zosterops pallidus	Orange river white eye	LC
BUTTERFLIES		
Vanessa cardui		
Catopsilia florella		

***Clarification of symbols:**

IUCN Red data list categories are as follows: Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Endangered (EN), Critically Endangered (CR), Extinct in the Wild (EW) and Extinct (EX). These categories indicate the conservation importance of a species based on an expert evaluation of the species.

CITES Appendix I includes species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances. Appendix II includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival. Appendix III contains species that are protected in at least one country, which has asked other CITES Parties for assistance in controlling the trade. CITES does not regulate the EIA process but species listed in the Appendices of CITES are considered to be of conservation importance internationally and thus should be considered of conservation importance locally.

Appendix C. Curriculum Vitae and summary of expertise – Gretel van Rooyen

1. Biographical information

Surname	Van Rooyen	Maiden name	Rösch
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Fax (H)	+27 (0)12 348-9043	Fax (W)	+27 (0)12 362-5099
e-mail	gretel.vanrooyen@up.ac.za		
Current position	Professor in Plant Ecology		
Academic qualifications	BSc; BSc (Hons); HNOD; MSc (Botany); PhD (Plant ecology)		

2. Publications

I am author / co-author of more than 100 peer reviewed research publications and have presented / co-presented more than 100 posters or papers at international and national conferences. Four PhD-students and 27 Masters students have completed their studies under my supervision / co-supervision. At present there are 4 PhD and 6 MSc-students enrolled under my supervision. I have co-authored a book as part of a series on the Adaptations of Desert Organisms by Springer Verlag (Van Rheede van Oudtshoorn, K. & Van Rooyen, M.W. 1999. ***Dispersal biology of desert plants.*** Springer Verlag, Berlin) and two wildflower guides (Van Rooyen, G., Steyn, H. & De Villiers, R. 1999. ***Cederberg, Clanwilliam and Biedouw Valley*****.** Wild Flower Guide of South Africa no 10. Botanical Society of South Africa, Kirstenbosch, and Van der Merwe, H. & Van Rooyen, G. **Wild flowers of the Roggeveld and Tanqua**). I have also contributed to six chapters in the following books: (i) Dean, W.R.J. & Milton, S.J. (Eds) *The Karoo: Ecological patterns and processes*. Cambridge University Press, Cambridge. pp. 107-122; (ii) Knobel, J. (ed.) *The magnificent heritage of South Africa.* Sunbird Publishing, Llandudno. pp. 94-107; (iii)Hoffman, M. T., Schmiedel, U., Jürgens, N. [Eds.]: *Biodiversity in southern Africa. Volume 3: Implications for landuse and management*: pp. 109–150, Klaus Hess Publishers, Göttingen & Windhoek; (iv) Schmiedel, U., Jürgens, N. [Eds.]: *Biodiversity in southern Africa. Volume 2: Patterns and processes at regional scale: pp.* 222-232, Klaus Hess Publishers, Göttingen & Windhoek; (v) Stoffberg, H., Hindes, C. & Muller, L. South African Landscape Architecture: A Compendium and

A Reader. Chapter 10, pp. 129 – 140; and (vi) Stoffberg, H., Hindes, C. & Muller, L. South African Landscape Architecture: A Compendium and A Reader. Chapter 11, pp. 141 – 146.

3. Research interests

My primary research interests lie in population biology and vegetation dynamics. The main aim of the research is to gain an understanding of ecosystem dynamics and to use this understanding to develop strategies to conserve, manage, use sustainably or restore ecosystems. Geographically the focus of the studies has been in Namaqualand (Northern Cape Province, South Africa), Kalahari, Maputaland (Northern KwaZulu-Natal) and Namibia.

4. Projects

A brief selection of projects undertaken for industry or the private sector is provided:

Initially the research carried out in Namaqualand was done on behalf of the **Department of Environmental Affairs and Tourism**, South Africa. The objective of the research is to develop scientifically sound management plans for the optimal land-use of this area whether it is for conservation, ecotourism or farming. A main topic of this research centres around the effects of disturbance on the annual vegetation. This is an important issue to South African National Parks and they requested a study, which could indicate the minimum disturbance required to produce mass flowering displays in the Namaqua National Park. Recommendations are made to SANParks on the management of the vegetation on abandoned fields in the Namaqua National Park to attract tourists.

My involvement in Namaqualand resulted in being approached by Anglo American Association (**Namaqua Sands**) as advisor on the rehabilitation of mined areas along the West Coast. Namaqua Sands wanted to know whether they would be able to revegetate the mined area by topsoil replacement alone. The seed bank study that was undertaken demonstrated that topsoil replacement alone would not guarantee the success of the revegetation process. Reseeding with seeds of perennial species as well as transplanting seedlings of selected perennial species would have to supplement the topsoil replacement. This project lead to Ekotrust being requested to evaluate the rehabilitation at Namaqua Sands for the Department of Minerals Affairs and Energy and to do an Environmental Audit of Namaqua Sands.

Several projects in Namaqualand were carried out on behalf of **Northern Cape Nature Conservation Services** on vegetation change and stocking densities in Goegap Nature Reserve.

My involvement in Namaqualand has also lead to collaboration in **BIOTA** Southern Africa – a program that was funded by the German Ministry of Education and Research. This multidisciplinary program investigated changes due to **land-use and climate change** and aimed at sustainable use and conservation of biodiversity. The BIOTA transect runs from the Cape Fynbos to the Kavango in Namibia and therefore allows comparisons to be made on a much broader scale than would be possible otherwise.

Namaqualand is part of the Succulent Karoo, which is recognised by the IUCN as one of the global hotspots of biodiversity. In 2002 the **Succulent Karoo Ecosystem Plan (SKEP)** was launched to gather information on biodiversity and land-use pressures in the Succulent Karoo. The aim was to use systematic conservation planning methods to identify priorities for conservation action in the region. As the SKEP initiative progressed it soon became apparent that there was little information available on the biodiversity of the Hantam-Tanqua-Roggeveld region that could be used for future planning, conservation and development. The Critical Ecosystem Fund (CEPF) have granted funding to H van der Merwe and myself for botanical studies in the Hantam-Tanqua-Roggeveld, an area covering approximately 3 000 000 ha. The Critical Ecosystem Partnership Fund (CEPF) is a joint initiative of Conservation International (CI), the Global Environmental Facility (GEF), the Government of Japan, the MacArthur Foundation and the World Bank.

Studies have also been undertaken in collaboration with **Ezemvelo KwaZulu-Natal Wildlife** in Tembe Elephant Park and surrounds, Maputaland. The Maputaland region is a conservation priority and management strategies based on sustainable utilization are urgently needed. The studies in the region have made valuable contributions towards community-based natural resource management, a topic in the forefront of conservation in Third World countries.

Growth equations that were developed for indigenous trees in urban forests have found a new application in the context of carbon sequestration and the Kyoto Protocol. This study was also the basis of a patent (Ecotree) that has been registered. The equations can be used to quantify the carbon sequestration of indigenous trees over a predetermined period. These equations have also been used to calculate a monetary value of street trees in the City of Tshwane and elsewhere. The carbon stocks in five pools at **Richards Bay Minerals** have also been quantified and comparisons made of the stocks in the rehabilitated areas versus pre-mining forests.

5. Selected project references

Van Rooyen, N., Theron, G.K., Bredenkamp, G.J., Van Rooyen, M.W., Deutschländer, M. & Steyn, H.M. 1996. *Phytosociology, vegetation dynamics and conservation of the* *southern Kalahari*. Final report on a project executed on behalf of the Department of Environmental Affairs & Tourism, Pretoria.

Van Rooyen, M.W., Theron, G.K. & Van Rooyen, N. 1997. Studies on the ephemerals of Namaqualand. Report on a project executed on behalf of the Department of Environmental Affairs and Tourism 1994 – 1996.

Van Rooyen, M.W. 2000. Effect of disturbance on the annual vegetation in Namaqualand. Final Report for South African National Parks on Skilpad Disturbance Plots.

Van Rooyen, N. & Van Rooyen, M.W. 2000. Environmental audit of Namakwa Sands Mine at Brand-se-Baai, Western Cape. Report for Namaqua Sands to Department of Mineral Affairs and Energy.

Veldsman, S. & Van Rooyen, M.W. 2003. An analysis of the vegetation of the Witsand Nature Reserve. Report to Northern Cape Nature Conservation.

Van Rooyen, N, Van Rooyen, M.W. & Grobler, A. 2004. Habitat evaluation and stocking rates for livestock and wildlife - PAN TRUST RANCH, Ghanzi, Botswana. Report to People and Nature TRUST, Botswana.

Van Rooyen, N. & Van Rooyen, M.W. 2004. Vegetation of the Langer Heinrich area, Swakopmund, Namibia. Report to SoftChem.

Van Rooyen, N. & Van Rooyen, M.W. 2005. The vegetation types of the Timbavati, Klaserie and Umbabat Private Nature Reserves. Report to the Associated Private Nature Reserves.

Van Rooyen, M.W., Stoffberg, G.H. & Van Rooyen, N. 2005. Quantifying the vegetative carbon stocks for the Tisand and Zulti-North lease areas at Richards Bay Minerals. Confidential report to Richards Bay Minerals.

Stoffberg, G.H. & Van Rooyen, M.W. 2005. Estimates of carbon sequestrated by the *Jacaranda mimosifolia* street trees in the City of Tshwane, South Africa. Report to City Council of Tshwane.

Van Rooyen, N. & Van Rooyen, M.W. 2005. The Alien plant strategic management plan for the Zululand Region. Report to Ezemvelo KwaZulu-Natal.

Van Rooyen, M.W, Van Rooyen, N., Bothma, J. du P. & Van den Berg, H.M. 2007. Landscapes in the Kalahari Gemsbok National Park, South Africa. Report to SANParks.

Van Rooyen, N. & Van Rooyen, M.W. 2007. The vegetation and management of Ithala Game Reserve. Ekotrust, Pretoria. Report to Ezemvelo KwaZulu-Natal Wildlife.

Van Rooyen, N. & Van Rooyen, M.W. 2008. The vegetation of Nsubane (Royal Jozini Big 6, Swaziland & Scheepers property). Report to proposed Transfrontier Park.

Van Rooyen, M.W., Van Rooyen, N. & Stoffberg, H. 2009. Baseline vegetative and soil carbon stock estimates on properties of Exxaro Resources. Ekotrust CC., Pretoria.

Van Rooyen, N. & Van Rooyen, M.W. 2009. Ithala monitoring of the herbaceous layer. (Pete Ruinard). Ekotrust CC., Pretoria.

Van Rooyen, N. & Van Rooyen, M.W. 2011. Habitat evaluation and wildlife management on the Meletse Wildlife Reserve.

Van Rooyen, N., Van der Merwe, H. & Van Rooyen, M.W. 2011. Vegetation, veld condition and wildlife of Vaalputs. Report for NECSA

Appendix D. Curriculum Vitae and summary of expertise – Helga van der Merwe

PERSONAL INFORMATION

Surname	Van der Merwe
First names	Helga
Maiden name	Rösch
Identity Number	7303020177086
Home Address	Soekop Calvinia, 8190
Telephone/Fax Numbers	027 3412578
Postal Address	P.O. Box 1 Calvinia 8190
E-mail address	soekop@hantam.co.za

HIGHER EDUCATION

University Attended	University of Pretoria
Degrees Obtained	BSc – Botany and Genetics BSc(Hons) - Botany (Ecology) (cum laude) MSc - Botany (Ecology) (cum laude) PhD – Plant Science

TITLE BSc (HONS) PROJECT

Predicting competitive ability of Namaqualand species by using plant traits.

TITLE OF MSc THESIS

Life history strategies of Namaqualand pioneer plant species.

TITLE OF PhD THESIS

Patterns of plant diversity in the Hantam-Tanqua-Roggveld subregion of the Succulent Karoo, South Africa.

EMPLOYMENT HISTORY

- Student (1991 - 1996) – University of Pretoria
- Temporary Part-time Research Assistant (1990-1993) – University of Pretoria
- Tutor for Biology (First Semester 1995) – University of Pretoria
- Tutor for Botany (Second Semester 1995) – University of Pretoria
- Tutor for Biology (First Semester 1996) – University of Pretoria
- Preparation of Biology and Botany practicals (when technical assistants were on excursion or on leave) – University of Pretoria
- Senior Nature Conservation Scientist – Northern Cape Nature Conservation (April 1997 – June 2004)

- Temporary Full-time Research Officer - University of Pretoria (July 2004 – June 2008). I secured funding for a project in the Hantam-Tanqua-Roggeveld. These external funds received from the Critical Ecosystem Partnership Fund through the SKEP initiative were used to fund this position.
- Part-time PhD student at the Department of Plant Science, University of Pretoria (2006 – 2009)
- Student assistantship – University of Pretoria (August 2009 – December 2009)
- Botanical surveys and specialist reporting (May 2008 – until present)

MEMBERSHIPS

Golden Key International Honour Society – Membership upon invitation, granted to the 15% of academic achievers in their field of study. Membership number – 6790927.

South African Council for Natural Scientific Professions – Registered in the field of Botanical Science. Membership number 400193/10.

South African Association of Botanists

Botanical Society of South Africa

ABBREVIATED LIST OF PUBLICATIONS

RÖSCH, H., VAN ROOYEN, M.W. & THERON G.K. 1997. Predicting competitive interactions between pioneer plant species by using plant traits (*Journal of Vegetation Science* (8):489-494).

RÖSCH, H., VAN ROOYEN, M.W. & THERON G.K. 1997. Community level competition between five Namaqualand pioneer plant species (*South African Journal of Botany* 63(1): 1-3).

RÖSCH, H., VAN ROOYEN, M.W. & THERON G.K. 1997. Competitive effect and response of ten Namaqualand ephemeral plant species at two nutrient levels (*South African Journal of Botany* 63(4): 210-215).

RÖSCH, H. 1999. Exploring Namaqualand (*Veld & Flora* 85(3): 114-116).

RÖSCH, H. 2001. The identification and description of the management units of the Goegap Nature Reserve (*Koedoe* 44(1): 17 – 30).

CILLIERS, C., THERON, H., RÖSCH, H. & LE ROUX, A. 2002. *Succulent Karoo Ecosystem Plan, Sub-regional report, Hantam/Tanqua/Roggeveld*. Succulent Karoo Ecosystem Plan report, Critical Ecosystem Partnership Fund.

VAN DER MERWE, H. 2007. Floral spectacle in the Succulent Karoo (*Veld & Flora* 93(2): 78-81.

VAN DER MERWE, H., VAN ROOYEN, M.W. & VAN ROOYEN, N. 2008. Vegetation map of the Hantam-Tanqua-Roggeveld (*Veld & Flora* 94 (3): 132-133).

VAN DER MERWE, H., VAN ROOYEN, M.W. & VAN ROOYEN, N. 2008. Vegetation of the Hantam-Tanqua-Roggeveld subregion, South Africa. Part 1. Fynbos Biome-related vegetation (*Koedoe* 50(1): 61-71).

VAN DER MERWE, H., VAN ROOYEN, M.W. & VAN ROOYEN, N. 2008. Vegetation of the Hantam-Tanqua-Roggeveld subregion, South Africa Part 2. Succulent Karoo Biome-related vegetation (*Koedoe* 50(1): 160-183).

VAN DER MERWE, H. & VAN ROOYEN, M.W. 2011. Vegetation trends following fire in the Roggeveld, Mountain Renosterveld, South Africa (*South African Journal of Botany* 77: 127-136).

VAN ROOYEN, M.W., HENSTOCK, R., VAN ROOYEN, N. & VAN DER MERWE, H. 2010. Diversity and flowering displays on old fields in the Namaqua National Park, South Africa (*Koedoe* 52(1), Art. # 1004, 7 pages. DOI: 10.4102/Koedoe.v52i1.1004).

VAN DER MERWE, H. & VAN ROOYEN, M.W. 2011. Life form spectra in the Hantam-Tanqua-Roggeveld, Succulent Karoo, South Africa (*South African Journal of Botany* 77: 371-380).

VAN DER MERWE, H. & VAN ROOYEN, M.W. 2011. Species-area relationships in the Hantam-Tanqua-Roggeveld, Succulent Karoo, South Africa (*Biodiversity and conservation* 20:1183-1201).

VAN DER MERWE, H. & VAN ROOYEN, M.W. Guiding conservation efforts in the Hantam-Tanqua-Roggeveld (South Africa) using diversity parameters (*Koedoe* 53(1), Art. #1018, 9 pages. Doi: 10.4102/Koedoe.v53i1.1018.

VAN DER MERWE, H. & VAN ROOYEN, M.W. Life form and species diversity on abandoned croplands, Roggeveld, South Africa African. (*Journal of Range and Forage Science* 28: 99-110).

CONTRIBUTIONS TO CHAPTERS IN BOOKS

HOFFMAN, M. T., SCHMIEDEL, U., JÜRGENS, N. (2010) [Eds.]: Biodiversity in southern Africa. Volume 3: Implications for landuse and management. – XII + 226 pp. + CD-ROM, Klaus Hess Publishers, Göttingen & Windhoek.

FIELD GUIDE PUBLISHED (2010)

Wild flowers of the Roggeveld and Tanqua. Helga van der Merwe in collaboration with Gretel van Rooyen.

CONGRESS PAPERS AND POSTERS

Various papers and posters were presented at Botanical and arid region congresses, fora and meetings.

Numerous botanical specialist reports have been compiled as part of environmental impact assessments and vegetation surveys in the arid areas of South Africa.

Appendix E. Curriculum Vitae and summary of expertise – Noel van Rooyen

***Curriculum vitae*: DR NOEL VAN ROOYEN**

1. Biographical information

Surname	Van Rooyen
First names	Noel
ID number	501225 5034 084
Citizenship	South African
Business address	Ekotrust CC 272 Thatcher's Field Lynnwood 0081 Pretoria South Africa
Tel & Fax	+27 (0)12 348 9043
Cell	+27 (0) 82 882 0886
e-mail	gvrooyen@icon.co.za; www.ekotrust.co.za
Current position	Professional Ecologist/Botanist/Rangeland scientist
Professional registration	Professional Natural Scientist (Pr.Sci.Nat; Reg no. 401430/83), Professional Rangeland Scientist (GSSA) and Professional Ecologist (SAIE&ES).

Academic qualifications include BSc (Agric), BSc (Honours), MSc (1978) and DSc degrees (1984) in Plant Ecology at the University of Pretoria, South Africa. Until 1999 I was Professor in Plant Ecology at the University of Pretoria and at present I am a member of Ekotrust cc.

2. Publications

I am the author/co-author of 121 peer reviewed research publications in national and international scientific journals and was supervisor or co-supervisor of 9 PhD and 33 MSc students. During my academic career more than 140 papers and/or posters were presented at national and international congresses. More than 260 projects were undertaken by Ekotrust cc over a period of 20 years.

Examples of articles and reports relevant to the Succulent Karoo and Nama-Karoo in the western parts of South Africa:

Books:

Authored a wild flower field guide for the southern Kalahari:

VAN ROOYEN, N. (2001). ***Flowering plants of the Kalahari dunes***. Ekotrust CC, Pretoria. (In collaboration with H. Bezuidenhout & E. de Kock).

Author / co-author of various chapters on the Savanna and Grassland Biomes in:

LOW, B. & REBELO, A.R. (1996). ***Vegetation types of South Africa, Lesotho and Swaziland,*** Department of Environmental Affairs and Tourism, Pretoria.

KNOBEL, J. (Ed.) (1999, 2006). ***The Magnificent Natural Heritage of South Africa*.** (Chapters on the Kalahari and Lowveld).

VAN DER WALT, P.T. 2010. Bosveld. Briza, Pretoria. (Chapter on Sour Bushveld).

Contributed to chapters on vegetation, habitat evaluation and veld management in the book:

BOTHMA, J. du P. (Ed.) 2010**. *Game Ranch Management*.** 5th edition**.** Van Schaik, Pretoria.

Co-editor of:

BOTHMA, J. du P. & VAN ROOYEN, N**.** (eds). 2005**. *Intensive wildlife production in southern Africa.*** Van Schaik, Pretoria.

3. Ekotrust CC: Core Services

Ekotrust CC specializes in vegetation surveys, classification and mapping, wildlife management, wildlife production and economic assessments, vegetation ecology, veld condition assessment, carrying capacity, floristic diversity assessments, rare species assessments, carbon pool assessments and alien plant management.

4. Examples of projects

General projects:

Numerous vegetation surveys and vegetation impact assessments for Baseline, Scoping and Environmental Impact Assessments (EIA's) were made both locally and internationally.

Numerous projects have been undertaken in game ranches and conservation areas covering aspects such as vegetation surveys, range condition assessments and wildlife management. Of note is the Kgalagadi Transfrontier Park; iSimangaliso Wetland Park, Ithala Game Reserve, Phinda Private Game Reserve, Mabula Game Reserve, Tswalu

Kalahari Desert Reserve, Maremani Nature Reserve and Associate Private Nature Reserve (previously Timbavati, Klaserie & Umbabat Private Game Reserve).

Involvement in various research programmes: vegetation of the northern Kruger National Park, Savanna Ecosystem Project at Nylsvley, Limpopo; Kuiseb River Project (Namibia); Grassland Biome Project; Namaqualand and Kruger Park Rivers Ecosystem research programme.

5. Selected references of studies done by Ekotrust CC

VAN ROOYEN, N., THERON, G.K., BREDENKAMP, G.J., VAN ROOYEN, M.W., DEUTSCHLäNDER, M. & STEYN, H.M. 1996. *Phytosociology, vegetation dynamics and conservation of the southern Kalahari*. Final report: Department of Environmental Affairs & Tourism, Pretoria.

VAN ROOYEN, N. 1999. The vegetation types, veld condition and game of Tswalu Kalahari Desert Reserve.

VAN ROOYEN, N. & VAN ROOYEN, M.W. 2000. Environmental audit of Namakwa Sands Mine at Brand-se-Baai, Western Cape.

VAN ROOYEN, N. 2000. Vegetation survey and mapping of the Kgalagadi Transfrontier Park. Peace Parks Foundation, Stellenbosch.

VAN ROOYEN, N, VAN ROOYEN, M.W. & GROBLER, A. 2004. Habitat evaluation and stocking rates for wildlife and livestock - PAN TRUST Ranch, Ghanzi, Botswana.

VAN ROOYEN, N. & VAN ROOYEN, M.W. 2004. Vegetation of the Langer Heinrich area, Namib-Naukluft National Park, Namibia.

VAN ROOYEN, N. & VAN ROOYEN, M.W. 2008. Vegetation classification and habitat evaluation of the proposed Royal BigSix Nsubane-Pongola Transfrontier Park, Swaziland.

VAN ROOYEN, N. & VAN ROOYEN, M.W. 2008. Vegetation classification, mapping and habitat evaluation of the Ithala Game Reserve, KwaZulu-Natal. Report to Ezemvelo KwaZulu-Natal Wildlife.

VAN ROOYEN, N. & VAN ROOYEN, M.W. 2010. Ecological evaluation of the Usuthu Community Conservation Area. Report to Wildlands, KwaZulu-Natal.

VAN ROOYEN, N. 2000 - 2011. Biophysical studies of various sites in Gauteng, Mpumalanga, North-West, Limpopo and Northern Cape.

VAN ROOYEN, N. 2011. Evaluation of the vegetation and flora of the proposed ESKOM power transmission line from ETNA to GLOCKNER substations (South Gauteng). Report to Holistic Environmental Services, Polokwane.

APPENDIX F: Declaration of independence – Gretel van Rooyen

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/
NEAS Reference Number:	DEAT/EIA
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

PROJECT TITLE

Specialist ecological study for the proposed Rodicon Solar Energy facility south of Middelburg, Eastern Cape

Specialist:	Dr M W van Rooyen		
Contact person:	Dr M W van Rooyen		
Postal address:	272 Thatchers Fields, Lynnwood, Pretoria		
Postal code:	0081	Cell:	072 0253386
Telephone:	012 34809043	Fax:	012 348 9043
E-mail:	Gretel.vanrooyen@up.ac.za		
Professional affiliation(s) (if any)	South African Association of Botanists		

Project Consultant:	Ekotrust cc		
Contact person:	Dr N van Rooyen		
Postal address:	272 Thatchers Fields, Lynnwood, Pretoria		
Postal code:	0081	Cell:	082 8820886
Telephone:	012 34809043	Fax:	012 348 9043
E-mail:	noel@ekotrust.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, **M W van Rooyen** , declare that --

General declaration:

- I act as the independent specialist in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

M. W. van Rooyen

Signature of the specialist:

Ekotrust cc

Name of company (if applicable):

23 April 2012

Date:

APPENDIX G: Declaration of independence – Helga van der Merwe

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/
NEAS Reference Number:	DEAT/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

PROJECT TITLE

Specialist ecological study for the proposed Rodicon Solar Energy facility south of Middelburg, Eastern Cape

Specialist:	Dr. Helga van der Merwe		
Contact person:	Dr. Helga van der Merwe		
Postal address:	P.O. Box 1, Calvinia		
Postal code:	8190	Cell:	No reception
Telephone:	027 3412578	Fax:	027 3412578
E-mail:	soekop@hantam.co.za		
Professional affiliation(s) (if any)	South African Association of Botanists South African Council for Natural Scientific Professions (registration no.400193/10) Botanical Society of Southern Africa Golden Key International Honour Society (membership no. 6790927)		

Project Consultant:	Ekotrust cc		
Contact person:	Dr N van Rooyen		
Postal address:	272 Thatchers Fields, Lynnwood, Pretoria		
Postal code:	0081	Cell:	082 8820886
Telephone:	012 34809043	Fax:	012 348 9043
E-mail:	noel@ekotrust.co.za		

4.2 The specialist appointed in terms of the Regulations

I, **Helga van der Merwe** , declare that --

General declaration:

- I act as the independent specialist in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

H van der Merwe

Signature of the specialist:

Ekotrust cc

Name of company (if applicable):

23 April 2012

Date:

APPENDIX H: Declaration of independence – Noel van Rooyen

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/
NEAS Reference Number:	DEAT/EIA
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

PROJECT TITLE

Specialist ecological study for the proposed Rodicon Solar Energy facility south of Middelburg, Eastern Cape

Specialist:	Dr N van Rooyen		
Contact person:	Dr N van Rooyen		
Postal address:	272 Thatchers Fields, Lynnwood, Pretoria		
Postal code:	0081	Cell:	072 0253386
Telephone:	012 34809043	Fax:	012 348 9043
E-mail:	Gvrooyen@icon.co.za		
Professional affiliation(s) (if any)	South African Association of Botanists		

Project Consultant:	Ekotrust cc		
Contact person:	Dr N van Rooyen		
Postal address:	272 Thatchers Fields, Lynnwood, Pretoria		
Postal code:	0081	Cell:	082 8820886
Telephone:	012 34809043	Fax:	012 348 9043
E-mail:	noel@ekotrust.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, **N van Rooyen** , declare that --

General declaration:

- I act as the independent specialist in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Ekotrust cc

Name of company (if applicable):

23 April 2012

Date:

Appendix D2:
Agricultural Potential Study

BY

EDUPLAN
Louis George du Pisani

ASSESSMENT OF THE SOILS & AGRICULTURAL POTENTIAL – RODICON SITE

APRIL 2012

PROPOSED ESTABLISHMENT OF A PHOTOVOLTAIC (SOLAR POWER) FACILITY ON PORTION 0 (REMAINING EXTENT) OF THE FARM ZAK FONTYN NO. 267 IN THE MIDDELBERG ROAD DIVISION, MIDLANDS DISTRICT COUNCIL (EASTERN CAPE)

PREPARED FOR: RODICON TRADING & INVESTMENT (PTY) LTD, REPRESENTED BY SAVANNAH ENVIRONMENTAL (PTY) LTD

CONSULTANT: EDUPLAN
P O Box 48
MIDDELBURG (EC) 5900
TEL: 049 – 802 7300
FAX: 049 – 802 7312

I, Louis George du Pisani, hereby confirm my independence as a specialist and declare that I have no interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which I was appointed as Agricultural Specialist, other than fair remuneration for work performed on this project.

______________________________	24 April 2012
L G du Pisani	**Date**

EXECUTIVE SUMMARY

Site name and location: A site on Portion 0 (Remaining Extent) of the Farm Zak Fontyn No. 267 (area = 1340ha), in the Middelburg Road Division, Midlands District Council of the Eastern Cape, situated approximately 46km east of Middelburg (EC).

Purpose of the study: To conduct a soil and agricultural potential study of the site where the establishment of a photovoltaic farm is planned and provide a professional opinion on (i) whether the proposed site is of such high agricultural potential that the proposed development would lead to a significant loss of agricultural potential in the area and the property it is situated upon, (ii) whether the sites are situated within agricultural sensitive areas and (iii) to provide the necessary environmental impact assessments.

Specialists: **Dr L G du Pisani** (B.Sc. Agric., Hons B.Sc. Agric., M.Sc. Agric., Ph.D. Agric. - all in Pasture Science)

Mr T G Coetzee (B.Sc. Agric. (Soil Science & Pasture Science), Hons B.Sc. Agric., M.Sc. Agric. - in Pasture Science)
Pri. Sci. Nat. 400131/90

Date of Report: 24 April 2012

Findings:

1 The site is relatively insignificant when compared to the area of the Relative Homogeneous Farming Area it represents (0.08% of the area) and the total carrying capacity of 1 LSU.

2 The site is degraded and poor in terms of agricultural potential and is suitable for extensive grazing purposes only.

3 The site does not consist of unique agricultural land.

4 No part of the site is currently under cultivation or has been cultivated the last ten years.

5 The sites does not have agricultural infrastructure (i.e. silos, irrigation lines, pivot points, channels, feeding structures, grazing camps, animal housing, farm roads, etc.) or any conservation works (i.e. contour banks, waterways, etc.) that will be interfered with.

6 The slopes on the site are less than 20%.

7 The site has a low susceptibility to both water and wind erosion. Due diligence should still be observed with the implementation of proper control of water and wind erosion measures during the construction phase.

In summary, it is concluded that the agricultural potential of the site is low, that the site is too small to contribute significantly to the economy or food security of the area (or the farm on which it is situated upon). Although the site has a low susceptibility to both water and wind erosion, due diligence should still be observed with the implementation of proper control of water and wind erosion measures during the construction phase.

TABLE OF CONTENTS

LIST OF APPENDICES

1. INTRODUCTION

The consultant had the following brief:

1.1 To conduct a soil and agricultural potential assessment of a site on Portion 0 (Remaining Extent) of the Farm Zak Fontyn No. 267 (area = 1340ha), in the Middelburg Road Division, Midlands District Council, of the Eastern Cape where the establishment of photovoltaic arrays are planned.

1.2 To compile a report and provide a professional opinion on (i) whether the proposed sites are of such high agricultural potential that the proposed development would lead to a significant loss of agricultural potential in the area, (ii) whether the sites are situated within agricultural sensitive areas and (iii) to assess the direct, indirect and cumulative impacts of the issues identified through the scoping study, as well as all other issues identified in the EIA phase.

2. BACKGROUND INFORMATION

The Department of Agriculture, Forestry and Fisheries (DAFF) (2010) published '' Regulations for the evaluation and review of applications pertaining to wind farming on agricultural land''. This report states that ''*it is important to conduct land use in a way that it optimally adheres to the potential of the land. Consequently, it is imperative that all available land with the potential for producing sustained high crop yields, thus land with a high agricultural production potential, as well as land with a potential carrying capacity for livestock, be effectively utilized and protected for agricultural use. Agricultural production or the use of land for any other purpose should nevertheless not be conducted in a way that it could result in the degradation or loss of the available natural resources. This especially has reference in ensuring that high potential and unique agricultural land is preserved for current and future production thereby ensuring sustainable utilization of the country's natural resource base and adhering to food security*.''

This report by DAFF (November 2010) provides a draft list of guidelines that must be taken into account and be adhered to before permission will be granted for the establishment of Wind Farms on agricultural land. They are:

2.1 No development will be allowed on high potential or unique agricultural land.

2.2 No development will be allowed on areas currently being cultivated (cultivated fields/ production areas) or on fields that have been cultivated in the last ten years. This is relevant to cultivated land utilized for dry land production as well as land under any form of irrigation.

2.3 No development will be allowed should it intervene with or impact negatively on existing or planned production areas (including grazing land) as well as agricultural infrastructure (silos, irrigation lines, pivot points, channels, feeding structures, dip tanks, grazing camps, animal housing, farm roads etc).

2.4 No development will be allowed should it result in the degradation of the natural resource base of the farm or surrounding areas. These include, but are not limited to, soil degradation or soil loss through erosion or any manner of soil degradation, the degradation of water resources (both quality and quantity) and the degradation of vegetation (composition and condition of both natural or established vegetation). It also includes establishment on or impacting on:

2.4.1 Wetlands (*land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil*). No development will be allowed on a wetland, vlei, pan or any other water body unless otherwise approved by DAFF.

2.4.2 Flow pattern of run-off water and shall not in any manner divert any run-off water from a water course to any other watercourse or obstruct the natural flow pattern of run off water.

2.4.3 Utilization and protection of vegetation. Every care should be taken to protect the vegetation and veld condition against deterioration and destruction.

2.5 No development will be allowed should it result in a degradation of existing soil conservation work. This includes but are not limited to:

2.5.1 Contour banks.

2.5.2 Waterways/Watercourses

2.6 No development will be allowed on slopes (*the vertical difference in height between the highest and the lowest points of that portion of land, expressed as a percentage of the horizontal distance between those two points*) of more than 20%.

It is assumed that the same set of guidelines is relevant in the case of photovoltaic energy facilities.

3. *MODUS OPERANDI* FOLLOWED WITH THE ASSESSMENT

The consultant:

3.1 Conducted a reconnaissance of the site by foot (16 April 2012), traversing the site, listing the site's agricultural attributes, i.e. plant species present, topographic features, soil surface condition, erosion status, etc.

3.2 Prepared a compendium of available published data, information, maps and satellite images for each site-area.

3.3 Used the data, information, maps and satellite images to prepare a professional opinion on whether any of the six DAFF-guidelines (as was discussed in paragraph 2 of this report) will be contravened upon and conduct an environmental impact assessment of the agricultural resources.

4. SITE INFORMATION

A 18,6ha site, situated between the GPS points 31°46'55.08''S - 25°13'01,6''E, 31°46'43,46'S - 25°13'07.40''E, 31°46'54.77''S - 25°13'21.68''E, 31°47'04.74'S - 25°13'13.74''E, on Portion 0 (Remaining Extent) of the Farm Zak Fontyn No. 267 (area = 1340ha), in the Middelburg Road Division, Midlands District Council, of the Eastern Cape was evaluated. The position of the site is indicated in the maps depicted in Appendix 1 & 2.

The slopes on the site are maximum 1% and flat.

5. DESCRIPTION OF THE SOILS AND AGRICULTURAL POTENTIAL

5.1 General description of the soil and agricultural potential

Appendix 3 provides a compendium of the general agricultural characteristics of the area the site is situated in.

The site is situated within a relative homogeneous farming area (RHF) with a surface area of 356 705ha (Vorster, 1985) (see also Appendix 5). The area of the proposed site (in total approximately 18,6ha) thus covers less than 0,01% of the total area of the RHF.

The climate of the area is typical of the southern steppe (Schultze, 1980) and is categorized as semi-arid. Rainfall is largely due to showers and thunderstorms, falling mainly in the months between October to March, with the peak of the rainy season between February and April. The longterm average annual rainfall for the area is 340mm (Vorster, 1985) (see also Appendix 6). Violent thunderstorms with high rainfall intensities are not uncommon.

The geology of the area is characterized by mainly Beaufort Group mudstone and sandstone, as well as Dolerite (Vorster, 1985). The B-horizons of the soils are generally prismacutaneous and pedocutaneous with a red to non-red colour (Dept. Agric., 1991), with a medium depth (300mm to 1000mm), are well drained and apedal (without structure) (Vorster, 1985) (see also Appendix 7). The susceptibility to erosion of the soils is categorised as low to medium (AGIS Website, Dept. Agric., Fisheries & Forestry – www.agis.agric.za - Appendix 8 & 9; Vorster, 1985). The most prevalent soil forms present are Hutton, Dundee, Clovelly, Avalon, Glenrosa, Sterkspruit, Shortlands, Swartland and Valsrivier (according to the classification of MacVicar et. al., 1977).

The vegetation is dominated by sweet grasses and karoo shrubs and falls within Veld Type 36 False Upper Karoo (Acocks, 1988). The long-term average grazing capacity varies between 13 ha/LSU (large stock unit) and 18 ha/LSU (Botha, 1998), depending on local rainfall and soil depth (see also Appendix 11).

5.2 More detailed description and discussion of the soil and agricultural potential of the specific site

5.2.1 Soil & Agricultural Potential

The site is located on an apron sloping from east into a westerly direction. The maximum slope on the site is 1%.

The development of False Upper Karoo constitutes the most spectacular of all changes in the vegetation of South Africa and the conversion of 51 800 square km of grassveld into eroded Karoo can only be regarded as a national disaster (Acocks, 1988). This is specifically true about this site. The soil is almost completely denuded of topsoil (possibly due to mainly wind erosion over many years in the distant past) with only the sub-soil layers left and compacted (see photographs in Appendix 12). The current soil condition is categorized as degraded with the loss of top soil.

A detailed plant species list is provided in Appendix 10. The sward is dominated by the annual grasses *Aristida congesta* and *Aristida adscensionis* and the karoo shrubs *Felicia muricata, Pentzia globosa, Phymaspermum aciculare* and *Rosenia humulis*. Perennial sweet grasses are present where the topsoil is still present, but in low numbers. The vegetation cover can be categorized as average (see photographs in Appendix 12). In general the veld condition can be categorised as poor and degraded.

There are no wetland areas (i.e. vlei and pan areas) or watercourses present within the site.

The mean long term grazing capacity of the site is estimated at 20 ha/LSU, giving this 17,5 ha site a carrying capacity of 1 large stock unit (LSU). The best agricultural use according to Vorster (1985) is for grazing by sheep, goats and beef cattle (see also Appendix 11). These demonstrate that the loss in agricultural potential would be low and negligible.

5.2.2 Agricultural infrastructure

There is no agricultural infrastructure (i.e. silos, irrigation lines, pivot points, etc.) present within the site.

5.2.3 Accessibility to the site and roads

The site is accessible by road via the N10 and R701 roads (approximately 1 km). The ESCOM power line runs approximately 1km to the north of the site. There is no substation in the vicinity.

5.2.4 Vulnerability of the site to erosion

The susceptibility to erosion of a site is characterised by several factors, of which the erosion characteristics of the soil, the slope of the site, rainfall characteristics and plant cover is the most important.

According to the AGIS Website (Dept. Agric., Fisheries & Forestry – www.agis.agric.za) and Vorster (1985) (see Appendix 3, 8 & 9) the site is situated in an area where the soil's susceptibility is categorised as low to medium. The specific mixture of factors prevalent on this site (it is flat and has a compacted top soil layer which is almost completely denuded of the A horizon) put it in a **low** category for soil erosion, both water and wind erosion.

Although the site is categorised to be low in terms of soil erosion susceptibility, it does not mean that no erosion control should be taken. Proper soil erosion control measures should still be implemented on the site during and after the construction phase.

5.2.5 Groundwater, soil and geological stability of the site

	YES	NO
Shallow water table (less than 1.5m deep)		X
Dolomite, sinkhole, or doline areas		X
Seasonally wet soils (often close to water bodies)		X
Unstable rocky slopes or steep slopes with loose soil		X

Dispersive soils (soils that dissolve in water)		X
Soils with high clay content (clay fraction more than 40%)		X
Any other unstable soil or geological feature		X
An area sensitive to erosion		X

5.2.5 Assessment of impacts

Direct, indirect and cumulative impacts of the issues identified through the scoping study, as well as all other issues identified in the EIA phase must be assessed in terms of the following criteria:

» 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) – assigned a score of 1;
* the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
* medium-term (5–15 years) – assigned a score of 3;
* long term (> 15 years) - assigned a score of 4; or
* permanent - assigned a score of 5;

» The **magnitude**, quantified on a scale from 0-10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is 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 on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).

» the **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; 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.*

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

S=(E+D+M)P

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

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

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

Assessment of impacts must be summarised in the following table format. The rating values as per the above criteria must also be included.

Table 1 Summary of the significance of impacts (with and without mitigation)

a)

Nature: Soil erosion on the construction site during and after the construction phase due to decreased vegetation cover and increased water run-off		
	Without mitigation	**With mitigation**
Extent	Regional (2)	Local (1)
Duration	Medium-term (2)	Very short-term (1)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**18 (Low)**	**12 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: Care must be taken with the ground cover during and after construction on the site. If it is not possible to retain a good plant cover during construction, technologies should be employed to keep the soil covered by other means, i.e. straw, mulch, erosion control mats, etc., until a healthy plant cover is again established. Care should also be taken to control and contain storm water run-off		
Cumulative Impacts: Little with the necessary mitigation in place		
Residual Impacts: Little with the necessary mitigation in place		

b)

Nature: Increased wind erosion due to trampling effect on the top soil by increased vehicle traffic.		
	Without mitigation	**With mitigation**
Extent	Regional (2)	Local (1)
Duration	Short-term (1)	Very short-term (1)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**15 (Low)**	**12 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation: Care should be taken to put gravel on access road surfaces to protect		

the soil against wind erosion, as well as construction sites.
Cumulative Impacts: Little with the necessary mitigation in place
Residual Impacts: Little with the necessary mitigation in place

c)

Nature: Dust pollution		
	Without mitigation	**With mitigation**
Extent	Regional (2)	Local (1)
Duration	Very short term (1)	Very short-term (1)
Magnitude	Mino (3)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**18 (Low)**	**12 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation: Apply dust control measures, i.e. water spraying.		
Cumulative Impacts: Little with the necessary mitigation in place		
Residual Impacts: Little with the necessary mitigation in place		

5.2.7 Measures for inclusion in the draft Environmental Management Plan

Table 2 Measures for inclusion in the draft EMP

a)

OBJECTIVE: Soil erosion (water erosion) control and mitigation	
Project component/s	Maintenance of soil cover
Potential Impact	Increased water run-off, soil degradation due to water erosion and sediment generation
Activity/risk source	Further degradation of the soil and increased storm water run-off
Mitigation: Target/Objective	Prevention and control of water erosion on the site

Mitigation: Action/control	**Responsibility**	**Timeframe**
Plan and implement proper soil cover	Engineer and	Duration of the project

measures and storm water drainage mechanisms	construction personnel	

Performance Indicator	Minimum soil surface erosion Immediate action should be taken when negative impacts are experienced
Monitoring	Monitor erosion rates and erosion sites on a weekly basis and after each storm water event

b)

OBJECTIVE: Limit construction and vehicle impact on wind erosion	
Project component/s	Covering all access and construction routes with gravel Control of water run-off from road surfaces
Potential Impact	Further soil degradation due to increased wind erosion and dust production Soil degradation due to water erosion caused by poor water run-off control from roads
Activity/risk source	Poor road construction and maintenance
Mitigation: Target/Objective	Proper road construction and maintenance

Mitigation: Action/control	**Responsibility**	**Timeframe**
Plan and implement proper soil cover measures and storm water drainage mechanisms	Engineer and construction personnel	Duration of the project

Performance Indicator	Minimum dust formation and water erosion along roadsides and construction sites Immediate action should be taken when negative impacts are experienced
Monitoring	Monitor roads and construction sites on a regular basis

6 CONCLUSIONS

6.1 The site is relatively insignificant when compared to the area of the Relative Homogeneous Farming Area it represents (less than 0.01% of the area) and the total carrying capacity of 1 LSU.

6.2 The site is degraded and poor in terms of agricultural potential and is suitable for extensive grazing purposes only.

6.3 The site does not consist of unique agricultural land.

6.4 No part of the site is currently under cultivation or has been cultivated the last ten years.

6.5 The site does not have agricultural infrastructure (i.e. silos, irrigation lines, pivot points, channels, feeding structures, grazing camps, animal housing, farm roads, etc.) or any conservation works (i.e. contour banks, waterways, etc.) that will be interfered with.

6.6 The slopes on the site are less than 20%.

6.7 The site has a low susceptibility to both water and wind erosion. Due diligence should still be observed with the implementation of proper control of water and wind erosion measures during the construction phase.

In summary, it is concluded that the agricultural potential of the site is low, that the site is too small to contribute significantly to the economy or food security of the area (or the farm on which it is situated upon). Although the site has a low susceptibility to both water and wind erosion, due diligence should still be observed with the implementation of proper control of water and wind erosion measures during the construction phase.

8. REFERENCES

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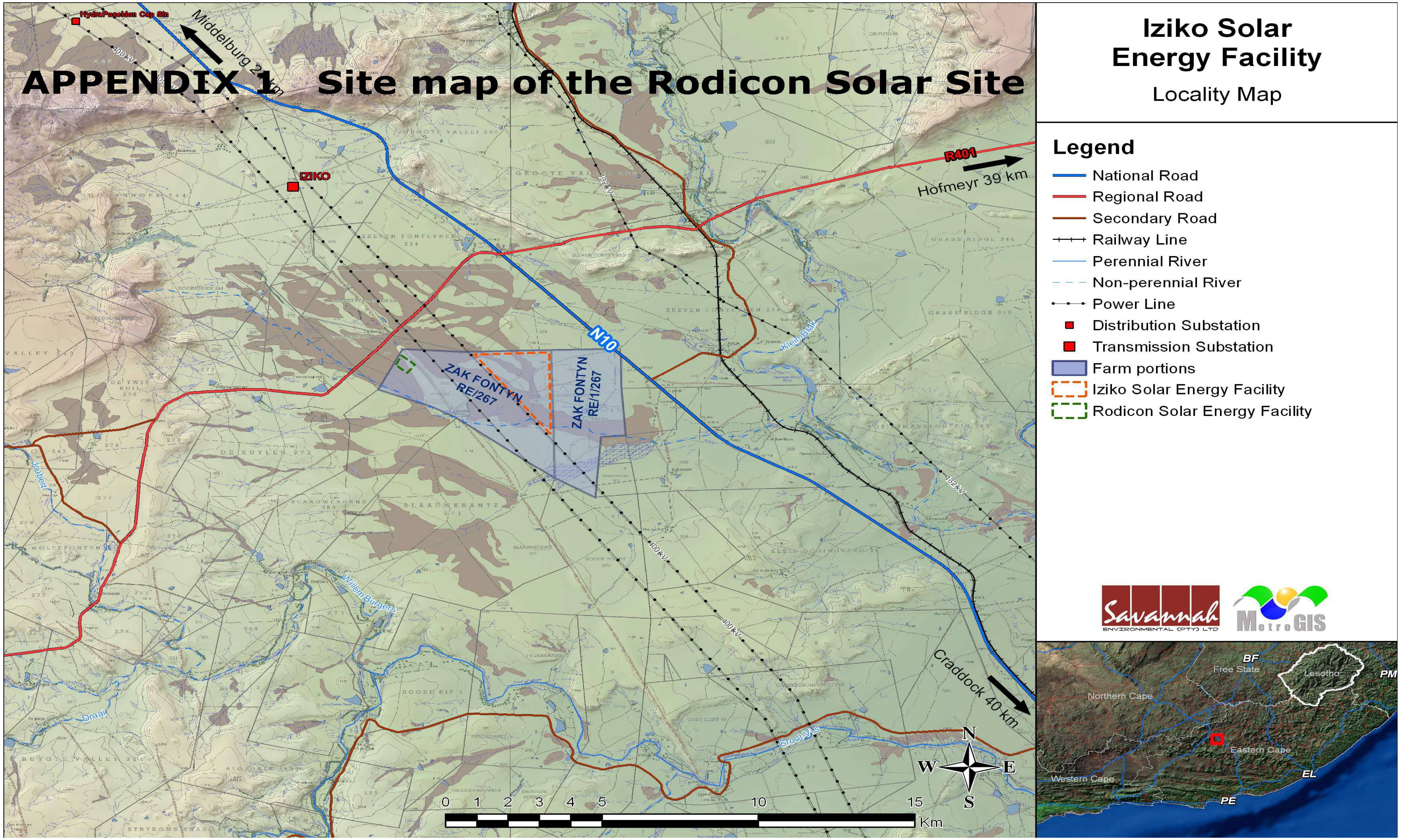
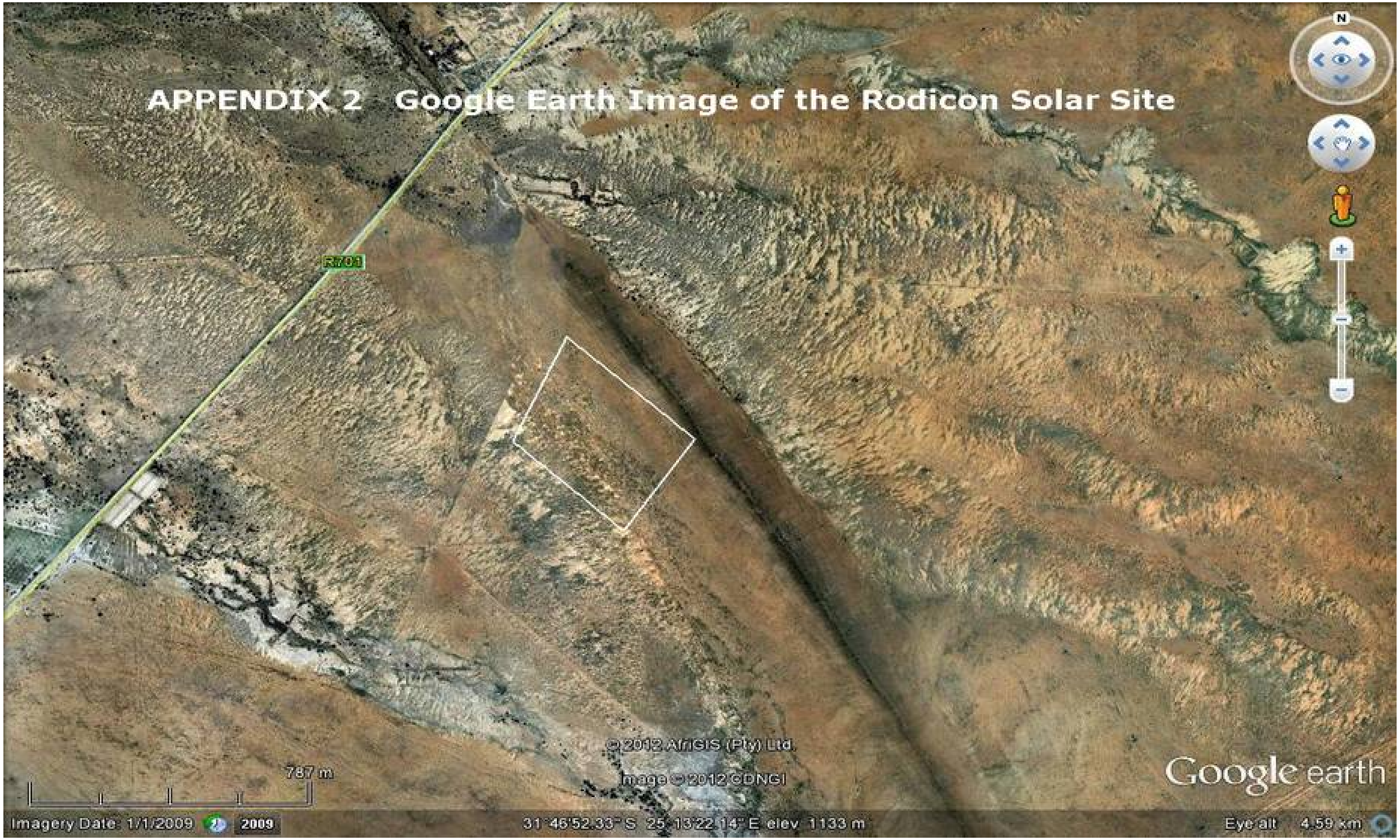
APPENDIX 1 Site map of the Rodicon Solar Site

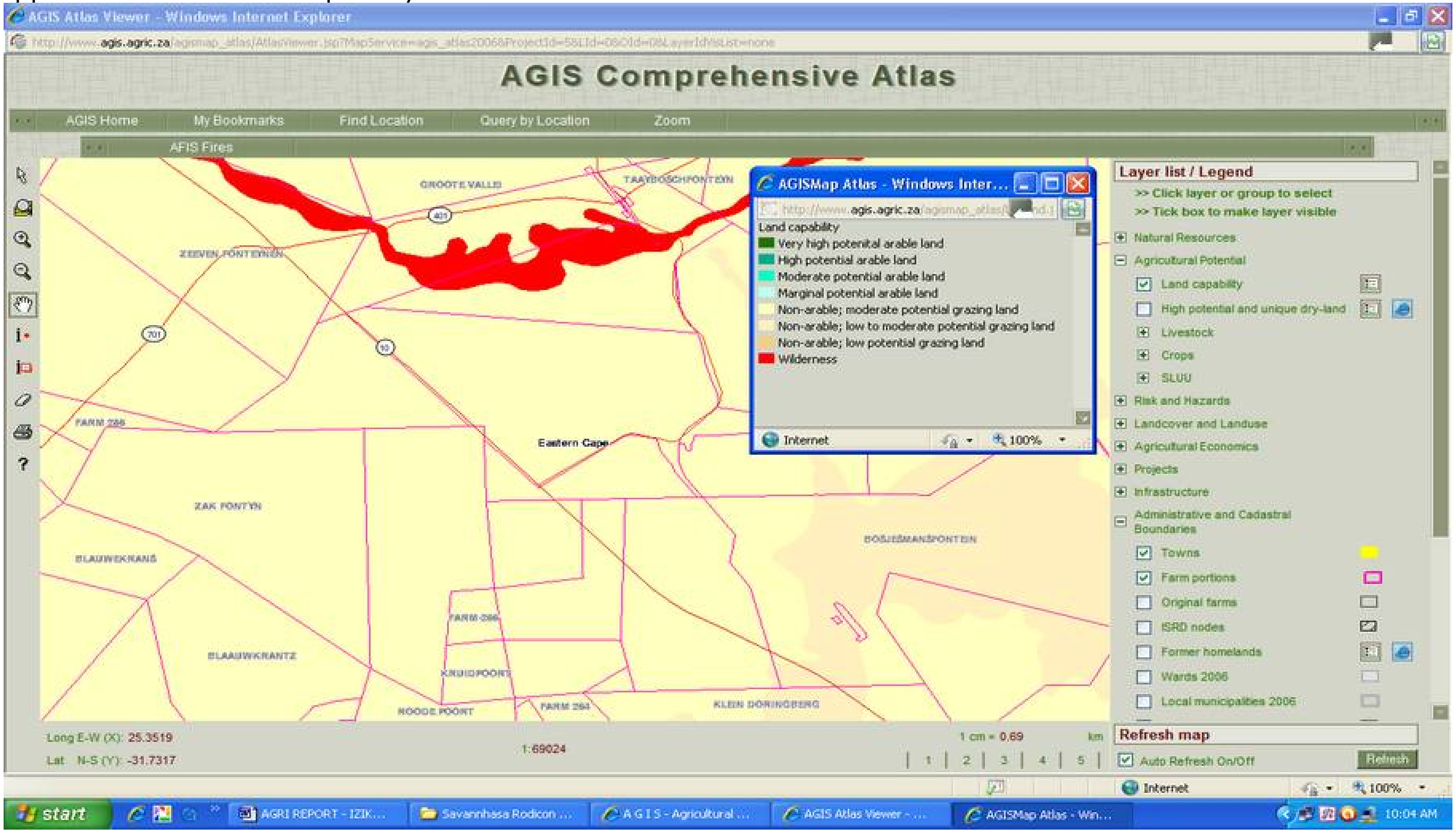



APPENDIX 2 Google Earth Image of the Rodicon Solar Site
R701
© 2012 AfriGIS (Pty) Ltd.
Image © 2012 CDNGI
787 m
Google earth
Imagery Date: 1/1/2009
2009
31°46'52.33" S 25°13'22.14" E elev 1133 m
Eye alt 4.59 km
N

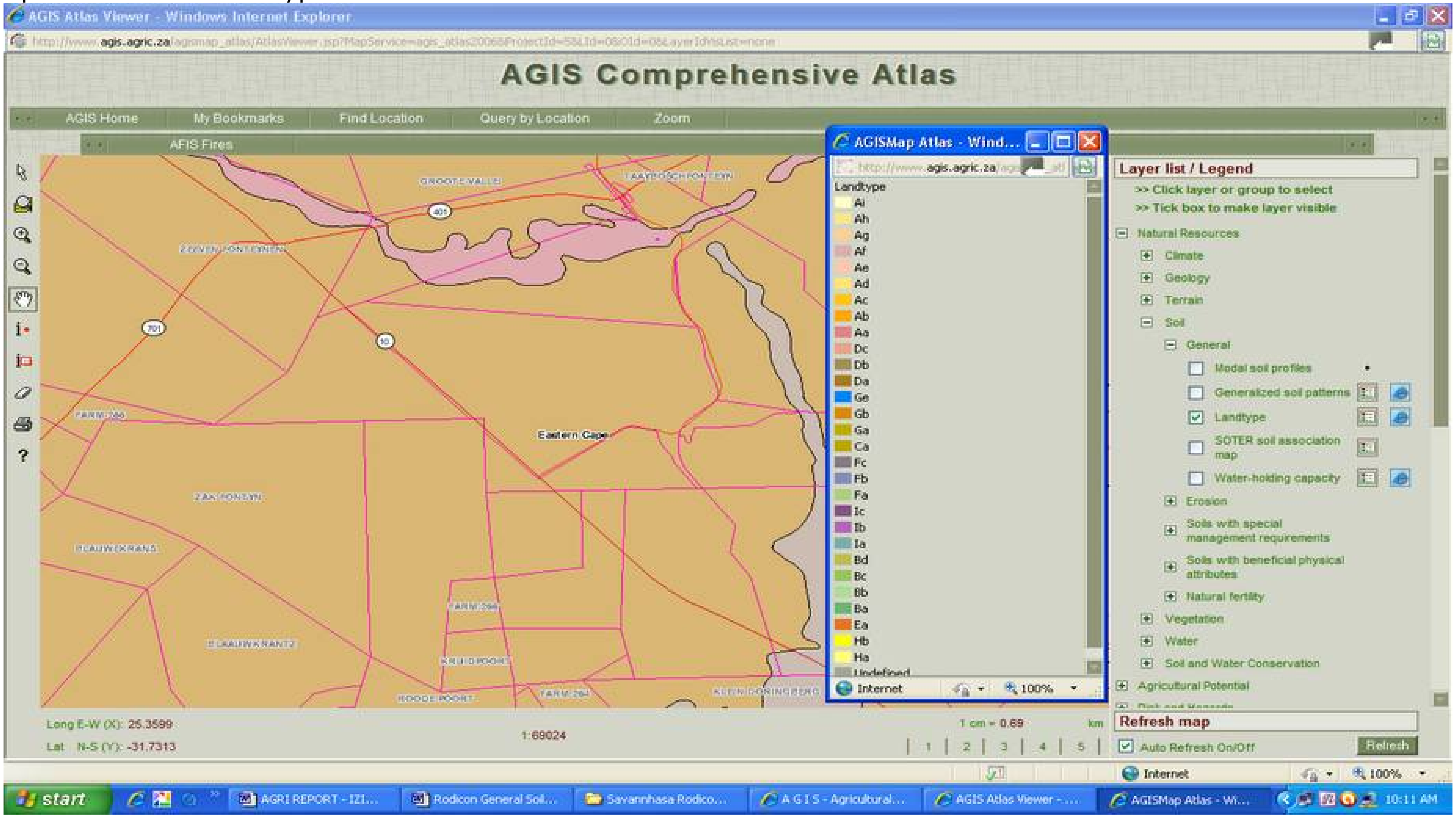
APPENDIX 3 Compendium of the agricultural characteristics of the area where the Rodicon Solar Site is situated

Relative Homogeneous Farming Area Number (Vorster, 1985)	4.8	
Magisterial Districts	Middelburg, Hofmeyr, Cradock & Steynsburg	
Area (ha)	356 705ha	
Land Types Prevalent (Vorster, 1985)	Fr (237) dH (236) Portion R (246)	
Floristic Climatic Region Most prominent plant species prevalent (Dept. Agric., 1991; Vorster, 1985)	FCR 4 *Rhus erosa, Themeda triandra, Chrysocoma ciliata (tenuifolia), Pentzia globosa, Aristida diffussa, Eragrostis lehmanniana*	
Climatic Region (Schultze, 1980)	SS (Southern Steppe)	
Average Rainfall (mm per annum) (Schulze, 1980)	340mm	
Main Rainfall Season (Schulze, 1980)	February to April	
Average Annual Temperature (°C) (Schulze, 1980)	15 – 17.5	
Prevalence of Snowfalls (Schulze, 1980)	Irregular	
Geology	Beaufort Group Mudstone and Sandstone; Dolerite	
General Soil Patterns (Dept. Agric., 1991)	A Soils with prismacutaneous and pedocutaneous B-horizons: i Ds – Red B-horizons ii Db Non-red B-horizons B Rocky outcrops with diverse soils	
Main Soil Forms (Vorster, 1985; MacVicar, et al, 1977)	Hutton, Dundee, Clovelly, Avalon, Glenrosa, Mispah, Sterkspruit, Shortlands, Swartland, Valsrivier	
Erodibility of Soils Vorster, 1985 Agis Website, Dept. Agric., Forestry & Fisheries (www.agis.agric.za)	 Low to Medium Medium	
Land Types (Vorster, 1985)	% of Area (Vorster, 1985)	Veld Soil Potential Class (Vorster, 1985)
* Ridge	15	5
* Hill	1	4
* Apron	33	2
* Plain	42	5
* Floodplain	4	6
* Watercourse	5	1
* Mountain slope		
Veld Type (Acocks, 1988)	Veld Type 36 – False Upper Karoo Mixture of sweet grasses and karoo shrubs	
Grazing Capacity (ha/LSU) (Botha, 1998)	13 – 18	
Best Agricultural Use	Grazing for sheep, goats & beef cattle	

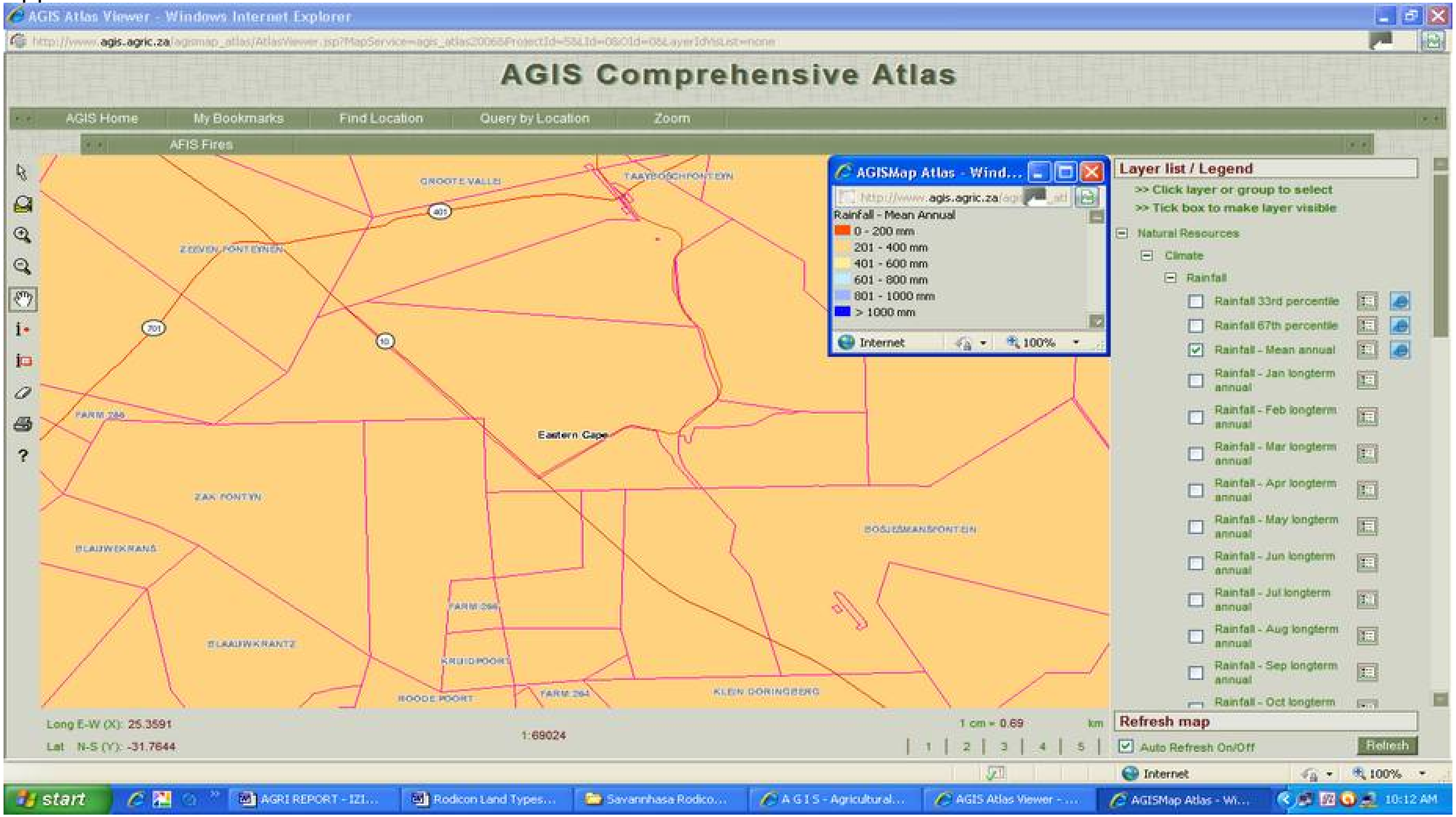
Appendix 4 The land capability at the Rodicon Solar Site



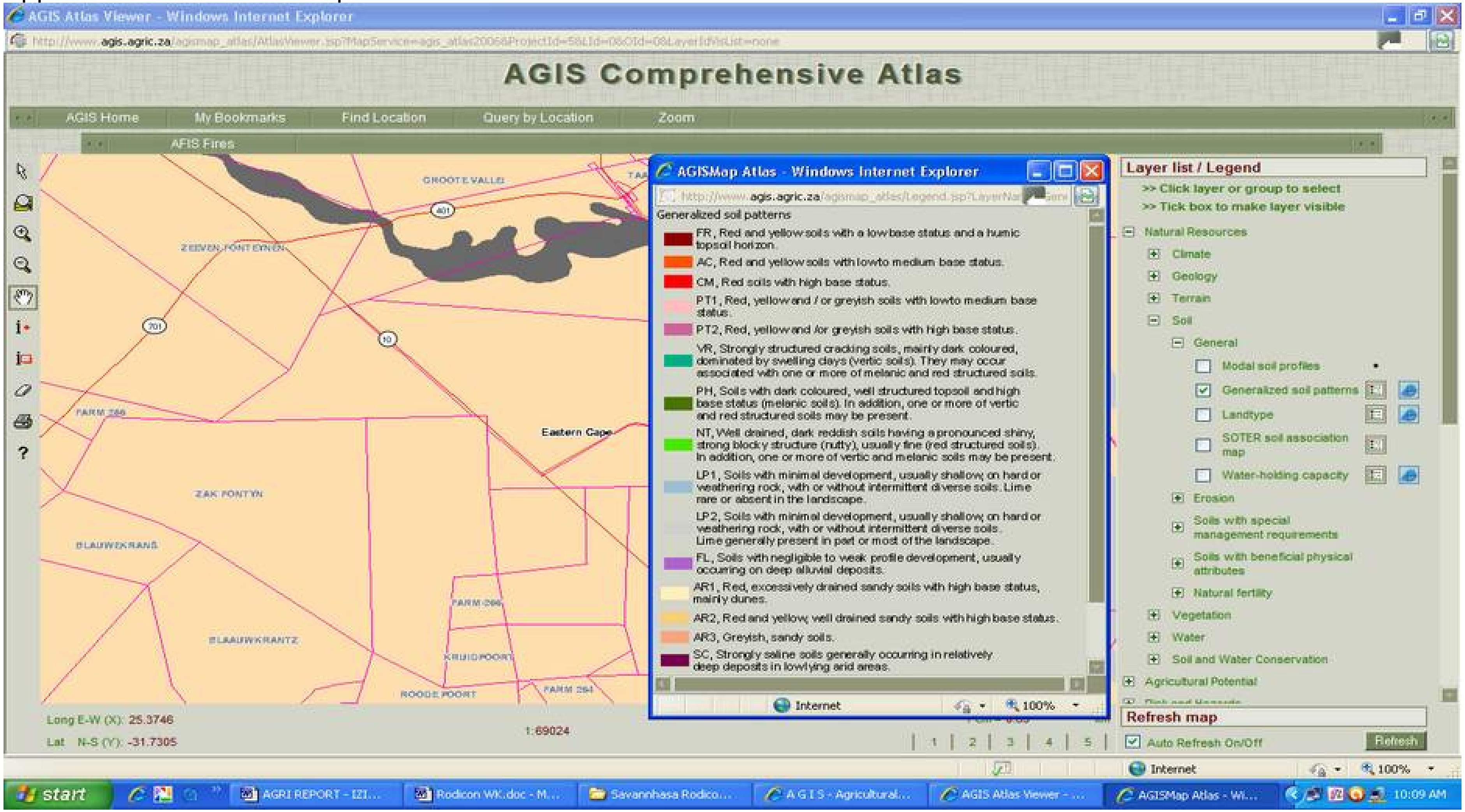
Apendix 5   The land types at the Rodicon Solar Site



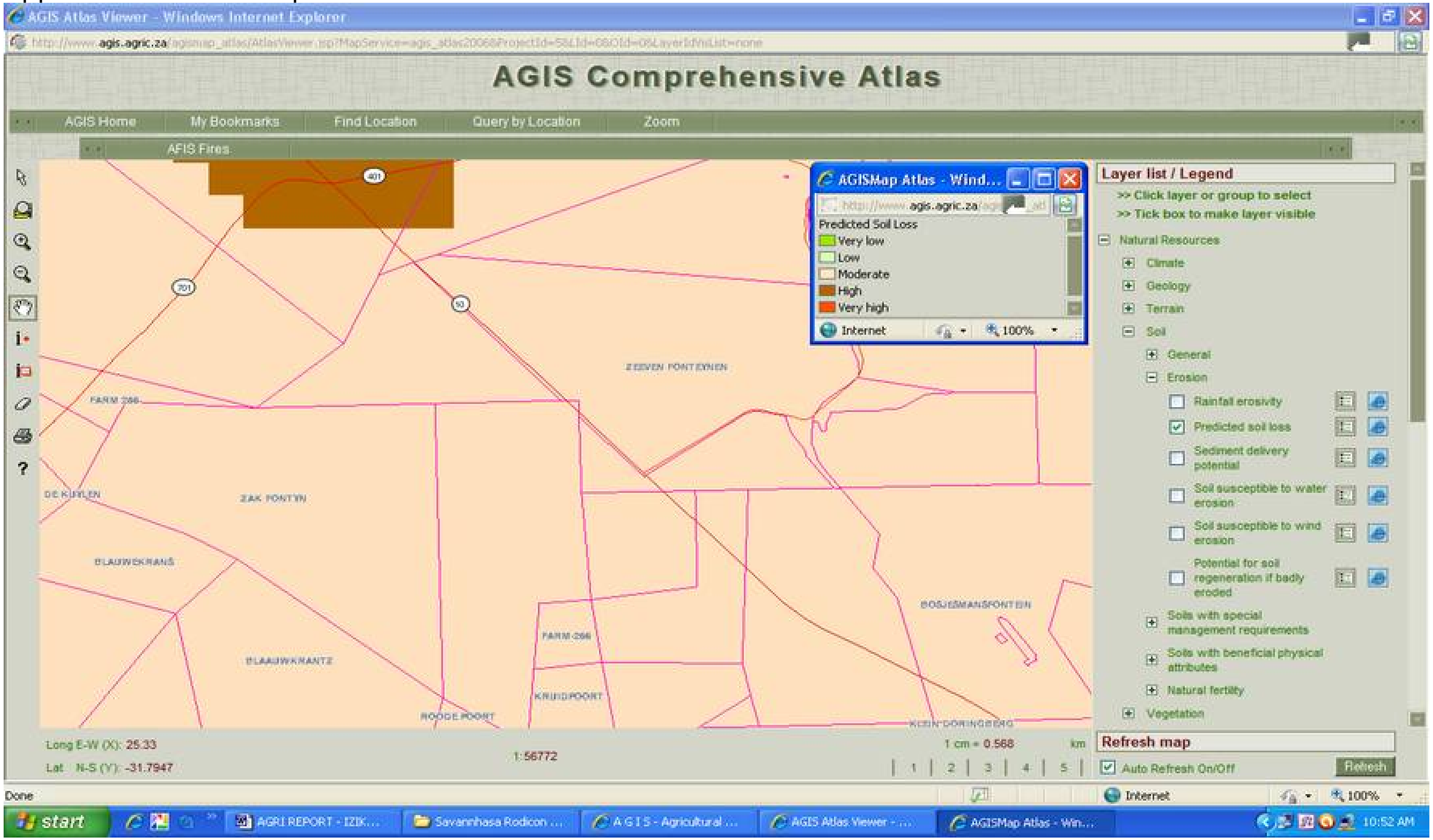
Appendix 6   The mean annual rainfall at the Rodicon Solar Site



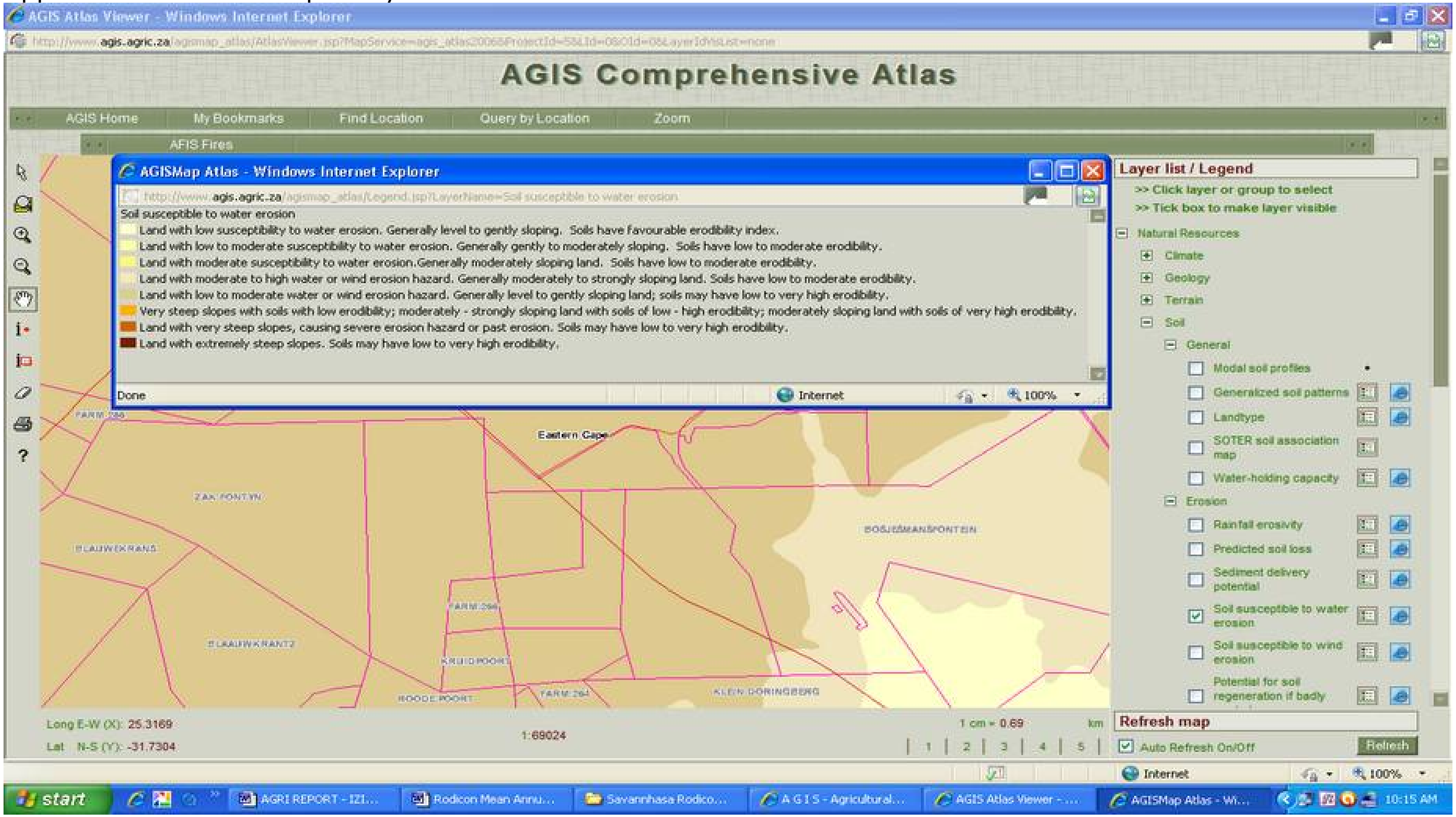
Appendix 7 General soil patterns at the Rodicon Solar site



Appendix 8 Soil loss potential at the Rodicon Solar Site



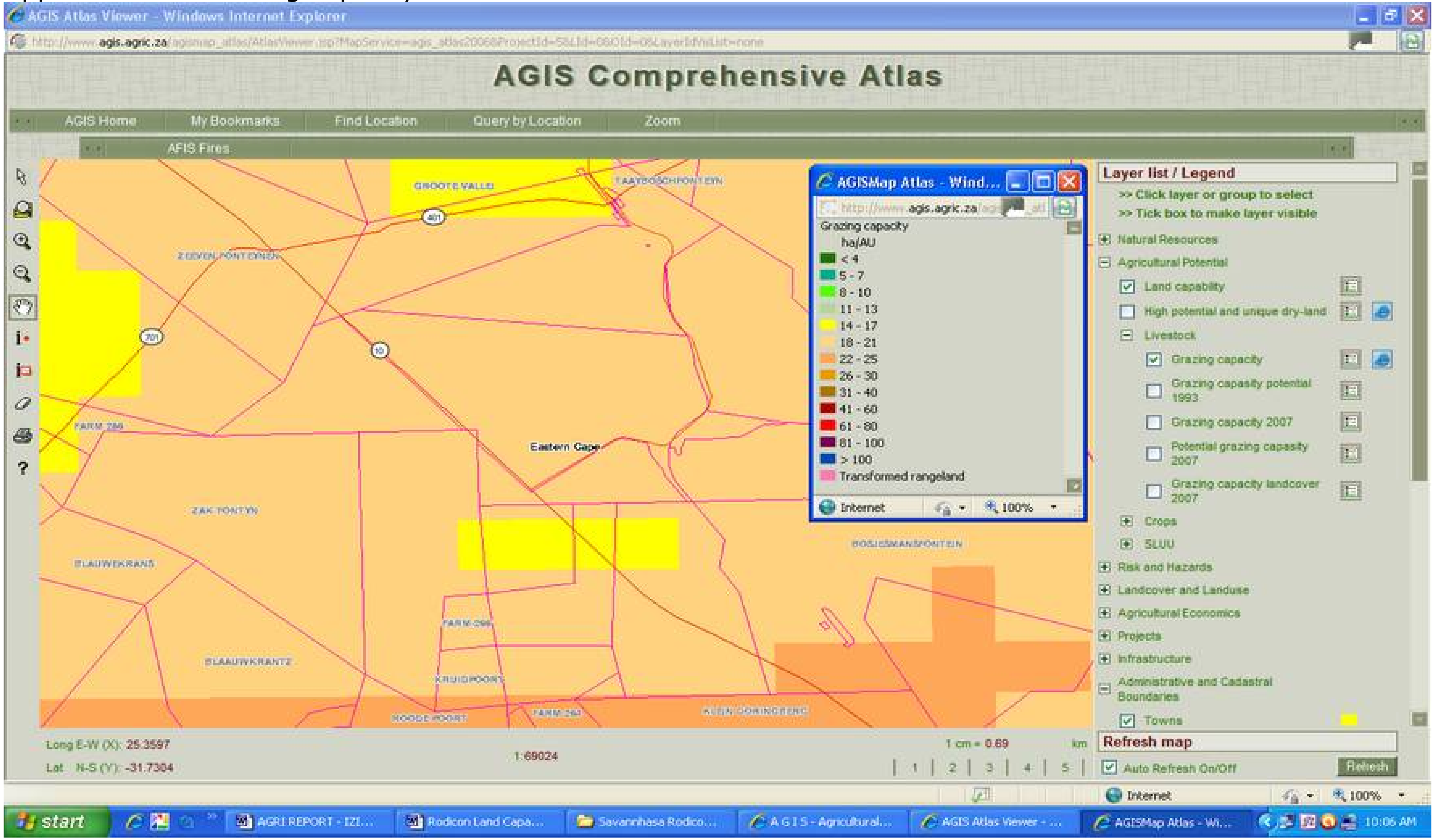
Appendix 9   Soil susceptiblilty to water erosion at the Rodicon Solar Site



APPENDIX 10 Plant species list of the Rodicon Solar Site

Grasses	Karroo Bushes	Trees & Shrubs	Succulents & Annuals
Aristida adscensionis *Aristida congesta* *Aristida diffusa* *Chloris virgata* *Cymbopogon plurinodis* *Cynodon incompletus* *Digitaria eriantha* *Eragrostis lehmanniana* *Eragrostis obtusa* *Heteropogon contortis* *Panicum stapfianum* *Sporobolus fimbriatus* *Tragus koelerioides* *Tragus racemosus*	*Aptosimum procumbens* *Chrysocoma ciliata (tenuifolia)* *Eriocephalus ericoides* *Eriocephalis spinescens* *Felicia muricata* *Geigeria ornativa* *Gnidia polycephala* *Helichrysum lucilioides* *Hermannia depressa* *Limeum aethiopicum* *Melolobium candicans* *Nenax microphylla* *Osteospermun leptolobum* *Pentzia globosa* *Pentzia incana* *Phymaspermum parvifolium* *Plinthus karrooicus* *Rosenia humulis* *Salsola glabrescens* *Sutera pinnatifida* *Thesium lineatum* *Walafrida geniculata* *Walafrida saxatilis*	*Lycium oxycarpa*	*Eberlanzia ferox* *Psilocaulon absimile* *Trichodiadema pomeridianum*

Appendix 11 Grazing capacity of the Rodicon Solar site



Appendix 12   Photographs taken at the Rodicon Solar Site

Appendix D3:
Heritage Resources Study

By

Celeste Booth

A PHASE 1 ARCHAEOLOGICAL IMPACT ASSESSMENT FOR THE PROPOSED ESTABLISHMENT OF THE RODICON SOLAR ENERGY FACILITY ON THE FARM ZAKFONTYN 267, BETWEEN MIDDELBURG AND CRADOCK, EASTERN CAPE PROVINCE.

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April 2012

TABLE OF CONTENTS

A PHASE 1 ARCHAEOLOGICAL IMPACT ASSESSMENT FOR THE PROPOSED ESTABLISHMENT OF THE RODICON SOLAR ENERGY FACILITY ON THE FARM ZAKFONTYN 267, BETWEEN MIDDELBURG AND CRADOCK, EASTERN CAPE PROVINCE.

NOTE: This report follows the minimum standard guidelines required by the South African Heritage Resources Agency (SAHRA) for compiling a Phase 1 Archaeological Impact Assessment (AIA).

1. EXECUTIVE SUMMARY

1.1. Purpose of the Study

The purpose of the study was to conduct and compile a phase 1 archaeological impact assessment (AIA) for the establishment of the proposed Rodicon Solar Energy Facility on the Farm Zakfontyn 267, between Middelburg and Cradock, Eastern Cape Province. The survey was conducted to establish the range and importance of the exposed and *in situ* archaeological heritage material remains, sites and features; to establish the potential impact of the development; and to make recommendations to minimize possible damage to the archaeological heritage.

1.2. Brief Summary of Findings

Surface scatters of predominantly Middle Stone Age (MSA) stone artefacts extend over the proposed area for the Rodicon Solar Energy Facility and the adjacent rocky outcrop to the east. Denser scatters were observed within the large surface exposed and eroded areas within the south-western extent of the proposed development. No associated archaeological material or organic remains were documented with the stone artefact surface scatters. No other archaeological heritage remains, features or sites were observed within the area proposed for development.

1.3. Recommendations

The area is of a medium cultural sensitivity, the following recommendations must be considered:

1. Once the final layout (including the positions of the solar panels; underground cabling; overhead power line; additional internal access roads, and the workshop area) of the proposed Rodicon Solar Energy Facility has been finalised an archaeological ground-truthing should be conducted and further recommendations be made to protect the archaeological heritage within the area proposed for development; and / or

2. A professional archaeologist (with an already authorised collection and excavation permit) must be appointed during all construction and development activities including vegetation clearing and the excavation activities to monitor and identify possible archaeological material remains and features that may occur below the surface and make further appropriate recommendations on removing and / or protecting the archaeological material remains and features.

3. If concentrations of archaeological heritage material and human remains are uncovered during construction, all work must cease immediately and be reported to the Albany Museum (046 622 2312) and/or the South African Heritage Resources Agency (SAHRA) (021 642 4502) so that systematic and professional investigation/ excavation can be undertaken.

4. Construction managers/foremen should be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites.

2. BACKGROUND INFORMATION

The phase 1 archaeological impact assessment (AIA) report has been prepared as part of the environmental impact assessment (EIA) phase.

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Terms of Reference (ToR)

- Provide an indication of the methodology used in determining the significance of potential environmental (archaeological heritage) impact by conducting and compiling the phase 1 archaeological impact assessment (AIA);
- Describe all environmental issues (archaeological heritage) that were identified during the phase 1 archaeological impact assessment (AIA);

- Assess the significance of direct, indirect and cumulative impacts on the environment (archaeological heritage);
- Describe and comparatively assess all of the alternatives identified during the environmental impact assessment process;
- Make recommendations regarding practical mitigation measures for potentially significant impacts;
- Provide an indication of the extent to which the issue could be addressed by the adoption of mitigation measures;
- Describe any assumptions, uncertainties and gaps in knowledge; and
- Provide an environmental impact statement.

3. BRIEF LEGISLATIVE REQUIREMENTS

Parts of sections 35(4), 36(3) and 38(1) (8) of the National Heritage Resources Act 25 of 1999 apply:

Archaeology, palaeontology and meteorites

35 (4) No person may, without a permit issued by the responsible heritage resources authority—

(a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
(b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
(d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.

Burial grounds and graves

36. (3) (a) No person may, without a permit issued by SAHRA or a provincial heritage resources authority—

(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;
(b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
(c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.

Heritage resources management

38. (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorized as –

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
(b) the construction of a bridge or similar structure exceeding 50m in length;
(c) any development or other activity which will change the character of the site –
(i) exceeding 5000m^2 in extent, or
(ii) involving three or more erven or subdivisions thereof; or
(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or
(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA, or a provincial resources authority;
(d) the re-zoning of a site exceeding 10 000m^2 in extent; or
(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must as the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

4. BRIEF ARCHAEOLOGICAL BACKGROUND

Literature review

The Early Stone Age (ESA) spans a period of between 1.5 million and 250 000 years ago and refers to the earliest that *Homo sapiens sapiens* predecessors began making stone artefacts. The Acheulian Industry which replaced the Olduwan Industry approximately 1.5 million years ago is attested to in diverse environments and over wide geographical areas. The hallmark of the Acheulian Industry is its large cutting tools (LCTs or bifaces), primarily handaxes and cleavers. The end products were astonishingly similar across the geographical and chronological distribution of the Acheulian techno-complex: large flakes that were suitable in size and morphology for the production of handaxes and cleavers perfectly suited to the available raw materials (Sharon 2009). Early Stone Age stone artefacts endure for long periods and generally occur as open air surface scatters either as isolated occurrences or in large quantities and very rarely in association with other archaeological heritage, plant and material remains. The Albany Museum database includes records of occurrences of Acheulian handaxes between Middelburg and the Camdeboo National Park near Graaff Reinet, Sampson (1985) located a large number of sites and there is also a collection in the Albany Museum from the Cradock area.

The large Early Stone Age handaxes and cleavers were replaced by smaller stone tools called the Middle Stone Age (MSA) flake and blade industries. The Middle Stone Age spans a period from 250 000-30 000 years ago and focuses on the emergence of modern humans through the change in technology, behaviour, physical appearance, art, and symbolism. Various stone artefact industries occur during this time period, although less is known about the time prior to 120 000 years ago, extensive systemic archaeological research is being conducted on sites across southern Africa dating within the last 120 000 years (Thompson & Marean 2008). Surface scatters of these flake and blade industries occur widespread across southern Africa although rarely with any associated botanical and faunal remains. It is also common for these stone artefacts to be found between the surface and approximately 50-80cm below ground. Fossil bone may be associated with Middle Stone Age occurrences. These stone artefacts, like the Earlier Stone Age handaxes are usually observed in secondary context with no other associated archaeological material. The Albany Museum database holds records of the occurrence of Middle Stone Age stone artefacts around the Cradock area and the Department of Archaeology has curated Middle Stone Age stone artefacts in its collection from the Cradock area including Highlands Rock Shelter excavated by H.J. Deacon during the 1970's. Relevant archaeological impact assessments conducted by the Archaeology Contracts Office of the National Bloemfontein Museum in 2006 (Van Ryneveld & Koortzen 2006) and the Albany Museum in 2008 have recorded surface scatters of Middle Stone Age stone artefacts in the Cradock vicinity (Binneman & Booth 2008). Middle Stone Age stone artefacts (long blades and points) are found throughout the region, but because these are found in the open areas it is difficult to know where they fit into the cultural time sequence. At Highlands Rock Shelter MSA stone artefacts, possibly a Howieson's Poort Industry, was dated older than 30 000 years (Deacon 1976). Sampson on the other hand reported many open-air MSA sites which he assigned to the Orangian Industry (dating between 128 000 - 75 000 years old), Florisbad and Zeekoegat Industries dating between 64 000 and 32 000 years old.

The Later Stone Age spans a period from 30 000 years ago to the historical period (the last 500 years) until 100 years ago and is associated with the archaeology of San hunter- gatherers. The majority of archaeological sites date from the past 10 000 years where San hunter-gatherers inhabited the landscape living in rock shelters and caves as well as on the open landscape, inland and along the coast. The open sites are difficult to locate because they are in the open veld and often covered by vegetation and sand and those along the coast are sometimes opened and closed by the movement of the dunes. Sometimes these sites are only represented by a few stone artefacts and fragments of bone. The preservation of these sites is poor and it is not always possible to date them (Deacon & Deacon 1999). Caves and rock shelters, however, in most cases, provide a more substantial preservation record of pre-colonial human occupation. The Albany Museum holds records of Later Stone Age fresh water shell midden sites along the Fish River and the surrounding area as well as rock shelters containing rock paintings.

Some 2 000 years ago Khoekhoen pastoralists entered into the region and lived mainly in small settlements. They were the first food producers in South Africa and introduced domesticated animals (sheep, goats and cattle) and ceramic vessels to southern Africa.

Often, these archaeological sites are found close to the banks of large streams and rivers and along the coast. Large piles of freshwater mussel shell (called freshwater middens) usually mark the large stream and river sites and large piles of marine shellfish middens mark the coastal sites. Precolonial groups collected the freshwater mussel from the muddy banks of the rivers as a source of food. Mixed with the shell and other riverine and terrestrial food waste are also cultural materials. Human remains are often found buried in the middens along the coast (Deacon and Deacon 1999).

In general little systematic archaeological research and regional surveys/recordings have been conducted in the Cradock area. The only systematic survey and recording in the immediate vicinity was conducted in the Mountain Zebra National Park (Brooker 1974) and H.J. Deacon (1976) excavated Highlands Rock Shelter a few kilometres to the north. Sampson's, Brooker's, and Deacon's research and surveys, together with records/collections of the Albany Museum, provide the background information for compiling an archaeological time sequence for the region. The Later Stone Age deposits at Highlands Rock Shelter date to 4 500 years old (Deacon 1976). Better preservation of organic material at Highlands Rock Shelter provides some insight into hunter-gatherer subsistence in the area. Collecting of underground plant remains such as *Cyperus usitatus* and *Freezia corymbrosa* would appear to have been an important food source together with the hunting of mountain zebra/quagga, mountain reedbuck, and various small antelope such as duiker, klipspringer and steenbok. The survey of the Mountain Zebra National Park (Brooker 1974) confirmed that the area is rich in archaeological remains and that some of the Later Stone Age time sequence for the region was present, as well as rock art. Unfortunately, apart from the stone tools, little else is preserved and it is not possible to reconstruct subsistence patterns. Also listed in the museum records are freshwater shell middens along the banks of the Great Fish River and small quantities of crab and freshwater mussel were also found in the excavations. Many stock enclosures with stone walls and fragments of sand-tempered ceramic vessels are found throughout the Seacow River area and are most probably associated with Khoi pastoralists who settled in the area during the past 1 000 years.

Rock art is generally associated with the Later Stone Age period mostly dating from the last 5000 years to the historical period. It is difficult to accurately date the rock art without destructive practices. The southern African landscape is exceptionally rich in the distribution of rock art which is determined between paintings and engravings. Rock paintings occur on the walls of caves and rock shelters across southern Africa. Rock engravings, however, are generally distributed on the semi-arid central plateau, with most of the engravings found in the Orange-Vaal basin, the Karoo stretching from the Eastern Cape (Cradock area) into the Northern Cape as well as the Western Cape, and Namibia. At some sites both paintings and engravings occur in close proximity to one another especially in the Karoo and Northern Cape. The greatest concentrations of engravings occur on the andesite basement rocks and the intrusive Karoo dolerites, but sites are also found on about nine other rock types including dolomite, granite, gneiss, and in a few cases on sandstone (Morris 1988).

5. DESCRIPTION OF THE PROPERTY

5.1. Area Surveyed

The proposed area for the Rodicon Solar Energy Facility is located on the on the Farm Zakfontyn 267, situated on flat floodplains, 40 km south of Middelburg and about 50 km north of Cradock, approximately 5 km west on the R701 secondary road. The proposed area for development of the solar facility is approximately 20 ha in extent. A rocky outcrop extends east and north of the proposed area. No major waterways flow near to the site, however, several dry water courses are situated west and south of the proposed development area. The vegetation cover is typical Karoo shrubs and grasses.

5.2. Map

1:50 000 MAP: 3125BCC SPITSKOPVLEI

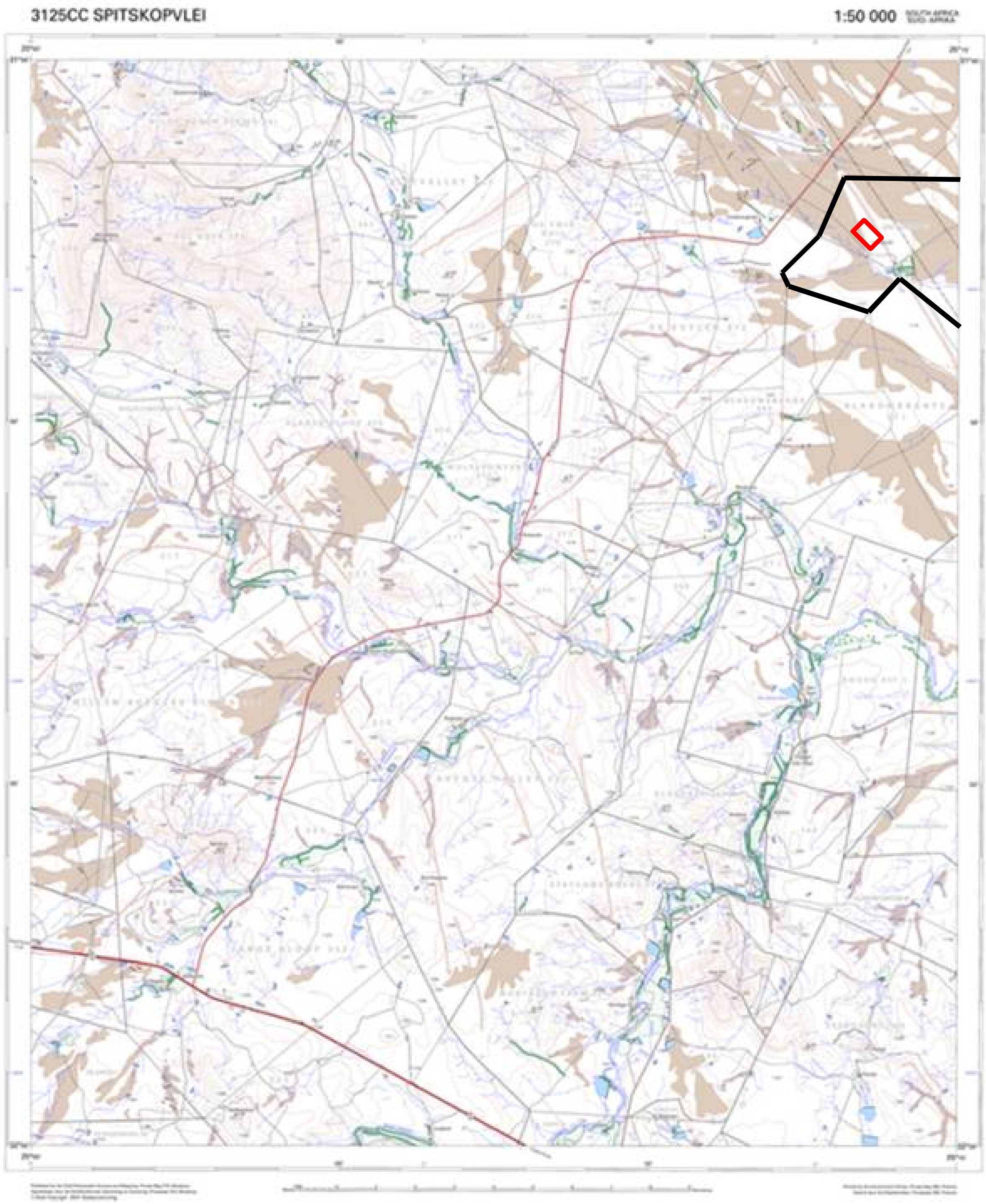


Figure 1. Map 1. 1:50 000 topographic map 3125CC SPITSKOPVLEI showing the location of the area proposed for the Rodicon Solar Energy Facility (Black: farm boundary; Red: proposed area for the Rodicon Solar Energy facility).

Figure 2. Map 2. Aerial view of the area proposed Rodicon Solar Energy Facility.

Figure 3. Map 3. Close-up aerial view of the area proposed for the Rodicon Solar Energy Facility and extent of area surveyed (Yellow block).

6. ARCHAEOLOGICAL INVESTIGATION

The archaeological investigation was conducted on foot focusing on the proposed area for the Rodicon Solar Energy Facility and the immediate surrounding environment. The GPS co-ordinate readings and photographs were taken using a Garmin Oregon 550 unit. The general GPS readings and artefact surface occurrences have been plotted on Maps 2-4 (only seven GPS points have for the stone artefact occurrences have been provided that show the extent of the distribution).

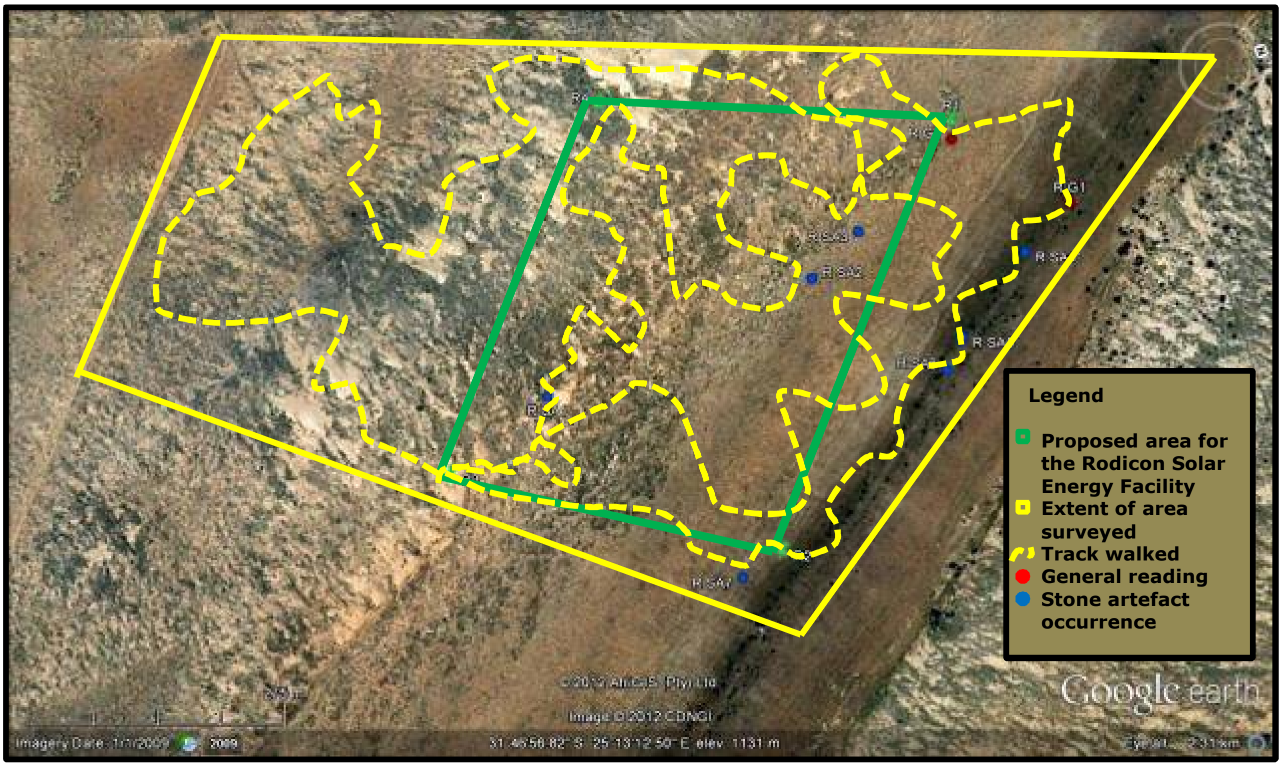


Figure 4. Map 4. Close-up aerial view of the proposed area for the Rodicon Solar Energy Facility showing the tracks walked.

The proposed area is mainly covered in shrubs and dense grass vegetation obscuring and making archaeological visibility difficult. Soil erosion occurs within the majority of the proposed area, however, large surface exposed and eroded areas within the south-western extent of the proposed development made it possible to investigate the possibility of the encountering archaeological material remains. The rocky outcrop, situated east and adjacent to the proposed development area was also investigated for possible archaeological heritage remains and sites (Figure 9).

Figure 5. View of the landscape and dense grass vegetation.

Figure 6. View of the landscape and dense grass vegetation.

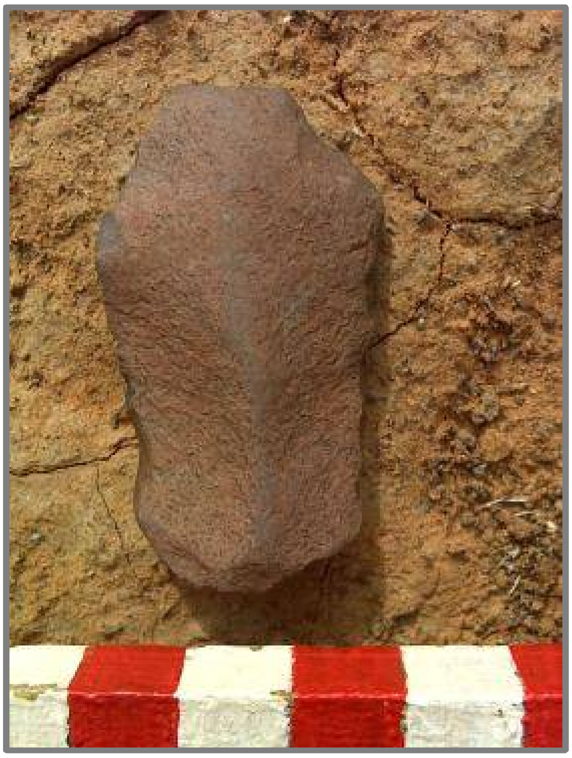
Figure 7. View of the landscape from the rocky outcrop showing the extent of the surface exposed areas.

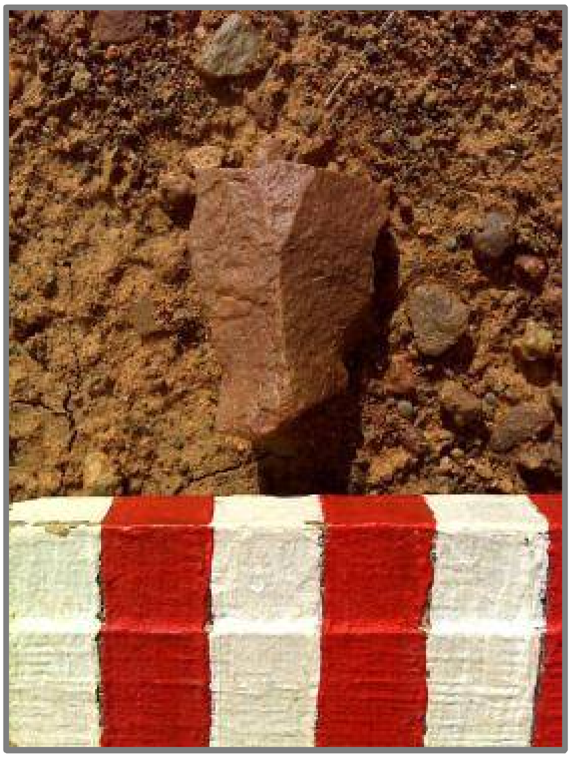
Figure 8. View of the landscape from the rocky outcrop showing the extent of the surface exposed areas.

Figure 9. View of the rocky outcrop bordering the proposed area for development.

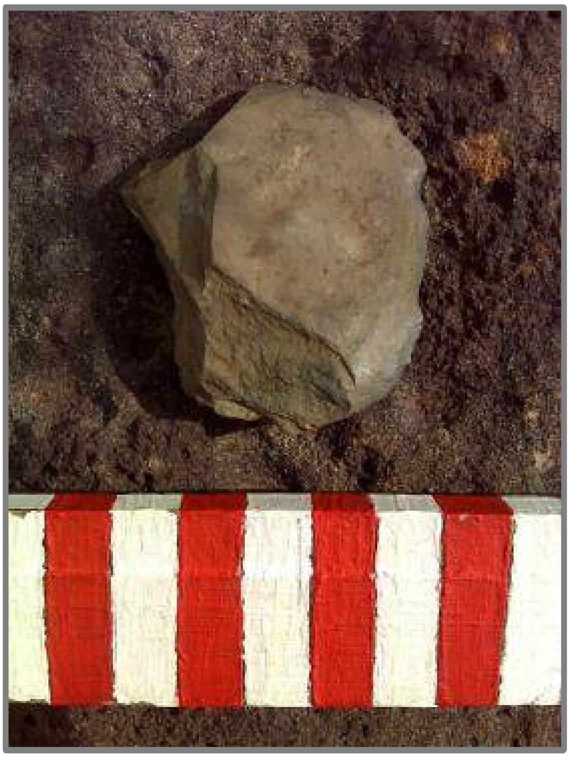
Surface scatters of Middle Stone Age and possibly Later Stone age stone artefacts occurred within the immediate and surrounding area proposed for the development, as well as the rocky outcrop (Figures 10-15). Most of the Middle Stone Age stone artefacts were predominantly manufactured on a fine-grained black (hornfels or lydianite) raw material and all similarly heavily weathered and patinated. Some stone artefacts were also manufactured on a medium-grained quartzite raw material and well as other fine-grained raw materials referred to as chert. The stone artefacts comprised mostly of varying small and large flakes and miscellaneous retouched pieces. Several of the flakes showed evidence of secondary retouch and some showed evidence of edge-damage that may indicate utilisation. Several stone artefacts also showed fresh flaking that may have been caused recently by trampling by domestic stock and/or human and farming activity.

It is unlikely that the stone artefacts would be *in situ* and are regarded as being in a secondary and out of context position as they have been washed into the exposed areas and have been disturbed by domestic animal and human activities. However, the stone artefacts that occurred between the shrubs and dense grass vegetation may be in a less disturbed position. It is also possible that stone artefact may occur below the vegetation cover between the surface and 50 – 80 cm below the ground.





Figures 10-13. Examples of stone artefacts.



Figures 14-15. Examples of stone artefacts.

7. DESCRIPTION OF SITES

7.1. Stone Artefact Occurrences and Scatters:

Mainly surface scatters of predominantly Middle Stone Age (MSA) and a few Later Stone Age (LSA) stone artefacts are distributed over the area proposed for the Rodicon Solar Energy Facility on the Farm Zakfontyn 267. Ten GPS co-ordinate readings were taken to show the extent of the distribution (R SA1 – R SA10 [Map 4]). The stone artefacts were observed and documented on the large exposed surface areas, within the dense grass vegetation, and on the adjacent rocky outcrop. The stone artefacts comprised mainly patinated and heavily weathered flakes and miscellaneous retouched pieces of varying sizes manufactured on a fine-grained (hornfels and lydianite) raw material, a medium-grained quartzite raw material, and another fine-grained raw material referred to as chert. It is unlikely that the surface exposed stone artefacts occur *in situ* and are considered to be in a secondary and disturbed context. No other organic or material cultural remains were documented in association with the stone artefacts.

The stone artefact occurrences and scatters are considered as having a medium cultural significance.

The stone artefact occurrences and scatters has been allocated a heritage grading of Grade III (NHRA 25 of 1999) being worthy of conservation by local authorities.

(See Table 1 for descriptions and co-ordinates)

7.2. GPS CO-ORDINATES AND SITES FOR THE PROPOSED RODICON SOLAR ENERGY FACILITY.

TABLE 1: GPS CO-ORDINATES AND SITES FOR THE PROPOSED RODICON SOLAR ENERGY FACIITY.

REFERENCE	DESCRIPTION	CO-ORDINATES	HERITAGE RATING
R SA1	Stone artefact scatter	31°47'00.8"S; 25°13'11.6"E	III
R SA2	Stone artefact scatter	31°46'49.9"S; 25°13'11.1"E	III
R SA3	Stone artefact scatter	31°46'47.8"S; 25°13'10.0"E	III
R SA4	Stone artefact scatter	31°46'42.7"S; 25°13'13.3"E	III
R SA5	Stone artefact scatter	31°46'45.8"S; 25°13'15.6"E	III
R SA6	Stone artefact scatter	31°46'46.7"S; 25°13'16.6"E	III
R SA7	Stone artefact scatter	31°46'56.0"S; 25°13'21.4"E	III
R G1	General reading	31°46'40.6"S; 25°13'12.1"E	N/A
R G2	General reading	31°46'43.6"S; 25°13'07.9"E	N/A
R1	Point of proposed development boundary	31°46'43.6"S; 25°13'07.5"E	N/A
R2	Point of proposed development boundary	31°46'54.6"S; 25°13'21.3"E	N/A
R3	Point of proposed development boundary	31°47'04.4"S; 25°13'13.4"E	N/A
R4	Point of proposed development boundary	31°46'54.8"S; 25°13'01.5"E	N/A

8. ASSESSMENT OF THE SIGNIFICANCE AND OF THE ARCHAEOLOGICAL HERITAGE RESOURCES FOR THE PROPOSED RODICON SOLAR ENERGY FACILITY.

TABLE 3: ASSESSMENT OF THE SIGNIFICANCE THE PROPOSED RODICON SOLAR ENERGY FACILITY: The destruction stone artefact occurrences and scatters.

9. RECOMMENDATIONS

The area is of a medium cultural sensitivity, the following recommendations must be considered:

1. Once the final layout (including the positions of the solar panels; underground cabling; overhead power line; additional internal access roads, and the workshop area) of the proposed Rodicon Solar Energy Facility has been finalised an archaeological ground-truthing should be conducted and further recommendation be made to protect the archaeological heritage within the area proposed for development; and / or

2. A professional archaeologist (with an already authorised collection permit) must be appointed during all construction and development activities including vegetation clearing and the excavation activities to monitor and identify possible archaeological material remains and features that may occur below the surface and make further appropriate recommendations on removing and / or protecting the archaeological material remains and features.

3. If concentrations of archaeological heritage material and human remains are uncovered during construction, all work must cease immediately and be reported to the Albany Museum (046 622 2312) and/or the South African Heritage Resources Agency (SAHRA) (021 642 4502) so that systematic and professional investigation/ excavation can be undertaken.

4. Construction managers/foremen should be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites.

10. CONCLUSION

The survey for the proposed Rodicon Solar Energy Facility was conducted on foot by investigating the large exposed surface areas, between the shrubs, and on the rocky outcrop, the dense grass vegetation cover obscured archaeological visibility. Mainly surface scatters of Middle Stone Age and a few Later Stone Age stone artefacts were observed within the areas investigated and distributed across the proposed development area. It is unlikely that the stone artefact surface scatters that occur on the exposed surface areas are positioned *in situ*, however, stone artefacts may occur between 50 – 80 cm below the surface.

The proposed development would have negative implications on the archaeological heritage remains documented within the proposed area during all phases of the development. The negative implications include the destruction of the surface scatters of stone artefacts and further occurrences that are not immediately visible. The recommendations must be considered as appropriate mitigation measures to protect and conserve the archaeological heritage remains observed within the proposed development area and further archaeological remains that may occur and are not immediately visible on the surface.

11. GENERAL REMARKS AND CONDITIONS

NOTE: This report is a phase 1 archaeological impact assessment (AIA) only and does not include or exempt other required specialist assessments as part of the heritage impact assessments (HIAs).

The National Heritage Resources Act (Act No. 25 of 1999, Section 35 [Brief Legislative Requirements]) requires a full Heritage Impact Assessment (HIA) in order that all heritage resources including all places or objects of aesthetics, architectural, historic, scientific, social, spiritual, linguistic, or technological value or significance are protected. Thus any assessment should make provision for the protection of all these heritage components including archaeology, shipwrecks, battlefields, graves, and structures older than 60 years, living heritage, historical settlements, landscapes, geological sites, palaeontological sites and objects.

It must be emphasized that the conclusions and recommendations expressed in this phase 1 archaeological impact assessment (AIA) are based on the visibility of archaeological remains, features and, sites and may not reflect the true state of affairs. Many archaeological remains, features and, sites may be covered by soil and vegetation and will only be located once this has been removed. In the event of such archaeological heritage being uncovered (such as during any phase of construction activities), archaeologists or the relevant heritage authority must be informed immediately so that they can investigate the importance of the sites and excavate or collect material before it is destroyed. The onus is on the developer to ensure that this agreement is honoured in accordance with the National Heritage Resources Act No. 25 of 1999 (NHRA 25 of 1999).

Archaeological Specialist Reports (desktops and AIA's) will be assessed by the relative heritage resources authority. The final decision rests with the heritage resources authority that may confirm the recommendations in the archaeological specialist report and grant a permit or a formal letter of permission for the destruction of any cultural sites.

12. REFERENCES

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APPENDIX A: GRADING SYSTEM

The NHRA stipulates the assessment criteria and grading of archaeological sites. The following categories are distinguished in Section 7 of the Act:

- Grade I: Heritage resources with qualities so exceptional that they are of special national significance;
- Grade II: Heritage resources which, although forming part of the national estate, can be considered to have special qualities which make them significant within the context of a province or a region; and
- Grade III: Other heritage resources worthy of conservation on a local authority level.

The occurrence of sites with a Grade I significance will demand that the development activities be drastically altered in order to retain these sites in their original state. For Grade II and Grade III sites, the applicable mitigation measures would allow the development activities to continue.

APPENDIX B: IDENTIFICATION OF ARCHAEOLOGICAL FEATURES AND MATERIAL FROM INLAND AREAS: guidelines and procedures for developers

1. Human Remains:

All human remains exposed during all the phases of the construction activities must be reported to the archaeologist, nearest museum or relevant heritage resources authority. Construction must be halted until the archaeologist has investigated and removed the human remains. Human remains may be exposed when a grave or informal burial has been disturbed. In general, the remains are buried in a flexed position on the side and may also be buried in a sitting position with a flat stone capping the location of the burial. Developers are requested to be aware of the exposing human remains.

2. Stone Artefacts:

Stone artefacts are difficult for the layman to identify. Large accumulations of flaked stones that do not appear to have been distributed naturally must be reported. If the stone artefacts are associated with bone / faunal remain or any other associated organic and material cultural artefacts development must be halted immediately and reported to the archaeologist, nearest museum or relevant heritage resources authority.

3. Large Stone Features:

Large stone features occur in different forms and sizes, however, are reatively easy to identify. The most common features are roughly circular stone walls (mostly collapsed), usually dry packed stone, and may represent stock enclosures, the remains of wind breaks or, cooking shelters. Other features consist of large piles of stones of different sizes and heights are known as *isisivane*. These features generally occur near river and mountain crossings. The purpose and meaning of the *isisivane* are not fully understood, however, interpretations include the representation of burial cairns and symbolic value.

4. Freshwater Shell Middens:

Accumulations of freshwater shell middens comprising mainly freshwater mussel occur along the muddy banks of rivers and streams and were collected by pre-colonial communities as a food resource. The freshwater shell middens generally contain stone artefacts, pottery, bone and, sometimes even human remains. Freshwater shell middens may be of various sizes and depths, an accumulation that exceeds $1m^2$ in extent must be reported to the archaeologist, nearest museum or, relevant heritage resources authority.

5. Historical Artefacts and Features:

These are relatively easy to identify and include the foundations and remains of buildings, packed dry stone walling representing domestic stock kraals. Other items include historical domestic artefacts such as ceramics, glass, metal, and military artefacts and dwellings.

6. Fossil Bone:

Fossil bones may embedded in geological deposits. Any concentrations of bone whether fossilized or not must be reported.

Appendix D4:
Visual Aesthetics Study

By
MetroGIS (Pty) Ltd

PROPOSED RODICON SOLAR ENERGY FACILITY
On a site near Middelburg in the Eastern Cape Province

VISUAL IMPACT ASSESSMENT
AS PART OF A BASIC ASSESSMENT PROCESS

Produced for:
Rodicon Trading and Investments (Pty)

Produced by:
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- April 2012 -

CONTENTS

MAPS

FIGURES

TABLES

1. STUDY APPROACH

1.1. Qualification and Experience of the Practitioner

MetroGIS (Pty) Ltd, specialising in visual assessment and Geographic Information Systems, undertook this visual assessment in collaboration with V&L Landscape Architects CC.

Lourens du Plessis, the lead practitioner undertaking the assessment, has been involved in the application of Geographical Information Systems (GIS) in Environmental Planning and Management since 1990.

The team undertaking the visual assessment has extensive practical knowledge in spatial analysis, environmental modelling and digital mapping, and applies this knowledge in various scientific fields and disciplines. The expertise of these practitioners is often utilised in Environmental Impact Assessments, State of the Environment Reports and Environmental Management Plans.

The visual assessment team is familiar with the "Guidelines for Involving Visual and Aesthetic Specialists in EIA Processes" (Provincial Government of the Western Cape: Department of Environmental Affairs and Development Planning) and utilises the principles and recommendations stated therein to successfully undertake visual impact assessments. Although the guidelines have been developed with specific reference to the Western Cape province of South Africa, the core elements are more widely applicable.

Savannah Environmental (Pty) Ltd appointed MetroGIS (Pty) Ltd as an independent specialist consultant to undertake the visual impact assessment for the proposed Rodicon Solar Energy in the Eastern Cape. Neither the author, MetroGIS or V&L Landscape Architects will benefit from the outcome of the project decision-making.

1.2. Assumptions and Limitations

This assessment was undertaken during the planning stage of the project and is based on information available at that time.

1.3. Level of Confidence

Level of confidence[1] is determined as a function of:

- The information available, and understanding of the study area by the practitioner:
  - 3: A high level of information is available of the study area and a thorough knowledge base could be established during site visits, surveys etc. The study area was readily accessible.
  - 2: A moderate level of information is available of the study area and a moderate knowledge base could be established during site visits, surveys etc. Accessibility to the study area was acceptable for the level of assessment.
  - 1: Limited information is available of the study area and a poor knowledge base could be established during site visits and/or surveys, or no site visit and/or surveys were carried out.

- The information available, understanding of the project and experience of this type of project by the practitioner:

[1] Adapted from Oberholzer (2005).

- 3: A high level of information and knowledge is available of the project and the visual impact assessor is well experienced in this type of project and level of assessment.
- 2: A moderate level of information and knowledge is available of the project and/or the visual impact assessor is moderately experienced in this type of project and level of assessment.
- 1: Limited information and knowledge is available of the project and/or the visual impact assessor has a low experience level in this type of project and level of assessment.

These values are applied as follows:

Table 1: Level of Confidence

	Information on the project & experience of the practitioner			
Information on the study area		**3**	**2**	**1**
	3	9	6	3
	2	6	4	2
	1	3	2	1

The level of confidence for this assessment is determined to be ***6*** *and indicates that the author's confidence in the accuracy of the findings is high:*

- The information available, and understanding of the study area by the practitioner is rated as **2** and
- The information available, understanding of the project and experience of this type of project by the practitioner is rated as **3.**

1.4. Methodology

The study was undertaken using Geographic Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed facility. A detailed Digital Terrain Model (DTM) for the study area was created from 20m interval contours supplied by the Surveyor General.

The approach utilised to identify issues related to the visual impact included the following activities:

- The creation of a detailed digital terrain model (DTM) of the potentially affected environment;
- The sourcing of relevant spatial data. This included cadastral features, vegetation types, land use activities, topographical features, site placement, etc.;
- The identification of sensitive environments upon which the proposed facility could have a potential impact;
- The creation of viewshed analyses from the proposed development area in order to determine the visual exposure and the topography's potential to absorb the potential visual impact. The viewshed analysis takes into account the dimensions of the proposed structures.

This report (visual impact assessment) sets out to identify and quantify the possible visual impacts related to the proposed facility, including associated infrastructure, as well as offer potential mitigation measures, where required.

The following methodology has been followed for the assessment of visual impact:

- **Determine Potential visual exposure**

  The visibility or visual exposure of any structure or activity is the point of departure for the visual impact assessment. It stands to reason that if the proposed SEF and associated infrastructure were not visible, no impact would occur.

  Viewshed analyses of the proposed SEF and related infrastructure on the site indicate the potential visibility.

- **Determine the Visual Absorption Capacity of the Landscape**

  This is the capacity of the receiving environment to absorb the potential visual impact of the proposed facility. The VAC is primarily a function of the vegetation, and will be high if the vegetation is tall, dense and continuous. Conversely, low growing sparse and patchy vegetation will have a low VAC.

  The VAC would also be high where the environment can readily absorb the structure in terms of texture, colour, form and light / shade characteristics of the structure. On the other hand, the VAC for a structure contrasting markedly with one or more of the characteristics of the environment would be low.

  The VAC also generally increases with distance, where discernable detail in visual characteristics of both environment and structure decreases.

  The digital terrain model utilised in the calculation of the visual exposure of the facility does not incorporate the potential visual absorption capacity (VAC) of the natural vegetation of the region. It is therefore necessary to determine the VAC by means of the interpretation of the vegetation cover, supplemented with field observations.

- **Determine Visual Distance and Observer Proximity to the facility**

  In order to refine the visual exposure of the proposed facility on surrounding areas/receptors, the principle of reduced impact over distance is applied in order to determine the core area of visual influence for the SEF.

  Proximity radii for the proposed development site are created in order to indicate the scale and viewing distance of the facility and to determine the prominence of the structures in relation to their environment.

  The visual distance theory and the observer's proximity to the facility are closely related, and especially relevant, when considered from areas with a high viewer incidence and a predominantly negative visual perception of the proposed facility.

- **Determine Viewer Incidence and Viewer Perception**

  The number of observers and their perception of a structure determine the concept of visual impact. If there are no observers, then there would be no visual impact. If the visual perception of the structure is favourable to all the observers, then the visual impact would be positive.

It is therefore necessary to identify areas of high viewer incidence and to classify certain areas according to the observer's visual sensitivity towards the proposed SEF and its related infrastructure.

It would be impossible not to generalise the viewer incidence and sensitivity to some degree, as there are many variables when trying to determine the perception of the observer; regularity of sighting, cultural background, state of mind, and purpose of sighting which would create a myriad of options.

- **Determine the Visual impact index**

  The results of the above analyses are merged in order to determine where the areas of likely visual impact would occur. These areas are further analysed in terms of the previously mentioned issues (related to the visual impact) and in order to judge the magnitude of each impact.

- **Determine Impact significance**

  The potential visual impacts identified and described are quantified in their respective geographical locations in order to determine the significance of the anticipated impact. Significance is determined as a function of extent, duration, magnitude and probability.

2. BACKGROUND

Rodicon Trading and Investments (Pty) is proposing the establishment of a Photovoltaic Solar Energy Facility (SEF) on a site about 30 km south east of Middelburg within the Inxuba Yethemba Local Municipality in the Eastern Cape Province.

Solar energy generation is generally considered to be an environmentally friendly electricity generation option. The company intends to utilise photovoltaic (PV) technology to construct an alternative energy generation facility with a total generating capacity of up to 5MW.

The proposed PV Solar Energy Facility will consist of a photovoltaic (PV) solar energy component as well as associated infrastructure. A formal layout of the SEF has not yet been finalised, but infrastructure is likely to include the following:

- An array of PV panels;
- An on-site switching station;
- An overhead power line feeding into the Eskom electricity network;
- Internal access roads and
- A workshop area for maintenance and storage.

3. SCOPE OF WORK

The study area for the visual assessment encompasses a geographical area of 30x35 km (the extent of the maps displayed below) and includes a minimum 8km buffer zone from the boundaries of the proposed development area.

The project is proposed to be located on the Farm Zak Fontein 267, comprising an area of less than 20 Ha.

The scope of work for this assessment includes the determination of the potential visual impacts in terms of nature, extent, duration, magnitude, probability and significance of the construction and operation of the proposed infrastructure.

Anticipated issues related to the proposed facility include:

- The visibility of the facility to, and potential visual impact on, observers travelling along main and secondary roads within the study area, specifically the N10 and the R401.
- The visibility of the facility to, and potential visual impact on homesteads and settlements within the study area.
- The potential visual impact of the facility on the visual character of the landscape and sense of place of the region.
- The potential visual impact of ancillary infrastructure (i.e. switching station, power line, access roads and workshop) on observers in close proximity to the proposed facility.
- The potential visual impact of operational, safety and security lighting of the facility at night on observers residing in close proximity of the facility.
- Potential visual impacts associated with the construction phase.
- The potential to mitigate visual impacts and inform the design process.

4. THE AFFECTED ENVIRONMENT

Regionally, the site is located approximately 30 km south east of Middelburg and some 60km north west of Cradock in the Eastern Cape Province.

The study area is situated on land that ranges in elevation from about 1000 m a.s.l. along the river valleys in the south east of the study area, to 1950 m a.s.l. in the Joubertsberge and Klein Doringberg in the north west.

The dominant topographical unit or terrain type of the study area is *lowlands with hills*. The terrain immediately surrounding the site is generally flat, but becomes more undulating in the south west and east, in the vicinity of the rivers (refer to **Map 1**).

Significant hydrological features within the study area include the Great Fish River in the south of the study area, and a number of its perennial tributaries to the west and east of the site at a distance of about 10 – 12km. A non-perennial tributary bypasses the site about 1km to the south and a number of water bodies are dotted throughout the study area, situated both on and off stream.

Development in the study area is largely absent, except for farming settlements homesteads, which occur in a dispersed pattern throughout the study area. The average population density within the local municipality is 4,1 persons per square km[2].

Situated in a low rainfall area (i.e. receiving between 135 mm and 379 mm per year), irrigated agricultural activities are mostly limited to the drainage lines and rivers, with the balance supporting livestock.

The N10 national road traverses the study area from the north west to the south east, and bypasses the site some 4,5km to the north east. The R401 arterial road bypasses the site less than 1km to the north west. A few secondary roads are also present within the study area, but not in close proximity to the site.

Apart from roads in the area, existing infrastructure includes The Hydra / Poseidon 1 and 2 400kV power lines, which traverse the study area, and bypass the site less than 1km to the east. A second power line lies to the east of the N10 and the Iziko substation is situated to the north west of the site.

[2] http://en.wikipedia.org/wiki/Inxuba_Yethemba_Local_Municipality

As indicated on **Map 2**, land cover consists primarily of *Shrubland*, interspersed with *Grassland* and large areas of *Bare Rock and Soil (sheet erosion)*. Limited areas of irrigated agriculture are evident along the Great Fish River in the south of the study area, and to a lesser extent, along the Little Brak River in the east.

The natural vegetation is classified as *False Karroid Broken Veld*.

Although there are no formal conservation areas within the study area, there exist significant areas identified as Terrestrial Critical Biodiversity Areas (CBA) for the Eastern Cape. These are located to the east and south west of the proposed site, and include both CBA1 areas (which are listed as critical), and CBA2 areas (which are listed as endangered). The latter areas occupies the entire south western corner of the study area.

The area potentially affected by the proposed development is generally seen as a farming area having limited tourism potential. It should be noted, however, that the N10 arterial route is considered as main tourist access route.

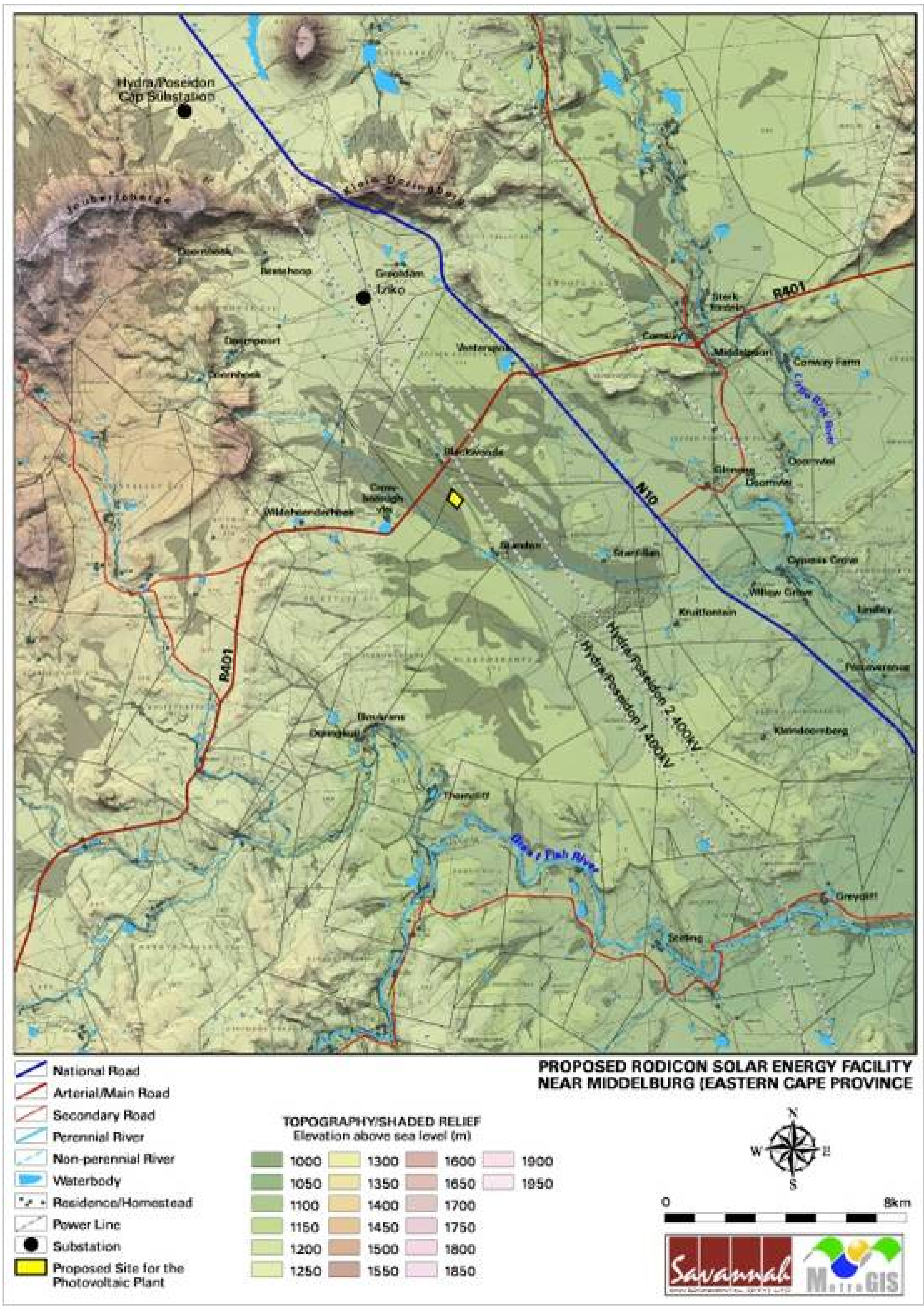
The character of the landscape is one of undeveloped, wide open spaces. Development, where this occurs is of a domestic scale. The visual quality of the landscape is considered to be high and the sense of place defined by an absence of development and vast karoo grazing lands.

Figure 1: View from the site to the north west

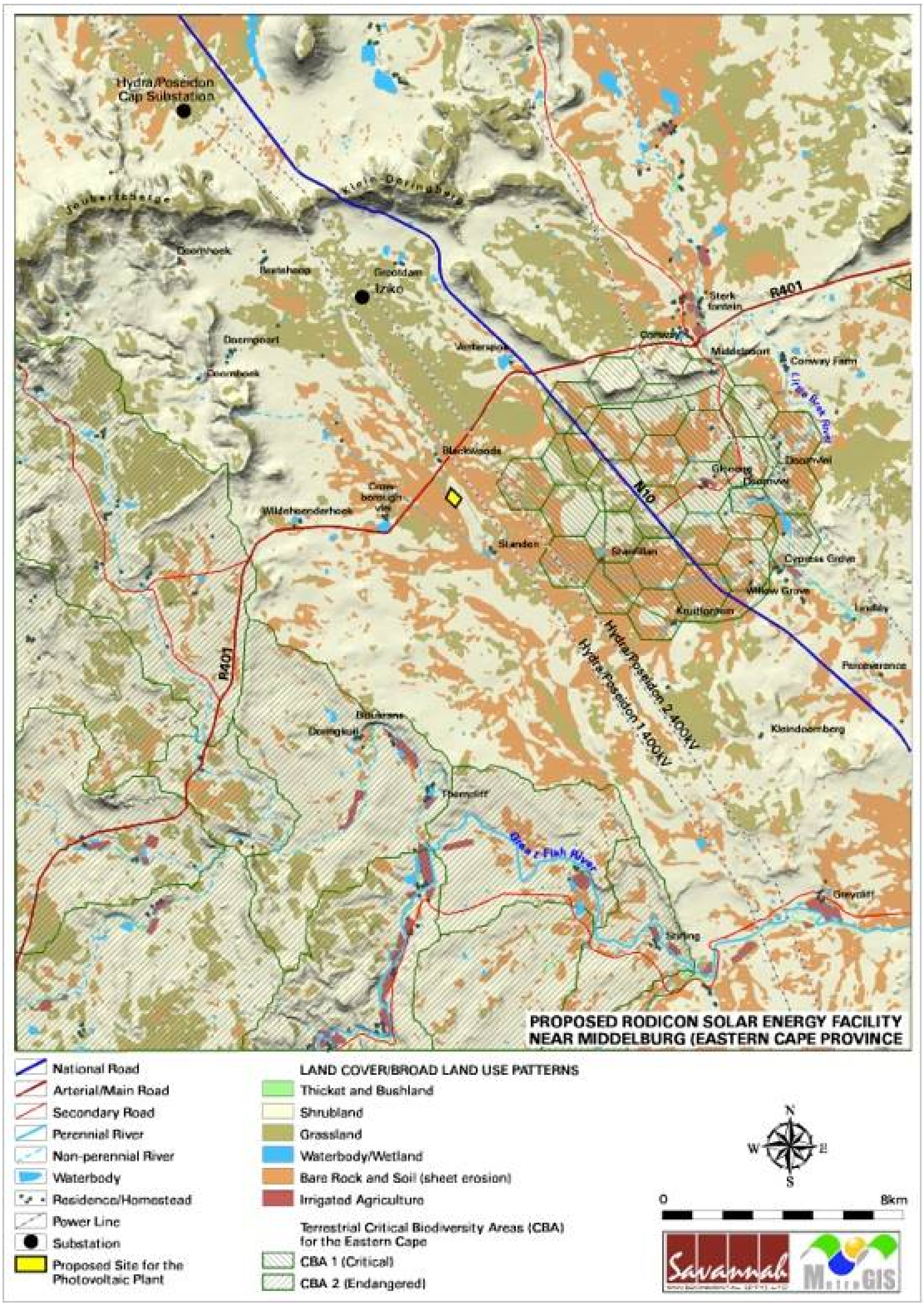
Note the low growing vegetation in the foreground and the mountains in the background.

Figure 2: View from the site to the south

Figure 3: View from the site to the west



Map 1: Locality, topography and shaded relief of the broader study area.



Map 2: Land cover and broad land use patterns within the broader study area.

5. RESULTS

5.1. Potential visual exposure

The result of the preliminary viewshed analyses for the proposed SEF is shown on the map overleaf (**Map 3**). The initial viewshed analysis was undertaken at offsets of 2m above average ground level (i.e. the approximate maximum height of the PV structures).

This was done in order to determine the general visual exposure of the area under investigation, simulating the proposed structures associated with the SEF.

It must be noted that the viewshed analysis does not include the effect of vegetation cover or existing structures on the exposure of the proposed SEF, therefore signifying a worst-case scenario. The viewshed analysis was based on a provisional zone identified for the development of the PV structures on site.

The proposed facility is likely to be visible on the site itself and within an area extending about 7km to the west, 10km to the north and south and some 12km to the east.

The mountains in the north west, north and north east of the study area effectively contain the viewshed in these directions, visually screening those areas that lie beyond. Similarly,

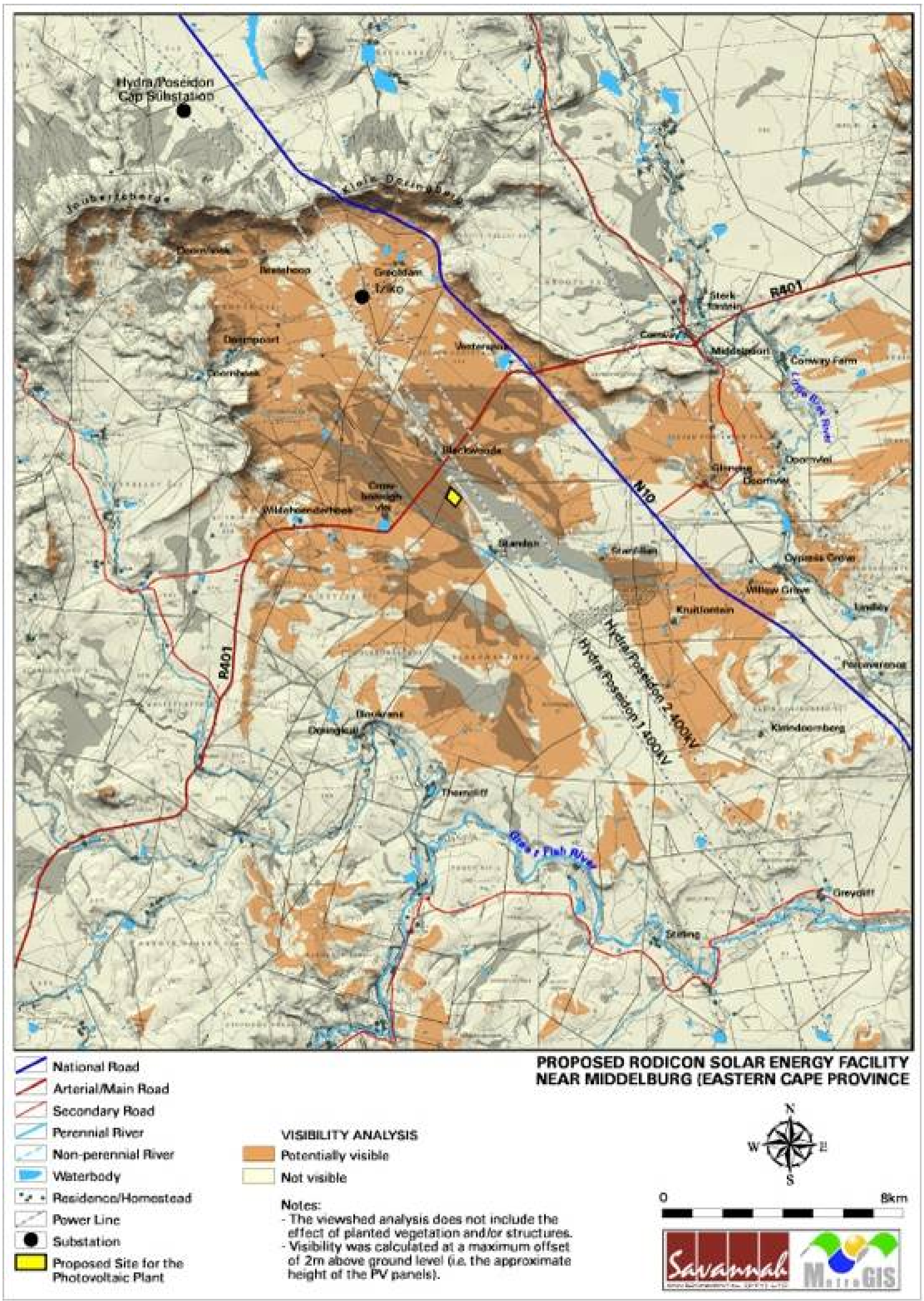
To the south and east, the flatter topography results in a viewshed that extends further, but the undulating nature of the land results in a highly fragmented viewshed.

In addition, the low lying drainage lines and rivers are also visually screened, by virtue of the topography.

Relatively long and continuous stretches of the R401 to the north west of the site fall within the zone of potential visual exposure. The N10 will also be visually exposed, especially north east of the site.

Similarly, a limited number of homesteads may also be exposed to potential visual impact.

It is envisaged that the proposed facility would be visible to observers travelling along roads and to residents of homesteads and farms as well as tourists visiting the region, within (but not restricted to) an 8km radius of the proposed facility.



Map 3: Potential visual exposure of the proposed facility.

Note that the viewshed analysis does not include the effect of vegetation cover or existing structures on the exposure of the proposed SEF, therefore signifying a worst-case scenario

5.2. Visual absorption capacity

consists primarily of *Shrubland*, interspersed with *Grassland* and large areas of *Bare Rock and Soil (sheet erosion)*. Limited areas of irrigated agriculture are evident along the Great Fish River in the south of the study area, and to a lesser extent, along the Little Brak River in the east.

Overall, the Visual Absorption Capacity (VAC) of the receiving environment and especially the area in close proximity to the proposed WEF is deemed low by virtue of the nature of the vegetation and the low occurrence of urban development. Figures 1-3 also illustrate this low VAC.

In addition, the design, appearance and colour of the PV structures means that it is unlikely that the environment will visually absorb them in terms of texture, colour, form and light / shade characteristics.

Where homesteads and settlements occur, some more significant vegetation and trees may have been planted, which would contribute to visual absorption. As this is not a consistent occurrence, however, VAC will not be taken into account for any of the homesteads or settlements, thus assuming a worst case scenario in the impact assessment.

5.3. Visual distance / observer proximity to the facility

MetroGIS / V&L determined proximity radii based on the anticipated visual experience of the observer over varying distances. The following factors are considered for the determination of appropriate proximity radii:

- The normal cone of vision for a stationary person, which is accepted to be 30 degrees in both the vertical and the horizontal fields. This cone of vision allows for no head or eye movement and no loss of focus of the object in question.
- The maximum horizontal extent or widest cross section of the proposed facility that an observer will be able to perceive.
- The maximum height of the tallest infrastructure.

For a solar energy facility, the horizontal extent is of most significance. Despite being made up of smaller components (i.e. the individual PV panels), a SEF will manifest as a single visual entity. It follows that the larger the facility, the larger will be the anticipated visual impact at any given distance, and the more visible the facility will be over larger distances.

In this respect, the proximity radii are calculated as a function of the critical point at which an observer will be able to perceive the full extent of the facility within a normal 30 degree cone of vision.

MetroGIS / V&L developed this methodology in the absence of any known and/or acceptable standards for South African solar energy facilities.

The proximity radii used for this study (calculated from the boundary of the proposed facility) are shown on **Map 4**.

- 0 – 2 km - Short distance view where the facility would dominate the frame of vision and constitute a very high visual prominence.
- 2 – 4 km - Medium distance views where the facility would be easily and comfortably visible and constitute a high visual prominence.

- 4 – 8 km - Medium to longer distance view where the facility would become part of the visual environment, but would still be visible and recognisable. This zone constitutes a medium visual prominence.
- Greater than 8 km - Long distance view where the facility would still be visible though not as easily recognisable. This zone constitutes a low visual prominence for the facility.

5.4. Viewer incidence / viewer perception

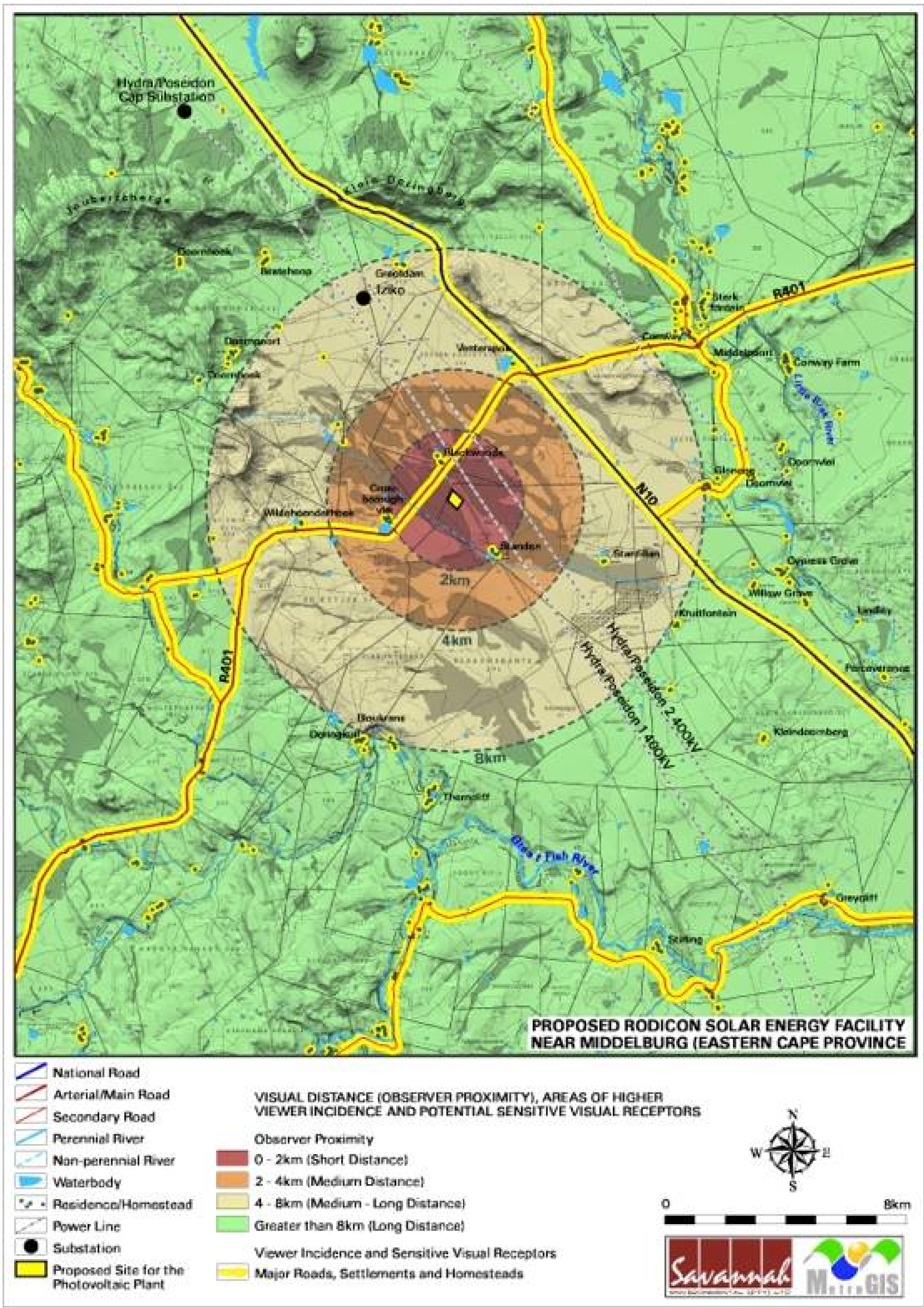
Refer to **Map 4**. Viewer incidence is calculated to be the highest along the national road (i.e. the N10) and arterial road (i.e. the R401) as well as along the secondary roads within the study area. Commuters using these roads could be negatively impacted upon by visual exposure to the facility, and are thus considered to be sensitive to visual intrusion.

Other than along the above roads, viewer incidence will be concentrated within the farming homesteads and settlements within the study area.

In terms of viewer sensitivity, the most vulnerable to potential visual impacts include residents of homesteads and settlements (who will be exposed while at home) and tourists visiting and travelling through the area.

Daily commuters (by road) are also considered to sensitive receptors, but as this exposure will be of shorter duration that for residents of homesteads, their sensitivity is somewhat lower.

The severity of the visual impact on visual receptors decreases with increased distance from the proposed facility.



Map 4: Observer proximity, areas of high viewer incidence and potential sensitive visual receptors.

5.5. Visual impact index

The combined results of the visual exposure, viewer incidence / perception and visual distance of the proposed SEF site options are displayed on **Map 5**.

Here the weighted impact and the likely areas of impact have been indicated as a visual impact index. Values have been assigned for each potential visual impact per data category and merged in order to calculate the visual impact index.

An area with short distance, a potential visual exposure to the proposed facility, a high viewer incidence and a predominantly negative perception would therefore have a higher value (greater impact) on the index. This helps in focussing the attention to the critical areas of potential impact when evaluating the issues related to the visual impact.

- Areas of potentially **moderate** visual impact are indicated within a 2km radius of the proposed facility, although the area to the immediate east and north east of the facility will experience no impact.

  Within the 2km radius, sensitive visual receptors are limited to users of the R401, which bypasses the site to the north west, and two homesteads. These include *Blackwoods* and *Crowboroughvlei.* These sensitive visual receptors are likely to be exposed to potentially **high** visual impact.

  A small section of CBA1 falls within this zone (to the east of the site).

- The extent of potential visual impact remains high between the 2km and 4km radius. Visually exposed areas lie in all directions, except the south east, which will experience no visual impact. The visually exposed areas are likely to experience potentially **low** visual impact.

  Sensitive visual receptors include users of the R401 in the north east and in the south west. These receptors, in addition to a single homestead in the north west, are likely to experience a potentially **moderate** visual impact.

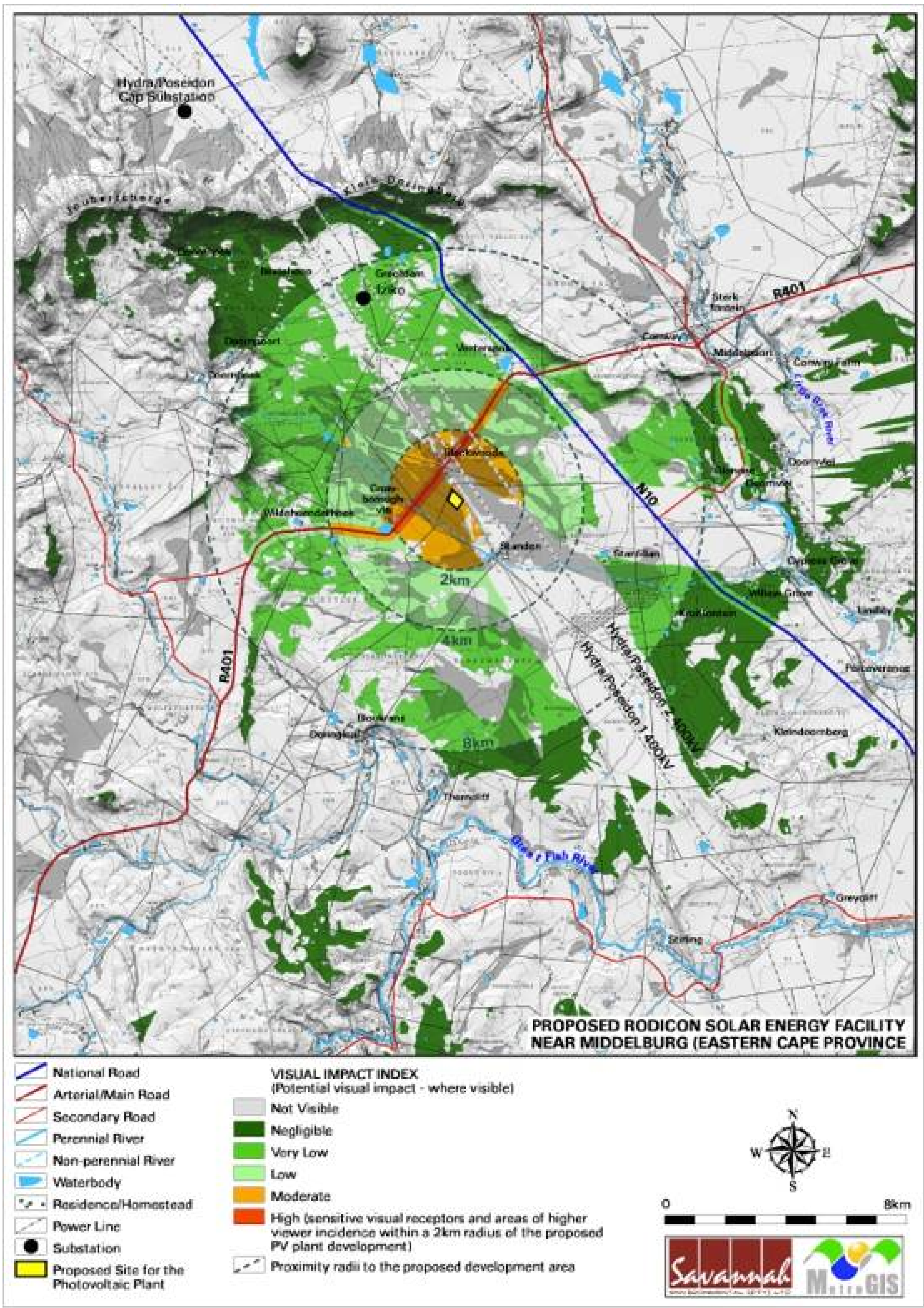
  Limited sections of CBA1, to the east of the proposed site, fall within the visually exposed zone.

- Between the 4km and 8km radius, the viewshed becomes increasingly fragmented, with visually exposed areas ling mainly in the north west, and to a lesser extent to the south, south west and east. These areas are likely to experience potentially **very low** visual impact.

  Stretches of both the N10 and the R401 fall within this zone, and users are likely to be exposed to potentially **low** visual impact. Approximately 6 homesteads also fall within this zone, and may also be exposed to potentially low visual impact.

  Very limited parts of CBA1, to the east of the proposed site, fall within the visually exposed zone.

- Beyond a radius of 8km from the site, the extent of potential visual exposure is further reduced and fragmented. The magnitude of visual impact is mostly **negligible,** with potentially **very low** visual impact occurring where potentially sensitive visual receptors are located (i.e. roads and homesteads).



Map 5: Visual impact index of the proposed facility.

5.6. Visual impact assessment: methodology

The previous section of the report identified specific areas where likely visual impacts would occur. This section will attempt to quantify these potential visual impacts in their respective geographical locations and in terms of the identified issues (see Chapter 2: SCOPE OF WORK) related to the visual impact.

The methodology for the assessment of potential visual impacts states the **nature** of the potential visual impact (e.g. the visual impact on users of major roads in the vicinity of the proposed SEF) and includes a table quantifying the potential visual impact according to the following criteria:

- **Extent** - site only (very high = 5), local (high = 4), regional (medium = 3), national (low = 2) or international (very low = 1).
- **Duration** - very short (0-1 yrs = 1), short (2-5 yrs = 2), medium (5-15 yrs = 3), long (>15 yrs = 4), and permanent (= 5).
- **Magnitude** - None (= 0), minor (= 2), low (= 4), medium/moderate (= 6), high (= 8) and very high (= 10). This value is read off the Visual Impact Index Map. Where more than one value is applicable, then the higher of these will be used in order to simulate a worst case scenario.
- **Probability** – very improbable (= 1), improbable (= 2), probable (= 3), highly probable (= 4) and definite (= 5). This value is read from the visual impact index.
- **Status** (positive, negative or neutral).
- **Reversibility** - reversible (= 1), recoverable (= 3) and irreversible (= 5).
- **Significance** - low, medium or high.

The **significance** of the potential visual impact is equal to the **consequence** multiplied by the **probability** of the impact occurring, where the consequence is determined by the sum of the individual scores for magnitude, duration and extent (i.e. **significance = consequence (magnitude + duration + extent) x probability**).

The significance weighting for each potential visual impact (as calculated above) is as follows:

- <30 points: Low (where the impact would not have a direct influence on the decision to develop in the area)
- 31-60 points: Medium/moderate (where the impact could influence the decision to develop in the area)
- >60: High (where the impact must have an influence on the decision to develop in the area)

*Please note that due to the declining visual impact over distance, the **extent** (or spatial scale) rating is reversed (i.e. a localised visual impact has a higher value rating than a national or regional value rating). This implies that the visual impact is highly unlikely to have a national or international extent, but that the local or site-specific impact could be of high significance.*

5.7 Visual impact assessment: primary impacts

Note: As discussed in section 5.2. above, this assessment does not take into account and Visual Absorption of the natural vegetation, and as such represents a worst case scenario.

5.7.1 The SEF and ancillary infrastructure

Potential visual impact on sensitive visual receptors in close proximity to the proposed SEF.

Sensitive visual receptors in close proximity to the proposed SEF (i.e. **within a 2km radius**) include residents of *Blackwoods* and *Crowboroughvlei* and users of the R401, which bypasses the site to the north west.

Primary infrastructure refers to the PV panels with a height of 2m, while ancillary infrastructure potentially includes the proposed on-site switching station, the workshop and a new overhead power line.

Both the primary and ancillary infrastructure could present a visual impact as these structures are built forms within a natural context. In addition, vegetation will need to be removed for these structures to be built.

The site will require an access road, which will also require a degree of vegetation clearing and grading. The access road, although devoid of any vertical dimension, has the potential of manifesting as a scar in the landscape.

The anticipated visual impact on users of roads, resulting from the proposed SEF and ancillary infrastructure is likely to be of **moderate** significance both before and after mitigation.

Table 2a: Impact table summarising the significance of visual impacts on users of roads in close proximity to the proposed SEF.

Nature of Impact: Potential visual impact on users of roads in close proximity to the proposed SEF.		
	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	High **(8)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Moderate **(48)**	Moderate **(32)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: <u>Planning:</u> ➢ Retain a buffer (approximately 30-50m wide) of intact natural vegetation along the perimeter of the development site. ➢ Retain and maintain natural vegetation in all areas outside of the development footprint. ➢ Plan internal roads and ancillary infrastructure in such a way and in such a location that clearing of vegetation is minimised. Consolidate infrastructure as much as possible, and make use of already disturbed areas rather than pristine sites wherever possible. <u>Construction:</u> ➢ Rehabilitation of all construction areas. ➢ Ensure that vegetation is not cleared unnecessarily to make way for the access road and ancillary buildings.		

Operations: ➢ Maintain the general appearance of the facility as a whole. ➢ Maintenance of roads to avoid erosion and suppress dust. Decommissioning: ➢ Remove infrastructure and roads not required for the post-decommissioning use of the site. ➢ Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications. ➢ Monitor rehabilitated areas post-decommissioning and implement remedial actions.
Cumulative impacts: The construction of the SEF and ancillary infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the existing 400 kV power lines to the west of the site and the Iziko substation in the north west.
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

The anticipated visual impact on residents of homesteads, resulting from the proposed SEF and ancillary infrastructure, is likely to be of **moderate** significance, and may be mitigated to **low.** The low occurrence of homesteads in close proximity to the proposed SEF reduces the probability of this impact occurring.

Table 2b: Impact table summarising the significance of visual impacts on residents of homesteads in close proximity to the proposed SEF.

Nature of Impact: Potential visual impact on residents of homesteads in close proximity to the proposed SEF.		
	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	High **(8)**
Probability	Improbable **(2)**	V Improbable **(1)**
Significance	Moderate **(32)**	Low **(16)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Planning: ➢ Retain a buffer (approximately 30-50m wide) of intact natural vegetation along the perimeter of the development site. ➢ Retain and maintain natural vegetation in all areas outside of the development footprint. ➢ Plan internal roads and ancillary infrastructure in such a way and in such a location that clearing of vegetation is minimised. Consolidate infrastructure as much as possible, and make use of already disturbed areas rather than pristine sites wherever possible. Construction: ➢ Rehabilitation of all construction areas. ➢ Ensure that vegetation is not cleared unnecessarily to make way for the access road and ancillary buildings. Operations: ➢ Maintain the general appearance of the facility as a whole. ➢ Maintenance of roads to avoid erosion and suppress dust. Decommissioning: ➢ Remove infrastructure and roads not required for the post-decommissioning use of the site. ➢ Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications. ➢ Monitor rehabilitated areas post-decommissioning and implement remedial actions.		

Cumulative impacts: The construction of the SEF and ancillary infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the existing 400 kV power lines to the west of the site and the Iziko substation in the north west.
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Potential visual impact on sensitive visual receptors within the region.

Sensitive visual receptors within the region (i.e. **beyond the 2km radius**) include users of main roads (i.e. the N10 and the R401) and residents of a limited number of homesteads and settlements (less than 8 between the 2km and 8km radius).

The visual impact is likely to result occur primarily as a result of primary infrastructure (i.e. the PV panels), but ancillary infrastructure may also be a factor.

The nature of the impact is again that of an expansive built form within a natural context. In addition, vegetation will need to be removed for these structures to be built.

The anticipated visual impact resulting from the proposed SEF and ancillary infrastructure is likely to be of **low** significance, both before and after mitigation. The low occurrence of sensitive visual receptors within the region reduces the probability of this impact occurring.

Table 3: Impact table summarising the significance of visual impacts on sensitive visual receptors within the region.

Nature of Impact: Potential visual impact on sensitive visual receptors within the region.		
	No mitigation	***Mitigation considered***
Extent	Regional **(3)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Moderate **(6)**	Moderate **(6)**
Probability	Improbable **(2)**	V Improbable **(1)**
Significance	Low **(26)**	Low **(13)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: <u>Planning:</u> ➢ Retain a buffer (approximately 30-50m wide) of intact natural vegetation along the perimeter of the development site. ➢ Retain and maintain natural vegetation in all areas outside of the development footprint. ➢ Plan internal roads and ancillary infrastructure in such a way and in such a location that clearing of vegetation is minimised. Consolidate infrastructure as much as possible, and make use of already disturbed areas rather than pristine sites wherever possible. <u>Construction:</u> ➢ Rehabilitation of all construction areas. ➢ Ensure that vegetation is not cleared unnecessarily to make way for the access road and ancillary buildings. <u>Operations:</u> ➢ Maintain the general appearance of the facility as a whole. ➢ Maintenance of roads to avoid erosion and suppress dust.		

Decommissioning: ➢ Remove infrastructure and roads not required for the post-decommissioning use of the site. ➢ Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications. ➢ Monitor rehabilitated areas post-decommissioning and implement remedial actions.
Cumulative impacts: The construction of the SEF and ancillary infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the existing 400 kV power lines to the west of the site and the Iziko substation in the north west.
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

5.7.2. Lighting Impacts

Potential visual impact of lighting at night on observers in close proximity to the proposed SEF.

The area immediately surrounding the proposed facility has a relatively low incidence of receptors and light sources, so light trespass and glare from the security and after-hours operational lighting for the facility will have some significance for visual receptors in close proximity.

Another potential lighting impact is that known as sky glow. Sky glow is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog. The sky glow intensifies with the increase in the amount of light sources. Each new light source, especially upwardly directed lighting, contribute to the increase in sky glow.

This anticipated impact for both site options is likely to be of **moderate** significance, and may be mitigated to **low**.

Table 4: Impact table summarising the significance of visual impact of lighting at night on visual receptors in close proximity to the proposed SEF.

Nature of Impact: Potential visual impact on of lighting on visual receptors in close proximity of the proposed SEF.		
	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Moderate **(6)**	Moderate **(6)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Moderate **(42)**	Low **(28)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation: Planning & operation: ➢ Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself); ➢ Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights; ➢ Making use of minimum lumen or wattage in fixtures; ➢ Making use of down-lighters, or shielded fixtures; ➢ Making use of Low Pressure Sodium lighting or other types of low impact lighting. ➢ Making use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.
Cumulative impacts: Some existing light impact exists as a result of the Iziko substation I the north west. The development of the proposed SEF will therefore contribute to a cumulative lighting impact within an otherwise rural region.
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

5.7.3. Construction Impacts

Potential visual impact of construction on observers in close proximity to the proposed SEF.

During the construction period, there will be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users and land owners in the area. Dust from construction work could also result in potential visual impact.

This anticipated visual impact for both site options is likely to be of **low** significance, both before and after mitigation. The low incidence of visual receptors in close proximity to the proposed facility reduces the probability of this impact occurring.

Table 5: Impact table summarising the significance of visual impact of construction on visual receptors in close proximity to the proposed SEF.

Nature of Impact: Potential visual impact of construction on visual receptors in close proximity to the proposed SEF.		
	No mitigation	***Mitigation considered***
Extent	Local **(4)**	Local **(4)**
Duration	Very short term **(1)**	Very short term **(1)**
Magnitude	Moderate **(6)**	Moderate **(6)**
Probability	Improbable **(2)**	V Improbable **(1)**
Significance	Low **(22)**	Low **(11)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Construction: ➢ Ensure that vegetation is not unnecessarily cleared or removed during the construction period. ➢ Reduce the construction period through careful logistical planning and productive implementation of resources. ➢ Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.		

➢ Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. ➢ Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities. ➢ Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent). ➢ Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting. ➢ Rehabilitate all disturbed areas, construction areas, roads, slopes etc. immediately after the completion of construction works.
Cumulative impacts: None.
Residual impacts: None.

5.8 Visual impact assessment: secondary impacts

5.8.1 The SEF and ancillary infrastructure

Potential visual impact of the proposed facility on the visual character of the landscape and the sense of place of the region.

Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria and specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.) play a significant role.

A visual impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light.

The character of the landscape is one of undeveloped, wide open spaces. Development, where this occurs is of a domestic scale. The visual quality of the landscape is considered to be high and the sense of place defined by an absence of development and vast karoo grazing lands.

The nature of the impact is again that of an expansive built form within a natural context. In addition, vegetation will need to be removed for these structures to be built.

The anticipated visual impact of the facility on the regional visual character, and by implication, on the sense of place, is expected to be of **low** significance, both before and after mitigation. The small scale of the proposed facility and the limited occurrence of sensitive visual receptors reduces the probability of this impact occurring.

Table 6: Impact table summarising the significance of visual impacts on the visual character of the landscape and sense of place of the region.

Nature of Impact: Potential visual impact on the visual character of the landscape and the sense of place of the region.		
	No mitigation	***Mitigation considered***
Extent	Regional **(3)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Moderate **(6)**	Moderate **(6)**
Probability	Improbable **(2)**	V Improbable **(1)**
Significance	Low **(26)**	Low **(13)**
Status (positive or	Negative	Negative

<table>
<tr><td>negative)</td><td></td><td></td></tr>
<tr><td>Reversibility</td><td>Recoverable (3)</td><td>Recoverable (3)</td></tr>
<tr><td>Irreplaceable loss of resources?</td><td>No</td><td>No</td></tr>
<tr><td>Can impacts be mitigated?</td><td colspan="2">Yes</td></tr>
<tr><td colspan="3">Mitigation:
<u>Planning:</u>
➢ Retain a buffer (approximately 30-50m wide) of intact natural vegetation along the perimeter of the development site.
➢ Retain and maintain natural vegetation in all areas outside of the development footprint.
➢ Plan internal roads and ancillary infrastructure in such a way and in such a location that clearing of vegetation is minimised. Consolidate infrastructure as much as possible, and make use of already disturbed areas rather than pristine sites wherever possible.
<u>Construction:</u>
➢ Rehabilitation of all construction areas.
➢ Ensure that vegetation is not cleared unnecessarily to make way for the access road and ancillary buildings.
<u>Operations:</u>
➢ Maintain the general appearance of the facility as a whole.
➢ Maintenance of roads to avoid erosion and suppress dust.
<u>Decommissioning:</u>
➢ Remove infrastructure and roads not required for the post-decommissioning use of the site.
➢ Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
➢ Monitor rehabilitated areas post-decommissioning and implement remedial actions.</td></tr>
<tr><td colspan="3">Cumulative impacts:
The construction of the SEF and ancillary infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is relevant in light of the existing 400 kV power lines to the west of the site and the Iziko substation in the north west.</td></tr>
<tr><td colspan="3">Residual impacts:
The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.</td></tr>
</table>

5.9 The potential to mitigate visual impacts

The appearance and size of the PV panels (with an approximate height of 2m) is not possible to mitigate. The functional design of the structures cannot be changed in order to reduce visual impacts.

Secondary impacts anticipated as a result of the proposed facility (i.e. visual character, sense of place, tourism value and tourism potential) are also not possible to mitigate.

The following mitigation is, however possible:

- Retain a buffer (approximately 30-50m wide) of intact natural vegetation along the perimeter of the development site.

- Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint. This measure will help to soften the appearance of the facility within its context.

- In terms of ancillary infrastructure, it is recommended that the access road, power line and ancillary infrastructure be planned in such a way and in such a location that clearing of vegetation is minimised. This implies consolidating infrastructure as much as possible and making use of already disturbed areas rather than pristine sites wherever possible.

- Mitigation of lighting impacts includes the pro-active design, planning and specification lighting for the facility by a lighting engineer. The correct specification and placement of lighting and light fixtures for the SEF and the ancillary infrastructure will go far to contain rather than spread the light. Mitigation measures include the following:

    - Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself);
    - Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights;
    - Making use of minimum lumen or wattage in fixtures;
    - Making use of down-lighters, or shielded fixtures;
    - Making use of Low Pressure Sodium lighting or other types of low impact lighting.
    - Making use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.

- Mitigation of visual impacts associated with the construction phase, albeit temporary, entails proper planning, management and rehabilitation of the construction site and all disturbed areas. Recommended mitigation measures include the following:

    - Ensure that vegetation is not unnecessarily cleared or removed during the construction period.
    - Reduce the construction period through careful logistical planning and productive implementation of resources.
    - Plan the placement of lay-down areas and any potential temporary construction camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.
    - Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.
    - Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.
    - Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).
    - Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.
    - Rehabilitate all disturbed areas, construction areas, roads, slopes etc. immediately after the completion of construction works. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.

- During operation, the maintenance of the PV panels and all ancillary structures and infrastructure will ensure that the facility does not degrade, thus aggravating visual impact.

- Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as a when required.

- Once the SEF has exhausted its life span, the main facility and all associated infrastructure not required for the post rehabilitation use of the site should be removed and all disturbed areas appropriately rehabilitated.

An ecologist should be consulted to give input into rehabilitation specifications.

- All rehabilitated areas should be monitored for at least a year following decommissioning, and remedial actions implemented as and when required.

Good practice requires that the mitigation of both primary and secondary visual impacts as listed above be implemented and maintained on an ongoing basis.

6. IMPACT STATEMENT

The finding of the Visual Impact Assessment undertaken for the Proposed Rodicon SEF is that the visual environment surrounding the site will be visually impacted upon for the anticipated operational lifespan of the facility (i.e. 20 - 30 years). Potential visual impacts will be concentrated within 2km of the proposed facility, although the extent of visual impact will not be limited to this zone.

The proposed facility would be visible within an area that incorporates certain sensitive visual receptors. These include users of the N10, the R401 and residents of farming homesteads and settlements.

The following is a summary of impacts remaining, assuming mitigation as recommended is exercised:

- The potential visual impact of the facility and ancillary infrastructure on users of roads in close proximity to the proposed facility (within a 2km radius) will be of **moderate** significance.

- The potential visual impact of the facility and ancillary infrastructure on residents of homesteads in close proximity to the proposed facility (within a 2km radius) will be of **low** significance.

- The anticipated visual impact of the facility and ancillary infrastructure on sensitive visual receptors (i.e. users of main roads and residents of homesteads) beyond the 2km radius will be of **low** significance.

- Visual impacts related to lighting will be of **low** significance, as will those related to construction.

- Lastly, the anticipated impact on the visual character of the landscape and the sense of place of the region will be of **low** significance.

It must also be noted that the viewshed analysis does not include the effect of vegetation cover or existing structures on the exposure of the proposed SEF, therefore signifying a worst-case scenario.

The anticipated visual impacts listed above (i.e. post mitigation impacts) are moderate and low, and none are considered to be fatal flaws from a visual perspective. The main considerations in this regard are the small size of the proposed facility, the relatively contained viewshed and extent of visual exposure and the very low occurrence of potentially sensitive visual receptors.

It is therefore recommended that the development of the facility as proposed be supported, subject to the implementation of the recommended mitigation measures (Chapter 5.9) and management plan (Chapter 7).

7. MANAGEMENT PROGRAMME

The management plan tables aim to summarise the key findings of the visual impact report and to suggest possible management actions in order to mitigate the potential visual impacts.

Table 7: Management Programme – Planning.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the planning of the Proposed Rodicon SEF.	
Project Component/s	SEF and ancillary infrastructure (i.e. access road, power lines, switching station and workshop).
Potential Impact	Primary visual impact of the facility due to the presence of the PV panels and associated infrastructure as well as the visual impact of lighting at night.
Activity/Risk Source	The viewing of the above mentioned by observers on or near the site (i.e. within 2 km of the site) as well as within the region.
Mitigation: Target/Objective	Optimal planning of infrastructure to minimise visual impact.

Mitigation: Action/control	**Responsibility**	**Timeframe**
Retain a buffer (approximately 30-50m wide) of intact natural vegetation along the perimeter of the development site. This buffer may be within or behind the security fence.	Rodicon Trading Investments (Pty) / design consultant	Early in the planning phase.
Retain and maintain natural vegetation in all areas outside of the development footprint.	Rodicon Trading Investments (Pty) / design consultant	Early in the planning phase.
Plan the ancillary buildings in such a way and in such a location that clearing of vegetation is minimised. Consolidate infrastructure and make use of already disturbed sites rather than pristine areas.	Rodicon Trading Investments (Pty) / design consultant	Early in the planning phase.
Consult a lighting engineer in the design and planning of lighting to ensure the correct specification and placement of lighting and light fixtures for the facility and the ancillary infrastructure. The following is recommended: o Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself); o Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights; o Making use of minimum lumen or wattage in fixtures; o Making use of down-lighters, or shielded fixtures; o Making use of Low Pressure Sodium lighting or other types of low impact lighting. o Making use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.	Rodicon Trading Investments (Pty) / design consultant	Early in the planning phase.

Performance Indicator	Minimal exposure of PV panels, ancillary infrastructure and lighting at night to observers on or near the site (i.e. within 2km) and within the

	region.
Monitoring	Not applicable.

Table 8: Management Programme – Construction.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the construction of the Proposed Rodicon SEF.		
Project Component/s	Construction site	
Potential Impact	Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing and resulting erosion.	
Activity/Risk Source	The viewing of the above mentioned by observers on or near the site (i.e. within 2 km of the site).	
Mitigation: Target/Objective	Minimal visual intrusion by construction activities and intact vegetation cover outside of immediate works areas.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Ensure that vegetation is not unnecessarily cleared or removed during the construction period.	Rodicon Trading Investments (Pty) / contractor	Early in the construction phase.
Reduce the construction period through careful logistical planning and productive implementation of resources.	Rodicon Trading Investments (Pty) / contractor	Early in the construction phase.
Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.	Rodicon Trading Investments (Pty) / contractor	Early in and throughout the construction phase.
Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.	Rodicon Trading Investments (Pty) / contractor	Throughout the construction phase.
Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.	Rodicon Trading Investments (Pty) / contractor	Throughout the construction phase.
Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).	Rodicon Trading Investments (Pty) / contractor	Throughout the construction phase.
Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.	Rodicon Trading Investments (Pty) / contractor	Throughout the construction phase.
Rehabilitate all disturbed areas, construction areas, servitudes etc. immediately after the completion of construction works. Consult an ecologist to give input into rehabilitation specifications.	Rodicon Trading Investments (Pty) / contractor	Throughout and at the end of the construction phase.
Performance Indicator	Vegetation cover on and in the vicinity of the site is intact (i.e. full cover as per natural vegetation within the environment) with no evidence of degradation or erosion.	
Monitoring	Monitoring of vegetation clearing during construction (by contractor as part of construction contract). Monitoring of rehabilitated areas quarterly for at least a year following the end of construction (by contractor as part of construction contract).	

Table 9: Management Programme – Operation.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the operation of the Proposed Rodicon SEF.

Project Component/s	SEF and ancillary infrastructure (i.e. access road, power lines, switching station and workshop).	
Potential Impact	Visual impact of facility degradation and vegetation rehabilitation failure.	
Activity/Risk Source	The viewing of the above mentioned by observers on or near the site (i.e. within 2 km of the site).	
Mitigation: Target/Objective	Well maintained and neat facility.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Maintain the general appearance of the facility as a whole, including the turbines the internal roads, servitudes and the ancillary buildings.	Rodicon Trading Investments (Pty) / operator	Throughout the operational phase.
Maintain roads to forego erosion and to suppress dust.	Rodicon Trading Investments (Pty) / operator	Throughout the operational phase.
Monitor rehabilitated areas, and implement remedial action as and when required.	Rodicon Trading Investments (Pty) / operator	Throughout the operational phase.
Performance Indicator	Well maintained and neat facility with intact vegetation on and in the vicinity of the facility.	
Monitoring	Monitoring of the entire site on an ongoing basis (by operator).	

Table 10: Management Programme – Decommissioning.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the decommissioning of the Proposed Rodicon SEF.		
Project Component/s	SEF and ancillary infrastructure (i.e. access road, power lines, switching station and workshop).	
Potential Impact	Visual impact of residual visual scarring and vegetation rehabilitation failure.	
Activity/Risk Source	The viewing of the above mentioned by observers on or near the site (i.e. within 2 km of the site).	
Mitigation: Target/Objective	Only the infrastructure required for post decommissioning use of the site retained and rehabilitated vegetation in all disturbed areas.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Remove infrastructure not required for the post-decommissioning use of the site. This may include the offices, workshop, storage areas, access roads etc.	Rodicon Trading Investments (Pty) / operator	During the decommissioning phase.
Rehabilitate access roads not required for the post-decommissioning use of the site. Consult an ecologist to give input into rehabilitation specifications.	Rodicon Trading Investments (Pty) / operator	During the decommissioning phase.
Monitor rehabilitated areas quarterly for at least a year following decommissioning, and implement remedial action as and when required.	Rodicon Trading Investments (Pty) / operator	Post decommissioning.
Performance Indicator	Vegetation cover on and in the vicinity of the site is intact (i.e. full cover as per natural vegetation within the environment) with no evidence of degradation or erosion.	
Monitoring	Monitoring of rehabilitated areas quarterly for at least a year following decommissioning.	

8. REFERENCES/DATA SOURCES

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CSIR/ARC, 2000. *National Land-cover Database 2000 (NLC 2000)*

Department of Environmental Affairs and Tourism, 2001. *Environmental Potential Atlas for the Eastern Cape Province (ENPAT Eastern Cape).*

National Botanical Institute (NBI), 2004. *Vegetation Map of South Africa, Lesotho and Swaziland (Unpublished Beta Version 3.0)*

Oberholzer, B. (2005). *Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1.*

Appendix E: Public Participation

Appendix E1: Advert
Appendix E2: Site Notices
Appendix E3: Stakeholder Letters
Appendix E4: Project Database
Appendix E5: Correspondence with Authorities

Appendix E1:
Media Notice

EN OPENBARE DEELNAMEPROSES

VOORGESTELDE RODICON SONKRAGAANLEG OP 'N TERREIN NABY MIDDELBURG, PROVINSIE OOS-KAAP
DEA-verwysing: 14/12/16/3/3/1/538

Projeknaam: Rodicon son-fotovoltaïese (FV) kragaanleg op 'n terrein naby Middelburg, Provinsie Oos-Kaap

Applikant: Rodocon Trading and Investments (Edms.) Bpk.

Aktiwiteit: Die voorgestelde ontwikkeling van 'n FV-sonkragaanleg en verwante infrastruktuur op die restant van die plaas Zak Fontyn 267. Die voorgestelde aanleg sal ~5 MW opwek en sal insluit:
- 'n Opwekkingstransformator en klein substasie op die perseel om die verbinding tussen die sonkragaanleg en die Eskom-elektrisiteitsnetwerk te fasiliteer.
- 'n Oorhoofse kraglyn.
- Interne toegangspaaie.
- Werkswinkeldeel vir instandhouding en berging.

Ligging: Die aanleg word voorgestel op die restant van die plaas Zak Fontyn 267, wat 30 km suidoos van Middelburg in die Provinsie Oos-Kaap geleë is. Die studiegebied val binne die Inxuba Yethemba Plaaslike Munisipaliteit.
Kragtens Artikel 24 en 24D van die Wet op Nasionale Omgewingsbestuur (Nr. 107 van 1998), soos gelees met die OIS-regulasies van GN R543, GN R544 en GN R546, sal 'n Omgewingsimpakstudieproses vir hierdie voorgestelde projek onderneem word. Hierdie projek is by die Nasionale Departement van Omgewingsake (DEA) geregistreer onder aansoekverwysingsnommer: **14/12/16/3/3/1/538**.

Uitnodiging om Konsep Basiese Evaluasieverslag te besigtig: Savannah Environmental onderneem die vereiste omgewingsevaluasie en openbare deelnameproses. 'n Konsep Basiese Evaluasieverslag is ooreenkomstig die OIS-regulasies saamgestel en sal vir openbare besigtiging en kommentaar deur B&GP'e en belanghebbers beskikbaar gestel word. Jy word genooi om die konsepverslag te besigtig en kommentaar daarop te lewer by die volgende plekke: **Middelburg Openbare Biblioteek by Reenenstraat 47, Middelburg, Oos-Kaap, 5900** of by www.savannahSA.com.

Die 30-dae oorsigtydperk strek van Dinsdag 8 Mei 2012 tot Woensdag 6 Junie 2012.. Rig asb. geskrewe kommentaar aan Shawn Johnston by die onderstaande besonderhede teen nie later as Saterdag 2 Junie 2012. Alle kommentaar sal in die Finale Basiese Evaluasieverslag ingesluit word, wat by die DEA ingedien sal word vir hul oorweging en besluit.

Uitnodiging na Openbare Vergadering: 'n Openbare vergadering sal gedurende die oorsigtydperk gehou word ten einde kommentaar op die Konsep Basiese Evaluasieverslag te fasiliteer. Alle B&GP'e word genooi om 'n openbare vergadering by te woon:

Datum: 16 Mei 2012
Tyd: 17:30
Plek: Midross-saal, Middelburg, Oos-Kaap

Die doel van die openbare vergadering is om B&GP'e van bykomende inligting rakende die voorgestelde projek (insluitend tegniese besonderhede, projekproses en tydperke, ens.) te voorsien ten einde 'n opsomming van die bevindings van die Basiese Evaluasieverslag wat onderneem is, te gee; vir kommentaar op die voorgestelde projek; en om moontlike vraagstukke van spesifieke belang verder te bespreek.

Shawn Johnston van **Sustainable Futures ZA**
Posbus 749, Rondebosch,
Kaapstad, 7701
Tel. 083 325 9965
Faks 086 510 2537
E-pos: swjohnston@mweb.co.za
www.savannahsa.com

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SUSTAINABLE FUTURES ZA

Appendix E2:
Site Notices

PLATE 09: NOTICE BOARDS PLACED ON SITE

PLATE 10: NOTICE – MIDDLEBURG SPAR

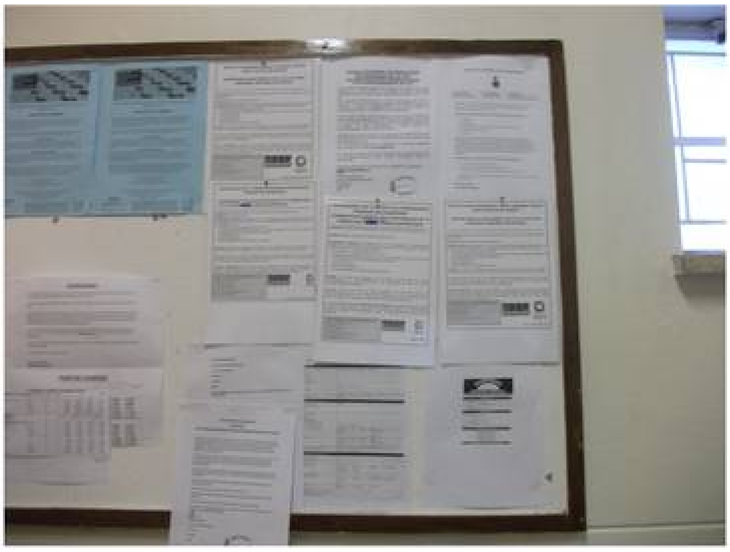

PLATE 11: NOTICE - INXUBA MUNICIPALITY

PLATE 12: NOTICE – MIDDLEBURG SPAR

Appendix E3:
Stakeholder Letters

SUSTAINABLE
FUTURES ZA

4 May 2012

ENVIRONMENTAL BASIC ASSESSMENT PROCESS: PROPOSED RODICON SOLAR ENERGY FACILITY NEAR MIDDLEBURG, EASTERN CAPE
DEA REF. NO.:14/12/16/3/3/1/538

Dear Stakeholder,

Rodicon Trading and Investments (Pty) proposes to establish a photovoltaic (PV) solar energy facility in order generate electricity. The facility is proposed to be established over an area of less than 20 ha located ~30 km south east of Middleburg in the Eastern Cape Province. In terms of sections 24 and 24D of the National Environmental Management Act (No 107 of 1998), as read with the EIA Regulations of GN R543 – R546, a Basic Assessment Process is required to be undertaken. The project has been registered with the National Department of Environmental Affairs (DEA) as the competent authority under application reference number **14/12/16/3/3/1/538**.

The Draft Basic Assessment Report has been compiled and is now available for public review from the **4 May 2012** to the **2 June 2012** at the Middelburg Public Library at 47 Reenen Street, Middelburg, Eastern Cape 5900 or on www.savannahSA.com

Please submit written comment to Shawn Johnston on the details provided below, no later than 2 June 2012. All comments will be included in the Final Basic Assessment Report, which will be submitted to the DEA for their consideration and decision.

In order to facilitate comments on the draft Basic Assessment Report, a **public meeting** will be held during the review period. All I&APs are invited to attend a public meeting as detailed below.

Date	**Time**	**Venue**
17 May 2012	17h30	Midross Hall, Middleburg, Eastern Cape

The aim of the public meeting is to provide I&APs with additional information regarding the proposed project (including technical details, project process and timeframes etc.), to provide a summary of the findings of the Basic Assessment undertaken, to invite comment on the proposed project, and to further discuss possible issues of specific concern.

Regards,

Shawn Johnston
Public Participation Facilitator

Sustainable Futures ZA PO Box 749 Rondebosch 7701 Cape Town South Africa
Tel: +27 (0)83 3259965 Fax 086 510 2537 E-mail: swjohnston@mweb.co.za

Appendix E4:
Project I&AP Database

Radicon Solar PV Basic Assessment Stakeholder Database 2012		
Initial /Name	Surname	Organisation
Kurt	Donoin	Surrounding Landowner
Andre	Perry	Surrounding Landowner
Andre	Perry	Surrounding Landowner
Kurt	Donoin	Surrounding Landowner
Kurt	Donoin	Surrounding Landowner
Edgar	Kingwill	Surrounding Landowner
Andre	Perry	Surrounding Landowner
Andre	Perry	Surrounding Landowner
Edgar	Kingwill	Surrounding Landowner
Andre	Perry	Surrounding Landowner
Andre	Perry	Surrounding Landowner
Andre	Perry	Surrounding Landowner
Carl	Perry	Surrounding Landowner
Takalani	Maswime	Department of Water and Environmental Affairs
Andries	Strüwig	Department of Economic Development and Environmental Affairs
Dedre	Watkins	Department of Minerals and Energy
District Manager		Department of Agriculture
Mzwandile	Tantsi	Municipal Manger Inxuba yeThemba Local Municipality: Cradock
Noncedo	Zonke	Inxuba yeThemba Local Municipality: Middelburg
Marie	Joubert	Middleburg Public Library
Rialize	Hayes	Middelburg Karoo Tourism
Mpilo	Mbambisa	Municipal Manager - Chris Hani District Municipality
Lizelle	Stroh	South African Civilian Aviation Authority
Mpilo	Mbambisa	Municipal Manager - Chris Hani District Municipality
D	Agyemang	Integrated Planning Economic Development - Chris Hani DM
M	Mdleleni	Department of Economic Development and Environmental Affairs
Sybert	Libenberg	Department of Economic Development and Environmental Affairs
Lmugesi	Getu	DEDEA: Chris Hani/Ukhahlamba Region
Dayalan	Govender	Department of Economic Development and Environmental Affairs
Marius	Keyser	EC Transport - District Roads Engineer
Dr. Marie	De Villiers	EC Transport - District Roads
Unathi	Tele	EC Transport - District Roads -Infrastructure
A	Mphangele	EC Chris Hani District Roads
Dr. Antonieta	Jerardino	South African Heritage Resources Agency
Vuyo	Mlokoti	Amathole District Municipality - Municipal Manger (Bev = PA to MP)
N	Mnukwa	Chief Director DWA Eastern Cape
Patrick	Cull	Interested Party
Morgan	Griffiths	WESSA Conservation Officer
Bradley	Gibbons	Project Coordinator: Karoo Crane Conservation Project
P.G.	Taai	Inxuba yeThemba Local Municipality: Middelburg
Nolitha	Ngcai	South African Heritage Resources Agency EC Provincial Manager
Oom At	Gouws	The Advertiser Newspaper Middelburg
Werner	Potgieter	Karoo Pompwerke
Nomaphelo	Danyela	PA Municipal Manager Chris Hani DM
Mawethu	Danyela	LED Manager - Chris Hani DM
Bronwyn	Viedge	IDP Manager - Chris Hani Dm
Francois	Nel	Environmental Manager - Renewable Energy Working Group
Makhaya	Dungu	Technical Services Manager - Chris Hani DM
A	Mavis	PA Municipal Manager Inxuba yeThemba Local Municipality: Cradock
Nardus	Bardenhorst	Technical Services Manager Inxuba yeThemba LM: Cradock
Mncedisi N	Makosonke	Regional Manager Environmental Affairs
Thando	Booi	Environmental Officer:EIM Chris Hani Region
Ms Nondwe	Mdekazi	Assistant Manager EIM, Waste & Air Quality Chris Hani Region
Weitz	Mentz	Chairperson Middelburg Farmers Union
Desmond	Qwabe	Transnet Freight Rail
Joseph	Jacobs	Department of Water and Environmental Affairs - Port Elizabeth

Appendix E5:
Correspondence with Authorities

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X 447· PRETORIA · 0001· Fedsure Building · 315 Pretorius Street · PRETORIA
Tel (+ 27 12) 310 3911 · Fax (+ 2712) 322 2682

NEAS Reference: DEA/EIA/0001146/2012
DEA Reference: 14/12/16/3/3/1/538
Enquiries: *Nyiko Nkosi*
Tel: 012 395 1694 **Fax:** 012 320 7539 **E-mail:** *nnkosi@environment.gov.za*

Karen Jodas
Savannah Environmental (Pty) Ltd
PO Box 148
SUNNINGHILL
2157

Fax: 086 684 0547
Tel: 011 234 6621

PER FACSIMILE / MAIL

Dear Sir/Madam

ACKNOWLEDGEMENT OF RECEIPT AND ACCEPTANCE OF NEW APPLICATION FOR ENVIRONMENTAL AUTHORISATION (BASIC ASSESSMENT PROCESS) FOR THE PROPOSED RODICON SOLAR ENERGY FACILITY ON A SITE NEAR MIDDLEBURG, NORTHERN CAPE

The Department confirms having received the Application Form and EAP Declaration of Interest on 29 March 2012 for environmental authorisation for the abovementioned project. The Application is accepted.

Please note that the Department will request the delegation of authority from the provincial Department and will notify you with regards to the outcome.

Please include both reference numbers (NEAS Reference and DEA Reference), as listed above, on all documents and correspondence submitted to the Department.

Please note that _one hard copy and one electronic copy (saved on CD/DVD) of draft reports_, and _five hard copies and one electronic copy of final reports_ must be submitted to the Department.

In addition, please consider the following during compilation of reports for this application for environmental authorisation:

- All applicable Departmental Guidelines must be considered throughout the application process. These can be downloaded from the Department's website: www.environment.gov.za, Environmental Impact Management button, listed under "EIA Administration": Integrated Environmental Management Information Series link. These include, but are not limited to, the following topics: Scoping, Environmental Impact

Reporting, Stakeholder Engagement, Specialist Studies, Impact Significance, Cumulative Effects Assessments, Alternatives in EIA and Environmental Management Plans.

- Please be advised that in terms of the EIA Regulations and NEMA the investigation of alternatives is mandatory. Alternatives must therefore be identified, investigated to determine if they are feasible and reasonable. It is also mandatory to investigate and assess the option of not proceeding with the proposed activity (the "no-go" option).
- Refer to the attached annexure for specific requirements for the submission of applications for environmental authorisation for solar power generation facilities.
- Should water, solid waste removal, effluent discharge, stormwater management and electricity services be provided by the municipality, you are requested to provide this office with written proof that the municipality has sufficient capacity to provide the necessary services to the proposed development. Confirmation of the availability of services from the service providers must be provided together with the reports to be submitted.
- In the reports to be submitted it must clearly be demonstrated in which way the proposed development will meet the requirements of sustainable development. You must also consider energy efficient technologies and water saving devices and technologies for the proposed development. This could include measures such as the recycling of waste, the use of low voltage or compact fluorescent lights instead of incandescent globes, maximising the use of solar heating, the use of dual flush toilets and low-flow shower heads and taps, the management of storm water, the capture and use of rainwater from gutters and roofs, the use of locally indigenous vegetation during landscaping and the training of staff to implement good housekeeping techniques.
- A detailed and complete EMPr must be submitted with the BAR. This EMPr must not provide recommendations but must indicate actual remediation activities which will be binding on the applicant. Without this EMPr the documents will be regarded as not meeting the requirements and will be returned to the applicant for correction.
- The applicant/EAP is required to inform this Department in writing upon submission of any draft report, of the contact details of the relevant State Departments (that administer laws relating to a matter affecting the environment) to whom copies of the draft report were submitted for comment. Upon receipt of this confirmation, this Department will in accordance with Section 24O(2) & (3) of the National Environmental Management Act, 1998 (Act 107 of 1998) inform the relevant State Departments of the commencement date of the 40 day commenting period, or 60 days in the case of the Department of Water Affairs for waste management activities which also require a licence in terms of the National Water Act, 1998 (Act 36 of 1998).
- Should it be necessary to apply for a permit in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999), please submit the necessary application to SAHRA or the relevant provincial heritage agency and submit proof thereof with the Basic Assessment Report/Environmental Impact Assessment Report. The relevant heritage agency should also be involved during the public participation process and have the opportunity to comment on all the reports to be submitted to this Department.

You are required to submit the final site layout plan together with the Final BAR to the Department. All available biodiversity information must be used in the finalisation of the layout plan. The site layout plan must indicate the following:

- Positions of solar facilities;
- Foundation footprint;
- Permanent laydown area footprint;
- Construction period laydown footprint;

- Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible);
- Wetlands, drainage lines, rivers, stream and water crossing of roads and cables indicating the type of bridging structures that will be used;
- The location of Heritage sites;
- Sub-station(s) and/or transformer(s) sites including their entire footprint;
- Cable routes and trench dimensions (where they are not along internal roads);
- Connection routes (including pylon positions) to the distribution/transmission network;
- Cut and fill areas at solar panels sites along roads and at sub-station/transformer sites indicating the expected volume of each cut and fill;
- Borrow pits;
- Spoil heaps (temporary for topsoil and subsoil and permanently for excess material);
- All existing infrastructure on the site, especially roads;
- Buildings including accommodation;
- All "no-go" areas; and
- A map combining the final layout plan must be superimposed (overlain) on the environmental sensitivity map.

The Environmental Management Programme (EMPr) submitted as part of the application for environmental authorisation must include the following:

- All recommendations and mitigation measures to be recorded in the Final BAR.
- A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialist familiar with the site in consultation with the ECO and be implemented prior to commencement of the construction phase.
- An open space management plan to be implemented during the construction and operation of the facility.
- A re-vegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility including timeframes for restoration which must indicate rehabilitation within the shortest possible time after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.
- An alien invasive management plan to be implemented during construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken.
- A storm water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water run-off.
- An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems.

- An erosion management plan for monitoring and rehabilitating erosion events associated with the facility. Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.
- A traffic management plan for the site access roads to ensure that no hazards would results from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimize impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.
- An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.
- Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants.

The EAP must, in order to give effect to regulation 56 (2), before submitting the final basic assessment report to the Department give registered interested and affected parties access to, and an opportunity to comment on the report in writing within 21 days.

In terms of regulation 67 of the EIA Regulations, 2010 this application will lapse if the applicant (or the EAP on behalf of the applicant) fails to comply with a requirement in terms of the Regulations for a period of six months after having submitted the application, unless the reasons for failure have been communicated to and accepted by this Department.

You are hereby reminded of Section 24F of the National Environmental Management Act, Act No 107 of 1998, as amended, that no activity may commence prior to an environmental authorisation being granted by the Department.

Yours sincerely

Mr Ishaam Abader
Deputy Director-General: Environmental Quality and Protection
Department of Environmental Affairs
Letter signed by: Ms Nyiko Nkosi
Designation: Environmental Officer: Environmental Impact Evaluation
Date: 12/04/2012

CC:	Mr Keith Kirby	Radicon Trading and Investment	Fax: 086 557 2061
	Gerry Pienaar	Eastern Cape DEDEA	Fax: 041 508 5865
	Mr Mzwandile Tantsi	Inxuba Yethemba Local Municipality	Fax: 048 881 1421

A. EIA INFORMATION REQUIRED FOR SOLAR ENERGY FACILITIES

1. General site information

The following general site information is required:

- Descriptions of all affected farm portions
- 21 digit Surveyor General codes of all affected farm portions
- Copies of deeds of all affected farm portions
- Photos of areas that give a visual perspective of all parts of the site
- Photographs from sensitive visual receptors (tourism routes, tourism facilities, etc.)
- Solar plant design specifications including:
  - ➢ Type of technology
  - ➢ Structure height
  - ➢ Surface area to be covered (including associated infrastructure such as roads)
  - ➢ Structure orientation
  - ➢ Laydown area dimensions (construction period and thereafter)
  - ➢ Generation capacity
- Generation capacity of the facility as a whole at delivery points

This information must be indicated on the first page of any Scoping or EIA document. It is also advised that it be double checked as there are too many mistakes in the applications that have been received that take too much time from authorities to correct.

2. Site maps and GIS information

Site maps and GIS information should include at least the following:

- All maps/information layers must also be provided in ESRI Shapefile format
- All affected farm portions must be indicated
- The exact site of the application must be indicated (the areas that will be occupied by the application)
- A status quo map/layer must be provided that includes the following:
  - ➢ Current use of land on the site including:
    - ▪ Buildings and other structures
    - ▪ Agricultural fields
    - ▪ Grazing areas
    - ▪ Natural vegetation areas (natural veld not cultivated for the preceding 10 years) with an indication of the vegetation quality as well as fine scale mapping in respect of Critical Biodiversity Areas and Ecological Support Areas
    - ▪ Critically endangered and endangered vegetation areas that occur on the site
    - ▪ Bare areas which may be susceptible to soil erosion
    - ▪ Cultural historical sites and elements
  - ➢ Rivers, streams and water courses
  - ➢ Ridgelines and 20m continuous contours with height references in the GIS database
  - ➢ Fountains, boreholes, dams (in-stream as well as off-stream) and reservoirs

- High potential agricultural areas as defined by the Department of Agriculture, Forestry and Fisheries
- Buffer zones (also where it is dictated by elements outside the site):
  - 500m from any irrigated agricultural land
  - 1km from residential areas
- Indicate isolated residential, tourism facilities on or within 1km of the site

- A slope analysis map/layer that include the following slope ranges:
  - Less than 8% slope
  - between 8% and 12% slope
  - between 12%and 14% slope
  - steeper than 18 % slope
- A map/layer that indicate locations of birds and bats including roosting and foraging areas (specialist input required)
- A site development proposal map(s)/layer(s) that indicate:
  - Positions of solar facilities
  - Foundation footprint
  - Permanent laydown area footprint
  - Construction period laydown footprint
  - Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible)
  - River, stream and water crossing of roads and cables indicating the type of bridging structures that will be used
  - Substation(s) and/or transformer(s) sites including their entire footprint.
  - Cable routes and trench dimensions (where they are not along internal roads)
  - Connection routes to the distribution/transmission network (the connection must form part of the EIA even if the construction and maintenance thereof will be done by another entity such as ESKOM)
  - Cut and fill areas along roads and at substation/transformer sites indicating the expected volume of each cut and fill
  - Borrow pits
  - Spoil heaps (temporary for topsoil and subsoil and permanently for excess material)
  - Buildings including accommodation

With the above information authorities will be able to assess the strategic and site impacts of applications.

3. Regional map and GIS information

The regional map and GIS information should include at least the following:

- All maps/information layers must also be provided in ESRI Shapefile format
- The map/layer must cover an area of 20km around the site
- Indicate the following:
  - roads including their types (tarred or gravel) and category (national, provincial, local or private)
  - Railway lines and stations
  - Industrial areas
  - Harbours and airports
  - Electricity transmission and distribution lines and substations

- Pipelines
- Waters sources to be utilised during the construction and operational phases
- A visibility assessment of the areas from where the facility will be visible
- Critical Biodiversity Areas and Ecological Support Areas
- Critically Endangered and Endangered vegetation areas
- Agricultural fields
- Irrigated areas
- An indication of new road or changes and upgrades that must be done to existing roads in order to get equipment onto the site including cut and fill areas and crossings of rivers and streams

4. Important stakeholders

Amongst other important stakeholders, comments from the National Department of Agriculture, Forestry and Fisheries must be obtained and submitted to the Department. Request for comment must be submitted to:

Mrs. Anneliza Collett
Directorate: Land Use & Soil Management
Department of Agriculture, Forestry & Fisheries
Tel: 012 - 319 7508
Fax: 012 - 329 5938
e-mail: AnnelizaC@nda.agric.za
www.agis.agric.za

In addition, comments must be requested from Eskom (Mr Kevin Leask or Mr Ronald Marais (011) 8008111) regarding grid connectivity and capacity.

B. AGRICULTURE STUDY REQUIREMENTS

- Detailed soil assessment of the site in question, incorporating a radius of 50 m surrounding the site, on a scale of 1:10 000 or finer. The soil assessment should include the following:
  - Identification of the soil forms present on site
  - The size of the area where a particular soil form is found
  - GPS readings of soil survey points
  - The depth of the soil at each survey point
  - Soil colour
  - Limiting factors
  - Clay content
  - Slope of the site
  - A detailed map indicating the locality of the soil forms within the specified area,
  - Size of the site
- Exact locality of the site
- Current activities on the site, developments, buildings
- Surrounding developments / land uses and activities in a radius of 500 m of the site
- Access routes and the condition thereof
- Current status of the land (including erosion, vegetation and a degradation assessment)

- Possible land use options for the site
- Water availability, source and quality (if available)
- Detailed descriptions of why agriculture should or should not be the land use of choice
- Impact of the change of land use on the surrounding area
- A shape file containing the soil forms and relevant attribute data as depicted on the map

Appendix F:
Draft Environmental Management Programme

PROPOSED RODICON PHOTOVOLTAIC SOLAR ENERGY FACILITY ON A SITE NEAR OF MIDDLEBURG, EASTERN CAPE

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

Submitted as part of the draft Environmental Impact Assessment Report
May 2012

Prepared for:
Rodicon Trading and Investments (Pty LTD)

Prepared by
UNIT 606, 1410 EGLIN OFFICE PARK
14 EGLIN ROAD, SUNNINGHILL, GAUTENG
PO BOX 148, SUNNINGHILL, 2157
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Savannah
ENVIRONMENTAL (PTY) LTD

PROJECT DETAILS

DEA Reference No.	:	14/12/16/3/3/1/538
Title	:	Environmental Basic Assessment Process Draft Basic Assessment Report: Proposed development of the Rodicon Solar Energy Facility near Middleburg, Northern Cape
Authors	:	Savannah Environmental (Pty) Ltd Sanusha Govender Karen Jodas
Specialists	:	Dr Gretel van Rooyen Eduplan cc MetroGIS Sustainable Futures ZA
Client	:	Rodicon Trading and Investment (Pty) Ltd
Report Status	:	Environmental Management Programme submitted as part of the draft Environmental Impact Assessment Report for public review

When used as a reference this report should be cited as: Savannah Environmental (2011) Draft Environmental Management Programme: Proposed Solar Energy Facility on a site northwest of Middleburg , Western Cape.

DEFINITIONS AND TERMINOLOGY

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

Archaeological material: Remains resulting from human activities which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.

Cumulative impacts: The impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

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

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

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

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

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

i. The land, water and atmosphere of the earth;
ii. Micro-organisms, plant and animal life;

iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

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

Environmental impact assessment: Environmental Impact Assessment (EIA), as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

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

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

Fossil: Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

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

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

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

Integrated energy plan: A plan commissioned by the DME in response to the requirements of the National Energy Policy, in order to provide a framework in which specific energy policies, development decisions and energy supply tradeoffs can be made on a project-by-project basis. The framework is intended to create a balance between the energy demand and resource availability to provide low cost electricity for social and economic development, while taking into account health, safety and environmental parameters.

Integrated strategic electricity planning: Eskom's planning process which provides strategic projections of supply-side and demand-side options to be implemented to deal with the energy management issues and meet long-term load forecasts.

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

National integrated resource plan: Commissioned by NERSA in response to the National Energy Policy's objective relating to affordable energy services, in order to provide a long-term, cost-effective resource plan for meeting electricity demand, which is consistent with reliable electricity supply and environmental, social and economic policies.

Photovoltaic effect: Electricity can be generated using photovoltaic panels (semiconductors) which are comprised of individual photovoltaic cells that absorb solar energy to produce electricity. The absorbed solar radiation excites the electrons inside the cells and produces what is referred to as the Photovoltaic Effect.

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

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

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

TABLE OF CONTENTS

PURPOSE AND OBJECTIVES OF THE EMP CHAPTER 1

An Environmental Management Programme (EMP) is defined as "an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts associated with the planning, construction, operation and decommissioning of a project are avoided or mitigated, and that the positive benefits of the projects are enhanced."[1] The objective of this EMP is to provide consistent information and guidance for implementing the management and monitoring measures established in the permitting process and help achieve environmental policy goals. The purpose of an EMP is to ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation of the facility. An effective EMP is concerned with both the immediate outcome as well as the long-term impacts of the project.

The EMP provides specific environmental guidance for the construction and operation phases of a project, and is intended to manage and mitigate construction and operation activities so that unnecessary or preventable environmental impacts do not result. These impacts range from those incurred during start up (i.e. site clearing and site establishment), during the construction activities themselves (i.e. erosion, noise, dust, and visual impacts), during site rehabilitation (i.e. soil stabilisation, re-vegetation), during operation and during decommissioning (i.e. similar to construction phase activities).

This EMP has been compiled in accordance with Section 33 of the EIA Regulations and will be further developed in terms of specific requirements listed in any authorisations issued for the proposed project. The EMP has been developed as a set of environmental specifications (i.e. principles of environmental management), which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications (i.e. on-site contextualisation is provided through the inclusion of various monitoring and implementation tools).

This EMP has the following objectives:

» Outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction and rehabilitation, operation, and decommissioning phases of the project in order to manage and minimise the extent of potential environmental impacts associated with the facility.

[1] Provincial Government Northern Cape, Department of Environmental Affairs and Development Planning: *Guideline for Environmental Management Plans*. 2005

- » Ensure that all the phases of the project do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.
- » Identify entities responsible for the implementation of the measures and outline functions and responsibilities.
- » Propose mechanisms and frequency for monitoring compliance, and preventing long-term or permanent environmental degradation.
- » Facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that was not considered in the EIA process.

The management and mitigation measures identified within the Environmental Impact Assessment (EIA) process are systematically addressed in this EMP, and ensure the minimisation of adverse environmental impacts to an acceptable level.

Rodicon Trading and Investments must ensure that the implementation of the project complies with the requirements of all environmental authorisations, permits, and obligations emanating from relevant environmental legislation. This obligation is partly met through the development and the implementation of this EMP and through its integration into the contract documentation. Since this EMP is part of the EIA process for the proposed facility, it is important that this document be read in conjunction with the final Scoping and EIA Reports compiled for this project. This will contextualise the EMP and enable a thorough understanding of its role and purpose in the integrated environmental management process. Should there be a conflict of interpretation between this EMP and the environmental authorisation, the stipulations in the environmental authorisation shall prevail over that of the EMP, unless otherwise agreed by the authorities in writing. Similarly, any provisions in legislation overrule any provisions or interpretations within this EMP.

This EMP shall be binding on all the parties involved in the construction and operational phases of the project, and shall be enforceable at all levels of contract and operational management within the project.

PROJECT DETAILS CHAPTER 2

Rodicon Trading and Investments (Pty) Ltd proposes to develop a Solar Energy Facility for the purpose of generating up to **5 Megawatts** (MW) of electricity. The aforementioned development is herein after referred to as the "**The Rodicon Solar Energy Facility**"

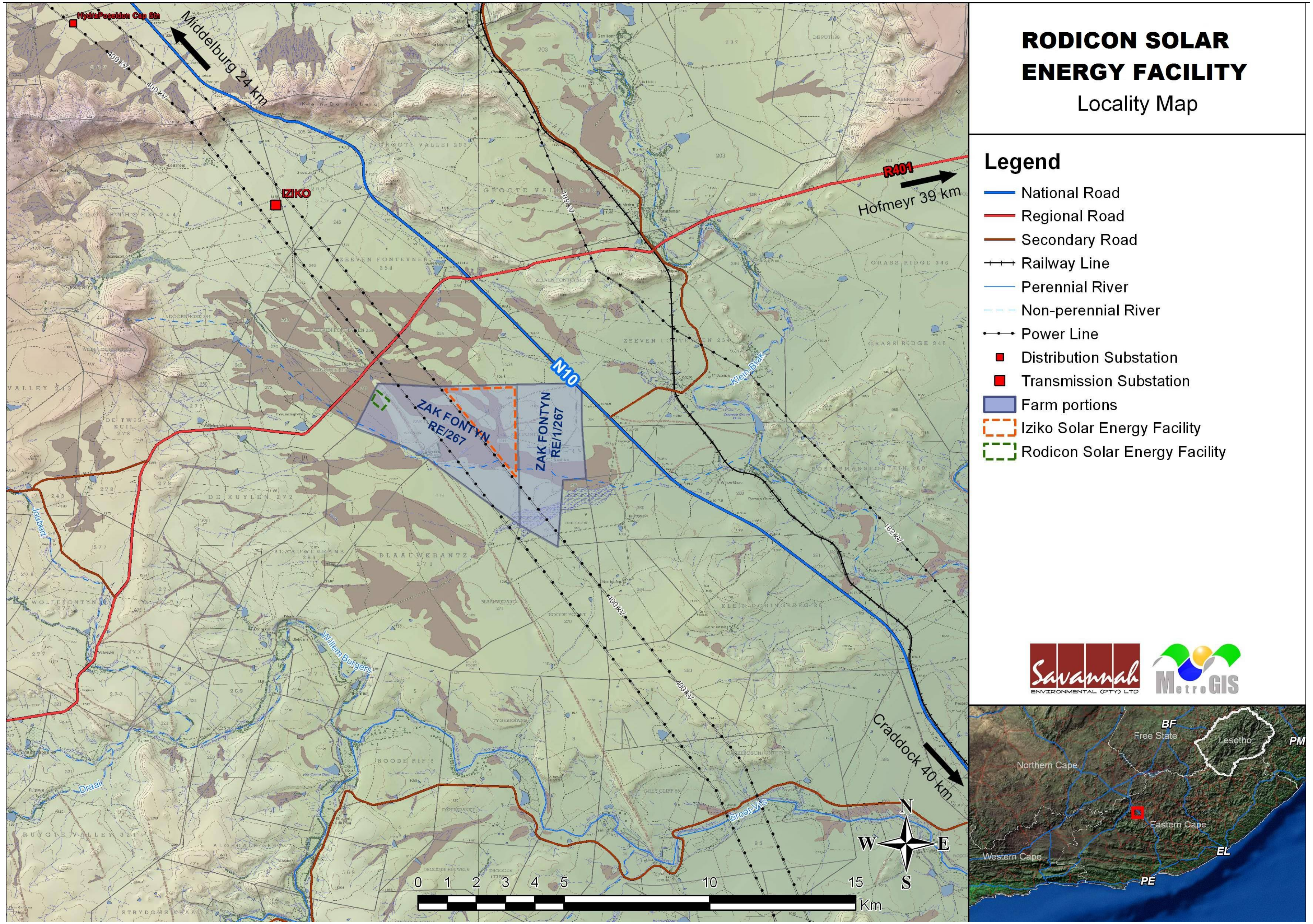
The Rodicon Facility is proposed on the remainder of the farm Zak Fontyn 267, which is approximately 40 Kilometres (Km) North East of Middleburg in the Eastern Cape (refer to **Figure 1**). The proposed site is accessed off the R401 which intersects the N10 towards Cradock.

The aim of the Rodicon facility is to sell the electricity to Eskom as part of the Renewable Energy Independent Power Producers (IPP) Procurement Programme. The IPP Procurement Programme has been introduced by the Department of Energy (DoE) to promote the development of renewable power generation facilities by IPPs. Selling of electricity according to the IPP Procurement Programme has the advantage of giving developers long-term stability and predictability.

The facility is expected to require an area of less than 20 ha within which the following infrastructure will be established (refer to **Figure 2**).

- Photovoltaic solar panels with a generating capacity of up to 20 MW.
- A site switching station (20m x 40m).
- Overhead distribution power line.
- Foundations to support the PV panels.
- Cabling between the project components, to be laid underground where practical.
- Internal access roads.
- Workshop area for maintenance and storage.

Furthermore the applicant in a separate application for environmental authorisation also proposes to develop a second solar energy facility on the same farm portion as indicated in **Figure 1** Below. This facility would be referred to as the Iziko Solar Energy Facility and aims to generate up to 75MW of electricity.


RODICON SOLAR ENERGY FACILITY
Locality Map
Legend
National Road
Regional Road
Secondary Road
Railway Line
Perennial River
Non-perennial River
Power Line
Distribution Substation
Transmission Substation
Farm portions
Iziko Solar Energy Facility
Rodicon Solar Energy Facility
Middelburg 24 km
Hofmeyr 39 km
Craddock 40 km
R401
N10
IZIKO
ZAK FONTYN RE/267
ZAK FONTYN RE/1/267
0 1 2 3 4 5 10 15 Km
N
S
E
W
Free State
Lesotho
Northern Cape
Eastern Cape
Western Cape
BF
PM
EL
PE

2.1. Activities and Components associated with the Solar Energy Facility

The main activities/components associated with the proposed facility are detailed in the tables which follow.

The construction of the facility is expected to take between 8 - 12 months. Approximately 90 people are expected to be required during the construction phase. Ideally low skilled and semi-skilled positions will be filled by locals living in and around middleburg; however this will be dependent on the skills availability in the area.

Typically the construction will operate as a follows: the groundworks will be prepared followed by the erection of mounting structures and then followed by the attachment of the solar panels and the integration of the electrical equipment. The following construction activities are expected to form part of the project's scope of works.

Table 2.1: Activities associated with the construction of a PV facility

Activity	Description
Pre-construction surveys	Prior to initiating construction, a number of detailed surveys will be required including, but not limited to: » *Geotechnical survey* – the geology and topography of the study area will be confirmed. The geotechnical study will look at flood potential, foundation conditions, potential for excavations, and the availability of natural construction materials. This study will serve to inform the type of foundations required to be built and the extent of earthworks and compaction required in the establishment of any internal access roads. » *Site survey* – this will be required to finalise the design layout of the solar field and other associated infrastructure. The finalisation will need to be confirmed in line with the Environmental Authorisation issued for the facility.
Establishment of access roads	» Access to the site will be constructed off the R401, this access road will be approximately 1Km in lenght. » Internal farm roads traverse the property; however further roads may need to be established for construction and maintenance purposes. The extent of earthworks and compaction required in the establishment of the access roads will be established through the detailed geotechnical study which will be undertaken as part of the design phase of the facility. » Internal roads within the study site may need to be established to provide access during construction. These

Activity	Description
	roads will be approximately 4 m in width and will be of a temporary nature. » A number of permanent access roads will be established within the study are for access during operation, will be approximately 4 m wide, and will be gravel based.
Undertake site preparation	» Site preparation activities will include clearance of vegetation at the footprint of the area infrastructure (i.e. substation, ancillary buildings) and linear component (i.e. internal access roads). These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site.
Transport of components and equipment to site	» The components for the proposed facility will be transported to site, in sections, by road. Some of the components for the power generation block may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)[2] by virtue of the dimensional limitations (i.e. length and weight). The typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, and compaction equipment etc.) as well as components required for the establishment of the substation and power line. » In some instances, the dimensional requirements of the loads to be transported during the construction phase (e.g. the transformer of the substation) may require alterations to the existing road infrastructure (e.g. widening on corners), and protection of road-related structures (i.e. bridges, culverts, etc.) because of abnormal loading.
Establishment of workshops, and temporary laydown areas	» Once the required construction equipment has been transported to site, dedicated equipment camp(s) and laydown area(s) will be required which will be of a temporary nature and approximately [150 m x 150 m] in size. These construction camp(s) will serve to confine activities and storage of equipment to designated area(s) to limit the potential ecological impacts associated with this phase of the project. The laydown area(s) will be used for assembly purposes and the general placement/storage of construction equipment. » Fuel required for the on-site construction vehicles and equipment will need to be secured in a temporary bunded facility within the construction camp(s) to prevent leakages and soil contamination.
Establishment of PV panels	» Foundation holes for the mounting of panels will be will be mechanically excavated to a depth of approximately 2.5 m. » Aggregate and cement may need to be used for some of the foundation holes where the bedrock prohibits the ability to ‘ram’ the supporting structure. If required, concrete and aggregate will be transported from

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

Activity	Description
	the closest centre to the development, with the establishment of small designated concrete batching areas either on or off site as required. » The installation of the underground cables (i.e. between the PV panels, inverters, and substation) will require the excavation of trenches of approximately 60 cm wide x 100 cm deep within which they can then be laid.
Establishment of substation and power line	» Electricity generation infrastructure will up to include a substation of up to a maximum dimension of 100m x 100 m; as well as a 66kV power line which will connect to the Juno Substation. » The substation will include transformers which will step-up the power generated by the PV panels. The substation power transformer steps up the voltage from 33 kV to the 66 kV needed for connection to the grid. » The construction of the substation and associated infrastructure will require a survey of the site, site clearing and levelling and construction of access road/s (where required), construction of a level terrace and foundations, assembly, erection, installation, and connection of equipment. The concrete required is likely to be mixed at an off-site batching plant.
Undertake site rehabilitation	» Once construction is complete and all construction equipment is removed, the site must be rehabilitated where practical and reasonable. On full commissioning of the facility, any access points to the site which are not required during the operational phase must be closed and prepared for rehabilitation.

2.1.1 Operation and Maintenance Phase

The facility is expected to be operational for more than 25 years. The total number of permanent employment opportunities is estimated to be in the region of 50. Of this, 20% will be for skilled positions (i.e. electrical engineers and maintenance/plant engineers), and 80% for semi- to low-skilled positions (i.e. plant cleaning, security and maintenance). The following operation and maintenance activities are expected to form part of the project scope of works.

Activity	Description
Operation of the PV panels and the associated electrical infrastructure	» The PV panels will convert the light energy from the incoming radiation into electrical energy (i.e. as direct current). » The inverters will change the power from direct to alternating current. Thereafter the electricity will be conveyed to the substation via the underground cabling, the 66 kV power line, and then to the

Activity	Description
	Juno Substation. » Occasional cleaning (twice annually on average) of the panels will be required throughout the life cycle of the facility. Compressed air or distilled water will be used to clean the panels. The water required for this will either be collected on site from storage tanks or transported to site as required.
Site operation and maintenance	» Full-time security, maintenance, and control room staff will be required on site. » Each component within the solar energy facility will be operational except under circumstances of mechanical breakdown, unfavourable weather conditions, or routine maintenance activities. » The access to the site and the internal access roads will be maintained during the operational phase.

2.1.2 Decommissioning Phase

The PV panels and associated infrastructure would only be decommissioned once they have reached the end of their economic life. It is most likely that decommissioning activities would comprise the disassembly and replacement of the individual components with more appropriate technology/infrastructure available at that time. The following decommissioning activities will form part of the project scope.

Activity	Description
Site preparation	Site preparation activities will include confirming the integrity of the access to the site to accommodate the required equipment (e.g. lay down areas and decommissioning camp) and the mobilisation of decommissioning equipment.
Disassemble and replace existing components	The components would be disassembled, and reused and recycled (where possible), or disposed of in accordance with regulatory requirements.

STRUCTURE OF THIS EMP CHAPTER 3

The first two chapters provide background to the EMP and the proposed project, while the chapters which follow consider the following:

» Key legislation applicable to the development;
» Planning and design activities;
» Construction activities;
» Operation activities; and
» Decommissioning activities.

These chapters set out the procedures necessary for Rodicon Solar Energy Facility, as the project developer, to minimise environmental impacts and achieve environmental compliance. For each of the phases of implementation, an over-arching environmental **goal** is stated. In order to meet this goal, a number of **objectives** are listed. The EMP has been structured in table format in order to show the links between the goals for each phase and their associated objectives, activities/risk sources, mitigation actions, monitoring requirements and performance indicators. A specific EMP table has been established for each environmental objective. The information provided within the EMP table for each objective is illustrated below:

OBJECTIVE: Description of the objective, which is necessary to meet the overall goals; which take into account the findings of the EIA specialist studies

Project Component/s	» List of project components affecting the objective.
Potential Impact	» Description of potential environmental impact if objective is not met.
Activity/Risk Source	» Description of activities which could affect achieving objective.
Mitigation: Target/Objective	» Description of the target and/or desired outcomes of mitigation.

Mitigation: Action/Control	Responsibility	Timeframe
List specific action(s) required to meet the mitigation target/objective described above.	Who is responsible for the measures?	Periods for implementation.

Performance Indicator	Description of key indicator(s) that track progress/indicate the effectiveness of the EMP.

Monitoring	Mechanisms for monitoring compliance; the key monitoring actions required to check whether the objectives are being achieved, taking into consideration responsibility, frequency, methods, and reporting.

The objectives and EMP tables are required to be reviewed and possibly modified whenever changes, such as the following, occur:

» Planned activities change (i.e. in terms of the components and/or layout of the facility);
» Modification to or addition to environmental objectives and targets;
» Relevant legal or other requirements are changed or introduced; and
» Significant progress has been made on achieving an objective or target such that it should be re-examined to determine if it is still relevant, should be modified, etc.

3.1. Project Team

This draft EMP was compiled by:

	Name	**Company**
EMP Compilers:	Sanusha Govender – Environmental Assessment Practitioner Karen Jodas – EAP	Savannah Environmental
Specialists:	Dr Gretel van Rooyen	Ecotrust cc
	Louis George du Pisani	Eduplan
	Ms Celeste Booth and Ms Sholeen Sanker	Albany Museum
	Mandy van der Westhuizen (PrLarch)	MetroGIS (Pty) Ltd.

The Savannah Environmental team have extensive knowledge and experience in EIAs and environmental management, having been involved in EIA processes over the past fourteen years. They have managed and drafted EMPs for other power generation projects throughout South Africa, including numerous wind and solar energy facilities.

KEY LEGISLATION APPLICABLE TO THE DEVELOPMENT CHAPTER 4

The following legislation and guidelines have informed the scope and content of this EMP Report:

» National Environmental Management Act (Act No 107 of 1998).
» EIA Regulations, published under Chapter 5 of the NEMA (GNR R545, GNR 546 in Government Gazette 33306 of 18 June 2010).
» Guidelines published in terms of the NEMA EIA Regulations, in particular:
  * Companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010 (Draft Guideline; DEA, 2010).
  * Public Participation in the EIA Process (DEA, 2010).
  * Integrated Environmental Management Information Series (published by DEA)
» International guidelines, including the Equator Principles

Several other Acts, standards, or guidelines have also informed the project process and the scope of issues addressed and assessed in the EIA Report. A review of legislative requirements applicable to the proposed project is provided in Table 4.1.

Table 4.1: Relevant legislative and permitting requirements applicable to the establishment of the proposed Solar Energy Facility

Legislation	***Applicable Requirements***	***Relevant Authority***	***Compliance requirements***
	National Legislation		
National Environmental Management Act (Act No. 107 of 1998)	» NEMA requires, inter alia, that: ∗ Development must be socially, environmentally, and economically sustainable." ∗ Disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied." ∗ A risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions." » EIA Regulations have been promulgated in terms of Chapter 5. Activities which may not commence without an environmental authorisation are identified within these Regulations. » In terms of S24(1) of NEMA, the potential impact on the environment associated with these listed activities must be considered, investigated, assessed and reported on to the competent authority charged by NEMA with granting of	» National Department of Environmental Affairs » Western Cape Department of Environmental Affairs and Development Planning (DEA&DP)	» This EIA Report is to be submitted to the DEA for review and decision making. » The DEA&DP will act as the commenting authority.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	the relevant environmental authorisation. » In terms of GNR 543 of 18 June 2010, a full Scoping and EIA Process is required to be undertaken for the proposed project.		
National Environmental Management Act (Act No. 107 of 1998)	» A project proponent is required to consider a project holistically and to consider the cumulative effect of potential impacts. » In terms of the Duty of Care provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with a project is avoided, stopped or minimised.	» National Department of Environmental Affairs	» While no permitting or licensing requirements arise directly, the holistic consideration of the potential impacts of the proposed project has found application in the EIA Phase. » The implementation of mitigation measures are included as part of the Draft EMP and will continue to apply throughout the life cycle of the project.
National Environmental Management: Biodiversity Act (Act No. 10 of 2004)	» In terms of the Biodiversity Act, the developer has a responsibility for: ∗ The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations). ∗ The application of appropriate environmental management	» National Department of Environmental Affairs	» As the applicant will not carry on any restricted activity in terms of S57, no permit is required to be obtained in this regard. » In terms of GNR 152 specialist flora and fauna studies have been undertaken as part of the EIA process. » A permit may be required should any protected plant species on site be disturbed or destroyed because of the proposed development.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	tools to ensure integrated environmental management of activities. * Limit further loss of biodiversity and conserve endangered ecosystems. » In terms of S57, a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 4. In this regard the Minister of Environmental Affairs has published a list of critically endangered, endangered, vulnerable, and protected species in GNR 151 in Government Gazette 29657 of 23 February 2007 and the regulations associated therewith in GNR 152 in GG29657 of 23 February 2007, which came into effect on 1 June 2007. » In terms of S75, (1) The control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs. (2) Any action taken to control and eradicate a listed invasive species must be		

Legislation	*Applicable Requirements*	*Relevant Authority*	*Compliance requirements*
	executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment. (3) The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating, or re-establishing itself in any manner. » In terms of GNR 152 of 23 February 2007: regulations relating to listed threatened and protected species, the relevant specialists must be employed during the EIA Phase to incorporate the legal provisions as well as the regulations associated with listed threatened and protected species (GNR 152) into specialist reports in order to identify permitting requirements. » In terms of GNR 1477 of 2009: Draft National List of Threatened Ecosystems published under S52(1)(a) of the Act provides for the listing of threatened or protected ecosystems based on national criteria. The list of threatened		

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the National Spatial Biodiversity Assessment (2004). » GNR1187 Amendment of Critically Endangered, Endangered, Vulnerable and Protected Species List published under S56(1)of the Act.		
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)	» The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. » In terms of the regulations published in terms of this Act (GN 718), a Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities. » Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that (a) The containers in which any waste is stored, are intact and not corroded or in any other way rendered unlit for the safe storage of waste; (b) Adequate measures are taken	» National Department of Water and Environmental Affairs » Provincial Department of Environmental Affairs	» As no waste disposal site is to be associated with the proposed project, no permit is required in this regard. » Waste handling, storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of this Act, as detailed in the EMP. » The volumes of waste to be generated and stored on the site during construction and operation of the facility will not require a waste license (provided these remain below the prescribed thresholds).

Legislation	***Applicable Requirements***	***Relevant Authority***	***Compliance requirements***
	to prevent accidental spillage or leaking; (c) The waste cannot be blown away; (d) Nuisances such as odour, visual impacts and breeding of vectors do not arise; and (e) Pollution of the environment and harm to health are prevented.		
National Environmental Management: Air Quality Act (Act No. 39 of 2004)	» S18, S19 and S20 of the Act allow certain areas to be declared and managed as "priority areas" » Declaration of controlled emitters (Part 3 of Act) and controlled fuels (Part 4 of Act) with relevant emission standards » The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act.	» National Department of Environmental Affairs » Provincial Department of Environmental Affairs	» While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction phase of the project.
National Water Act (Act No. 36 of 1998)	» Under S21 of the act, water uses must be licensed unless such water use falls into one of the categories listed in S22 of the Act or falls under the general authorisation. » In terms of S19, the project proponent must ensure that reasonable measures are taken	» National Department of Water Affairs » Western Cape Department of Water Affairs	» The use of water to clean the panels may require the obtaining of a water use license (as defined in terms of S21 of the NWA), depending on the source of water for this purpose. » This section of the Act will apply throughout the life cycle of the project. This will also pertain to the proposed

Legislation	*Applicable Requirements*	*Relevant Authority*	*Compliance requirements*
	throughout the life cycle of this project to prevent and remedy the effects of pollution to water resources from occurring, continuing, or recurring.		concrete batching site.
Environment Conservation Act (Act No. 73 of 1989)	» National Noise Control Regulations (GN R154 dated 10 January 1992)	» National Department of Environmental Affairs » Western Cape Department of Water Affairs » Local Authorities	» There is no requirement for a noise permit in terms of the legislation. » Any noisy activities carried out during the construction phase that could present an intrusion impact to the local community should be limited to 6:00am to 6:00pm Monday – Saturday (excluding public holidays). » Should these specific activities need to be undertaken outside of these times, the surrounding communities will need to be notified and appropriate approval will be obtained from the DEA and the Local Municipality.
Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)	» A mining permit or mining right may be required where a mineral in question is to be mined (i.e. materials from a borrow pit) in accordance with the provisions of the Act. » Requirements for Environmental Management Programmes and Environmental Management Plans are set out in S39 of the Act.	» Department of Minerals and Energy	» As no borrow pits are expected to be required for the construction of the facility, no mining permit or mining right is required to be obtained.
National Heritage Resources	» S38 states that Heritage Impact	» South African Heritage	» As per S38 an HIA has been undertaken

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
Act (Act No. 25 of 1999)	Assessments (HIAs) are required for certain kinds of development including » The construction of a road, power line, pipeline, canal or other similar linear development or barrier exceeding 300 m in length; » Any development or other activity which will change the character of a site exceeding 5 000 m^2 in extent » The relevant Heritage Authority must be notified of developments such as linear developments (i.e. roads and power lines), bridges exceeding 50 m, or any development or other activity which will change the character of a site exceeding 5 000 m^2; or the re-zoning of a site exceeding 10 000 m^2 in extent. This notification must be provided in the early stages of initiating that development, and details regarding the location, nature and extent of the proposed development must be provided. » Stand alone HIAs are not required where an EIA is carried out as long as the EIA contains an adequate HIA	Resources Agency	as part of the EIA Phase. » A permit may be required should identified cultural/heritage sites on site be required to be disturbed or destroyed as a result of the proposed development. » If concentrations of archaeological heritage material and human remains are uncovered during construction, all work must cease immediately. The find must be reported to a heritage specialist so that systematic and professional investigation/ excavation can be undertaken.

Legislation	**Applicable Requirements**	**Relevant Authority**	**Compliance requirements**
	component that fulfils the provisions of S38. In such cases only those components not addressed by the EIA should be covered by the heritage component.		
National Forests Act (Act No. 84 of 1998)	» In terms of S5(1) no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license granted by the Minister to an (applicant and subject to such period and conditions as may be stipulated". » GN 1042 provides a list of protected tree species.	» National Department of Forestry	» This Act has found application during the EIA Phase. In this regard, a permit would need to be obtained for any protected trees that are affected.
National Veld and Forest Fire Act (Act 101 of 1998)	» Provides requirements for veldfire prevention through firebreaks and required measures for fire-fighting. Chapter 4 places a duty on landowners to prepare and maintain firebreaks, and Chapter 5 places a duty on all landowners to acquire equipment and have available personnel to fight fires. » In terms of S21 the applicant would be obliged to burn firebreaks to	» National Department of Forestry	» While no permitting or licensing requirements arise from this legislation, this act will find application during the operational phase of the project in terms of fire prevention and management.

Legislation	***Applicable Requirements***	***Relevant Authority***	***Compliance requirements***
	ensure that should a veldfire occur on the property, that it does not spread to adjoining land. » In terms of S12 the firebreak would need to be wide and long enough to have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material. » In terms of sS17ection 17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires.		
Government Notice No. 1477 of 2009: Draft National List of Threatened Ecosystems	» Published under S52(1)(a) of NEMA: Biodiversity Act (Act No. 10 of 2004), it provides for the listing of threatened or protected ecosystems based on national criteria. The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the National Spatial Biodiversity Assessment (2004).	» Provincial Department of Environmental Affairs	» N/A
Subdivision of Agricultural Land Act (Act No. 70 of 1970)	» Details land subdivision requirements and procedures. Applies for subdivision of all agricultural land in the province	» National Department of Agriculture	» Subdivision is required to be undertaken following the issuing of an environmental authorisation for the proposed project. This generally forms part of the rezoning application process.

Legislation	***Applicable Requirements***	***Relevant Authority***	***Compliance requirements***
Hazardous Substances Act (Act No. 15 of 1973)	» This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising, or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. » Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc, nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared to be Group I or Group II hazardous substance; » Group IV: any electronic product; » Group V: any radioactive material. » The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in	» Department of Health	» It is necessary to identify and list all the Group I, II, III, and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	force.		
National Road Traffic Act (Act No 93 of 1996)	» The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. » Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts. » The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other	» South African National Roads Agency Limited (national roads) » Provincial Department of Transport	» An abnormal load/vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. » Transport vehicles exceeding the dimensional limitations (length) of 22m. » Depending on the trailer configuration and height when loaded, some of the power station components may not meet specified dimensional limitations (height and width).

Legislation	***Applicable Requirements***	***Relevant Authority***	***Compliance requirements***
	exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.		
Development Facilitation Act (Act No 67 of 1995)	» Provides for the overall framework and administrative structures for planning throughout the Republic » S2- 4 provide general principles for land development and conflict resolution.	» Local and District Municipality	» The applicant must submit a land development application in the prescribed manner and form as provided for in the Act. » A land development applicant who wishes to establish a land development area must comply with procedures set out in the Act.
Promotion of Access to Information Act (Act No. 2 of 2000)	» All requests for access to information held by state or private body are provided for in the Act under S11.	» National Department of Environmental Affairs	» No permitting or licensing requirements.
Promotion of Administrative Justice Act (Act No. 3 of 2000)	» In terms of S3 the government is required to act lawfully and take procedurally fair, reasonable, and rational decisions. » Interested and affected parties have right to be heard.	» National Department of Environmental Affairs	» No permitting or licensing requirements.
Provincial Legislation			
Nature Conservation Ordinance (Act No. 19 of 1974)	» Article 63 prohibits the picking of certain fauna (including cutting, chopping, taking, and gathering, uprooting, damaging, or destroying). » Schedule 3 lists endangered flora and Schedule 4 lists protected flora. » Articles 26 to 47 regulate the use of	» Provincial Department of Environmental Affairs	» No permitting or licensing requirements arise from this legislation for the proposed activities to be undertaken for the proposed project.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	wild animals.		
	Guideline Documents		
Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads	» Outlines the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits.	» Provincial Department of Transport	» N/A
	Policies and White Papers		
The White Paper on the Energy Policy of the Republic of South Africa (December 1998)	» Investment in renewable energy initiatives, such as the proposed solar energy facility, is supported by this white Paper.	N/A	N/A
The White Paper on Renewable Energy (November 2003)	» This Paper sets out Government's vision, policy principles, strategic goals, and objectives for promoting and implementing renewable energy in South Africa.	N/A	N/A
The White Paper on the Energy Policy of the Republic of South Africa (December 1998)	» Investment in renewable energy initiatives, such as the proposed solar energy facility, is supported by this white Paper.	N/A	N/A

MANAGEMENT PROGRAMME: PLANNING AND DESIGN CHAPTER 5

Overall Goal: undertake the planning and design phase in a way that:

» Ensures that the design of the facility responds to the identified environmental constraints and opportunities.
» Ensures that adequate regard has been taken of any landowner and community concerns and that these are appropriately addressed through design and planning (where appropriate).
» Ensures that the best environmental options are selected for the linear components, including the access roads and power line alignments.
» Enables the solar energy facility construction activities to be undertaken without significant disruption to other land uses and activities in the area.

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

5.1 Objectives

OBJECTIVE: Ensure the facility design responds to identified environmental constraints and opportunities

In order to minimise impacts associated with the construction and operation of the facility, the following is required to be undertaken during the final design phase:

» Geotechnical survey – this will investigate flood potential, foundation conditions, potential for excavations, and the availability of natural construction materials. This study will serve to inform the type of foundations required to be constructed (i.e. for the substation), and the extent of earthworks and compaction required in the establishment of the internal access roads.
» A storm-water management plan – this will detail how storm-water runoff (i.e. over engineered hard surfaces) can be managed to reduce velocities and volumes of water that could lead to erosion and potential sedimentation of drainage systems.
» Obtain heritage permits for excavation and recording of affected heritage sites.

Project Component/s	» PV panels. » Switching Station. » Access roads. » Power line.
Potential Impact	» Soil erosion. » Impacts on ecology
Activities/Risk Sources	» Positioning of all the facilities components.
Mitigation: Target/Objective	» The design of the facility responds to the identified environmental constraints and opportunities.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Obtain any additional environmental permits required (e.g. water use license, heritage permit).	Rodicon Solar Energy Facility Pty LTD	Project planning
Consider and incorporate design level mitigation measures recommended by the specialists as detailed within the EIA Report and relevant appendices.	Engineering design consultant, solar component supplier, and Rodicon Solar Energy Facility	Design review
Compile a comprehensive storm water management plan for hard surfaces as part of the final design of the project. This must include appropriate means for the handling of storm water within the site, e.g. separate clean and dirty water streams around the plant, install stilling basins to capture large volumes of run-off, trapping sediments, and reduce flow velocities (i.e. water used when washing the panels).	Rodicon Solar Energy Facility	Design

Performance Indicator	» The design meets the objectives and does not degrade the environment. » Design and layouts respond to the mitigation measures and recommendations in the EIA Report.
Monitoring	» Review of the design by the Project Manager and the Environmental Control Officer (ECO) prior to the commencement of construction.

OBJECTIVE: Ensure the selection of the best environmental option for the alignment of the power line, and access roads

Project Component/s	» Power line. » Access roads.
Potential Impact	» Route that degrades the environment unnecessarily, particularly with respect to visual aesthetics, loss of indigenous flora, and erosion.
Activities/Risk Sources	» Alignment of power line within corridor. » Alignment of access roads.
Mitigation: Target/Objective	» To ensure selection of best environmental option for alignment of linear infrastructure. » Environmental sensitivities are taken into consideration and avoided as far as possible, thereby mitigating potential impacts.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Select an alignment that curtails environmental impacts and enhances environmental benefits.	Rodicon Solar Energy Facility	Prior to submission of the final construction layout plan
Locate power line and access roads within disturbed corridors, as far as possible.	Rodicon Solar Energy Facility	Prior to submission of the final construction layout plan
Consider mitigation measures recommended by the specialists as detailed within the EIA report and relevant appendices.	Rodicon Solar Energy Facility	Design

Performance Indicator	» Power line and road alignments meet environmental objectives. » Selected linear alignments that minimise any negative environmental impacts and maximise any benefits.
Monitoring	» Ensure that the design implemented meets the objectives and mitigation measures in the EIA Report through review of the design by the Project Manager, and the ECO prior to the commencement of construction.

OBJECTIVE: Minimise storm water runoff

Project Component/s	» Storm water management components. » Any hard engineered surfaces (i.e. access roads).
Potential Impact	» Poor storm water management and alteration of the hydrological regime (i.e. drainage lines).
Activities/Risk Sources	» Construction of the facility (i.e. placement of hard engineered surfaces).
Mitigation: Target/Objective	» Appropriate management of storm water to minimise impacts on the environment.

Mitigation: Action/Control	Responsibility	Timeframe
Reduce the potential increase in surface flow velocities and the resultant impact on the localised drainage system through increased sedimentation.	Rodicon Solar Energy Facility	Planning and design
Appropriately plan hard-engineered bank erosion protection structures.	Rodicon Solar Energy Facility	Planning and design
Ensure suitable handling of storm water within the site (i.e. separate clean and dirty water streams around the plant and install stilling basins to capture large volumes of run-off, trapping sediments and reduce flow velocities) through appropriate design of the facility.	Rodicon Solar Energy Facility	Construction and operation

Performance Indicator	» Appropriate storm water management measures included within the facility design. » Sound water quality and quantity management during construction and operation.
Monitoring	» Devise a suitable surface water quality monitoring plan for implementation during construction and operation.

MANAGEMENT PROGRAMME: CONSTRUCTION CHAPTER 6

Overall Goal: Undertake the construction phase in a way that:

» Ensures that construction activities are properly managed in respect of environmental aspects and impacts.
» Enables construction activities to be undertaken without significant disruption to other land uses and activities in the area, in particular concerning noise impacts, farming practices, traffic and road use, and effects on local residents.
» Minimises the impact on the indigenous natural vegetation, and habitats of ecological value (i.e. drainage lines).
» Minimises impacts on fauna using the site.
» Minimises the impact on heritage sites should they be uncovered.
» Establishes an environmental baseline during construction activities on the site, where possible.

6.1 Institutional Arrangements: Roles and Responsibilities for the Construction Phase

As the proponent, Rodicon Solar Energy Facility must ensure that the implementation of the facility complies with the requirements of all environmental authorisations and permits, and obligations emanating from other relevant environmental legislation. This obligation is partly met through the development of the EMP, and the implementation of the EMP through its integration into the contract documentation. Rodicon Solar Energy Facility will retain various key roles and responsibilities during the construction of the facility.

OBJECTIVE: Establish clear reporting, communication, and responsibilities in relation to overall implementation of the EMP

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Project Manager; Site Manager; Safety, Health and Environment Representative; Environmental Control Officer (ECO) and Contractor for the construction phase of this project are as detailed below.

Project Manager will:

- Ensure all specifications and legal constraints specifically with regards to the environment are highlighted to the Contractor(s) so that they are aware of these.
- Ensure that Rodicon Solar Energy Facility and its Contractor(s) are made aware of all stipulations within the EMP.
- Ensure that the EMP is correctly implemented throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes.
- Be fully conversant with the EIA for the project, the EMP, the conditions of the Environmental Authorisation (once issued), and all relevant environmental legislation.

Site Manager (Rodicon Solar Energy Facility's on-site Representative) will:

- Be fully knowledgeable with the contents of the EIA and risk management.
- Be fully knowledgeable with the contents and conditions of the Environmental Authorisation (once issued).
- Be fully knowledgeable with the contents of the EMP.
- Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these.
- Have overall responsibility of the EMP and its implementation.
- Conduct audits to ensure compliance to the EMP.
- Ensure there is communication with the Project Manager, the ECO, and relevant discipline engineers on matters concerning the environment.
- Ensure that no actions are taken which will harm or may indirectly cause harm to the environment, and take steps to prevent pollution on the site.
- Confine activities to the demarcated construction site.

Environmental Control Officer (ECO) will be responsible for monitoring, reviewing, and verifying compliance by the Contractor with the environmental specification and accordingly will:

- Be fully knowledgeable with the contents with the EIA.
- Be fully knowledgeable with the contents with the conditions of the Environmental Authorisation (once issued).
- Be fully knowledgeable with the contents with the EMP.
- Be fully knowledgeable with the contents with all relevant environmental legislation, and ensure compliance with them.
- Ensure that the contents of this document are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion.

» Ensure that the compliance of the EMP is monitored through regular and comprehensive inspection of the site and surrounding areas.
» Ensure that if the EMP conditions or specifications are not followed then appropriate measures are undertaken to address this.
» Monitoring and verification must be implemented to ensure that environmental impacts are kept to a minimum, as far as possible.
» Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements.
» Ensure that activities on site comply with all relevant environmental legislation.
» Ensure that a removal is ordered of any person(s) and/or equipment responsible for any contravention of the specifications of the EMP.
» Ensure that the compilation of progress reports for submission to the Project Manager, with input from the Site Manager, takes place on a regular basis, including a final post-construction audit.
» Ensure that there is communication with the Site Manager regarding the monitoring of the site.
» Ensure that any non-compliance or remedial measures that need to be applied are reported.
» Independently report to DEA in terms of compliance with the specifications of the EMP and conditions of the Environmental Authorisation (once issued).

Contractors and Service Providers: It is important that contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMP. The contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The contractor's obligations in this regard include the following:

» Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
» A copy of the EMP must be easily accessible to all on-site staff members.
» Employees must be familiar with the requirements of this EMP and the environmental specifications as they apply to the construction of the proposed facility.
» Prior to commencing any site works, all employees and sub-contractors must have attended an environmental awareness training course which must provide staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
» Staff will be informed of environmental issues as deemed necessary by the ECO.

All contractors (including sub-contractors and staff) and service providers are ultimately responsible for:

» Ensuring adherence to the environmental management specifications.
» Ensuring that Method Statements are submitted to the Site Manager (and ECO) for approval before any work is undertaken.
» Any lack of adherence to the above will be considered as non-compliance to the specifications of the EMP.
» Ensuring that any instructions issued by the Site Manager on the advice of the ECO are adhered to.
» Ensuring that a report is tabled at each site meeting, which will document all incidents that have occurred during the period before the site meeting.
» Ensuring that a register is kept in the site office, which lists all transgressions issued by the ECO.
» Ensuring that a register of all public complaints is maintained.
» Ensuring that all employees, including those of sub-contractors receive training before the commencement of construction in order that they can constructively contribute towards the successful implementation of the EMP (i.e. ensure their staff are appropriately trained as to the environmental obligations).

6.2 Objectives

In order to meet the overall goal for construction, the following objectives, actions, and monitoring requirements have been identified.

OBJECTIVE: Minimise impacts related to inappropriate site establishment

The Contractor must take all reasonable measures to ensure the safety of the public in the surrounding area. Where the public could be exposed to danger by any of the works or site activities, the contractor must, as appropriate, provide suitable flagmen, barriers and/or warning signs in English, Afrikaans and any other relevant local languages, all to the approval of the Site Manager.

All unattended open excavations shall be adequately demarcated and/or fenced (fencing shall consist of a minimum of three strands of wire wrapped with danger tape). Adequate protective measures must be implemented to prevent unauthorised access to the working area and the internal access/haul routes.

Project Component/s	» Area infrastructure (i.e. PV panels, and substation). » Linear infrastructure (i.e. power line, and access roads).

Potential Impact	» Hazards to landowners and public. » Damage to indigenous natural vegetation, due largely to ignorance of where such areas are located. » Loss of threatened plant species and protected tree species.
Activities/Risk Sources	» Open excavations (foundations and cable trenches). » Movement of construction vehicles in the area and on-site.
Mitigation: Target/Objective	» To secure the site against unauthorised entry. » To protect members of the public/landowners/residents. » No loss of or damage to sensitive vegetation in areas outside the immediate development footprint.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Secure site, working areas and excavations in an appropriate manner, as agreed with the ECO.	Contractor	Site establishment, and duration of construction
Where necessary control access, fence, and secure area.	Contractor	Site establishment, and duration of construction
Fence and secure contractor's equipment camp.	Contractor	Site establishment
Establish appropriately bunded areas for storage of hazardous materials (i.e. fuel to be required during construction).	Contractor	Site establishment
All development footprints should be appropriately fenced off and clearly demarcated.	Contractor	Site establishment, and duration of construction
Establish the necessary ablution facilities with chemical toilets and provide adequate sanitation facilities and ablutions for construction workers (1 toilet per every 15 workers) at appropriate locations on site.	Contractor	Site establishment, and duration of construction
Ablution or sanitation facilities should not be located within 100 m from a 1:100 year flood line including drainage lines.	Contractor	Site establishment, and duration of construction
Supply adequate waste collection bins at site where construction is being undertaken. Separate bins should be provided for general and hazardous waste. As far as possible, provision should be made for separation of waste for recycling.	Contractor	Site establishment, and duration of construction

Performance Indicator	» Site is secure and there is no unauthorised entry. » No members of the public/ landowners injured.

	» Appropriate and adequate waste management and sanitation facilities provided at construction site.
Monitoring	» An incident reporting system will be used to record non-conformances to the EMP. » ECO to monitor all construction areas on a continuous basis until all construction is completed. Non-conformances will be immediately reported to the site manager.

OBJECTIVE: Appropriate management of the construction site and construction workers

Approximately 90 people are expected to be required during the construction phase. Ideally low skilled and semi-skilled positions will be filled by locals living in and around the Middleburg area. This will however be dependent on the skills availability in the area. Workers not living in the area, including those required for skilled positions will be transported to site on a daily basis and will not be housed on site. However, the security team will be required on site at all times.

Project Component/s	» Area and linear infrastructure.
Potential Impact	» Damage to indigenous natural vegetation and sensitive areas. » Damage to and/or loss of topsoil (i.e. pollution, compaction etc.). » Impacts on the surrounding environment due to inadequate sanitation and waste removal facilities. » Pollution/contamination of the environment.
Activities/Risk Sources	» Vegetation clearing and levelling of equipment storage area/s. » Access to and from the equipment storage area/s. » Ablution facilities. » Contractors not aware of the requirements of the EMP, leading to unnecessary impacts on the surrounding environment.
Mitigation: Target/Objective	» Limit equipment storage within demarcated designated areas. » Ensure adequate sanitation facilities and waste management practices. » Ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment.

Mitigation: Action/Control	Responsibility	Timeframe
As far as possible, minimise vegetation clearing and levelling for equipment storage areas.	Contractor	Site establishment, and during construction
Rehabilitate all disturbed areas at the construction equipment camp as soon as construction is complete within an area.	Contractor	Duration of Contract
Ensure waste removal facilities are maintained and emptied on a regular basis.	Contractor	Site establishment, and duration of construction
The terms of this EMP and the Environmental Authorisation (once issued) must be included in all tender documentation and Contractors contracts	Rodicon Solar Energy Facility	Tender process
Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm. This can be achieved through the provision of appropriate environmental awareness training to all personnel. Records of all training undertaken must be kept.	Contractor	Duration of construction
Contractors must use chemical toilets/ablution facilities situated at designated areas of the site; no ablution activities will be permitted outside the designated areas. These facilities must be regularly serviced by appropriate contractors. A minimum of one toilet shall be provided per 15 persons at each working area such as the Contractor's camp	Contractor and sub-contractor/s	Duration of contract
Cooking and eating of meals must take place in a designated area. No firewood or kindling may be gathered from the site or surrounds.	Contractor and sub-contractor/s	Duration of contract
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area. Particular attention needs to be paid to food waste.	Contractor and sub-contractor/s	Duration of contract
No one other than the ECO or personnel authorised by the ECO may disturb flora or fauna outside of the demarcated construction area/s.	Contractor and sub-contractor/s	Duration of contract
Fire fighting equipment and training must be provided before the construction phase commences.	Contractor and sub-contractor/s	Duration of contract
Draft Code of conduct for construction workers.	Contractor and sub-contractor/s	Pre-construction

Mitigation: Action/Control	Responsibility	Timeframe
Contractors must ensure that all workers are informed at the outset of the construction phase of the conditions contained in the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.	Contractor and sub-contractor/s	Construction
On completion of the construction phase, all construction workers must leave the site within one week of their contract ending.	Contractor and sub-contractor/s	Construction

Performance Indicator	» The construction camps have avoided sensitive areas, as approved by the ECO. » Ablution and waste removal facilities are in a good working order and do not pollute the environment due to mismanagement. » All areas are rehabilitated promptly after construction in an area is complete. » Excess vegetation clearing and levelling is not reported by the ECO. » No complaints regarding contractor behaviour or habits. » Appropriate training of all staff is undertaken prior to them commencing work on the construction site. » Code of Conduct drafted before commencement of construction phase.
Monitoring	» Regular audits of the construction camps and areas of construction on site by the ECO. » Proof of disposal of sewage at an appropriate wastewater treatment works. » An incident reporting system should be used to record non-conformances to the EMP. » Observation and supervision of Contractor practices throughout construction phase by the ECO. » Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Maximise local employment and business opportunities associated with the construction phase

Although limited, employment opportunities could be created during the construction phase, specifically for semi-skilled and unskilled workers. The unemployment rate in the study area is quite high and there are therefore various individuals in the area in search of employment.

Project Component/s	» Construction activities associated with the establishment of the facility.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business.
Activities/Risk Sources	» Contractors who make use of their own labour for unskilled tasks, thereby reducing the employment and business opportunities for locals. » The inflow of various specialists from outside the study area and even abroad. » Sourcing of individuals with skills similar to the local labour pool outside the municipal area.
Mitigation: Target/Objective	» Employment of a maximum number of low-skilled to semi-skilled workers for the project from the local area where possible.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
As far as possible, maximise employment of local community members, i.e. source labour from within the municipal area focused on the communities in closest proximity to the site should be undertaken where possible.	Rodicon Solar Energy Facility, and Contractor	Duration of construction
A broad-based approach should be followed to identify and involve relevant organisations which could assist the main contractor and developer in identifying people whose skills may correspond with the required job specifications.	Rodicon Solar Energy Facility, Local Municipality, and contractor	Pre-construction
Tender documentation should contain guidelines for the involvement of labour, entrepreneurs, businesses, and SMMEs from the local sector.	Rodicon Solar Energy Facility	Pre-construction
Develop a database of local BEE service providers and ensure that they are informed of tenders and job opportunities.	Rodicon Solar Energy Facility	Pre-construction and construction

Performance Indicator	» Job opportunities, especially of low to semi-skilled positions, are primarily awarded to members of local communities as appropriate. » Locals and previously disadvantaged individuals (including women) are considered during the hiring process. » SMMEs are awarded contracts, where possible, during the construction phase. » Labour, entrepreneurs, businesses, and SMMEs from the local sector are awarded jobs, where possible, based on requirements in the tender documentation. » The involvement of local labour is promoted. » Reports are not made from members of the local communities

	regarding unrealistic employment opportunities or that only outsiders were employed.
Monitoring	» Developer and or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase.

OBJECTIVE: Minimise the potential impacts on family structures and social networks associated with presence of construction workers from outside the area

Even though the inflow of jobseekers is likely to occur, the probability of this issue becoming problematic and resulting in severe negative social impacts is seen to be improbable.

Other possible negative impacts due to the workforce's presence in the area and especially when jobseekers come to the area would include misconduct of workers, trespassing of workers on privately owned farms, the possible increase in crime, littering, increase in traffic, increase in noise, the development of informal vending stations, and poaching of livestock.

Project Component/s	» Inflow of an outside workforce and jobseekers.
Potential Impact	» The inflow of outsiders and jobseekers could result in negative impacts on the surrounding property owners and local communities, and could even lead to conflict between the locals and these outsiders.
Activities/Risk Sources	» The presence of construction workers can affect negatively on family structures and social networks, especially in small, rural communities.
Mitigation: Target/Objective	» To avoid and or minimise the potential impact of construction workers on the local community. This can be achieved by maximising the number of locals employed during the construction phase and minimising the number of workers housed on the site.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Attempt to maximise employment of the low-skilled workers from the local area. This should be included in the tender documents.	Contractor	Pre-construction and construction
Develop and implement a Code of Conduct for	Contractor	Pre-

Mitigation: Action/Control	Responsibility	Timeframe
construction workers		construction and construction
Provide opportunities for workers to go home over weekends.	Contractor	Construction
Local labourers should remain at their existing residences.	Contractor	Construction
Before construction commences, representatives from the local municipality, community leaders, community-based organisations and the surrounding property owners (of the larger area), should be informed of the details of the contractors, size of the workforce and construction schedules.	Rodicon Solar Energy Facility	Pre-construction and construction
On-site security should be active prior to the construction phase.	Rodicon Solar Energy Facility	Pre-construction
Construction workers should be easily identifiable by wearing uniforms and even identity tags.	Contractor	Construction
The construction site should be appropriately fenced.	Contractors	Pre-construction
The applicant, local leaders, and the local municipality should jointly develop a strategy to minimise the influx of jobseekers to the area.	Rodicon Solar Energy Facility, local leaders and Local Municipality	Pre-construction Construction
Informal vending stations should not be allowed on or near the construction site. Construction workers should preferably receive daily meals and beverages to avoid the need for a vending station.	Contractors	Construction
Information distributed as part of the existing HIV/Aids awareness campaigns in the area should again be focused on and communicated to the local workforce.	Rodicon Solar Energy Facility and Contractors	Construction
Develop a transparent communication and recruitment process to minimise the influx of jobseekers to the area.	Rodicon Solar Energy Facility, local leaders and Local Municipality	Pre-construction
The recruitment process and the use of contractors should be clearly communicated to the local communities. The communication strategy should ensure that unrealistic employment expectations are not created	Rodicon Solar Energy Facility	Pre-construction

Performance Indicator	» Locals are employed where possible. » Reports are not made from members of the local communities regarding unrealistic employment opportunities and/or

	negative intrusions or even possible increase in crime. » Sound environmental management of the construction site. » No conflict between outsiders, jobseekers, and local community members.
Monitoring	» Rodicon Solar Energy Facility and or appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE: Minimise impacts related to traffic management and transportation of equipment and materials to site

The components for the proposed facility will be transported to site, in sections, by road.

Project Component/s	» Delivery of any component required within the construction phase.
Potential Impact	» Impact of heavy construction vehicles on road surfaces, and possible increased risk in accidents involving people and animals. » Traffic congestion, particularly on narrow roads or on road passes where overtaking is not permitted. » Deterioration of road pavement conditions (both surfaced and gravel road) due to abnormal loads.
Activities/Risk Sources	» Construction vehicle movement. » Speeding on local roads. » Degradation of local road conditions. » Site preparation and earthworks. » Foundations or plant equipment installation. » Transportation of ready-mix cement from off-site batching plant to the site. » Mobile construction equipment movement on-site. » Power line and substation construction activities.
Mitigation: Target/Objective	» Minimise impact of traffic associated with the construction of the facility on local traffic volume, existing infrastructure, property owners, animals, and road users. » To minimise potential for negative interaction between pedestrians or sensitive users and traffic associated with the facility construction. » To ensure all vehicles are roadworthy and all materials/equipment are transported appropriately and within any imposed permit/licence conditions.

Mitigation: Action/Control	Responsibility	Timeframe
The contractor's plans, procedures and schedules, as well as the anticipated intrusion impacts should be clarified with affected parties prior to the commencement of construction activities on site.	Rodicon Solar Energy Facility and ECO	Pre-construction
Source general construction material and goods locally where available to limit transportation over long distances.	Rodicon Solar Energy Facility and Contractor	Pre-construction and construction
Appropriate dust suppression techniques must be implemented to minimise dust from gravel roads.	Rodicon Solar Energy Facility and ECO	Construction
Construction vehicles and those transporting materials and goods should be inspected by the contractor or a sub-contractor to ensure that these are in good working order and not overloaded.	Contractor	Construction
Strict vehicle safety standards should be implemented and monitored.	Rodicon Solar Energy Facility and ECO	Construction
All relevant permits for abnormal loads must be applied for from the relevant authority.	Contractor (or appointed transportation contractor)	Pre-construction
A designated access to the proposed site must be created to ensure safe entry and exit.	Contractor	Pre-construction
No deviation from approved transportation routes must be allowed, unless roads are closed for whatever reason outside the control of the contractor.	Contractor	Duration of contract
Appropriate road management strategies must be implemented on external and internal roads with all employees and contractors required to abide by standard road and safety procedures.	Contractor (or appointed transportation contractor)	Pre-construction
Any traffic delays because of construction traffic must be co-ordinated with the appropriate authorities.	Contractor	Duration of contract
The movement of all vehicles within the site must be on designated roadways.	Contractor	Duration of contract
Signage must be established at appropriate points warning of turning traffic and the construction site (all signage to be in accordance with prescribed standards).	Contractor	Duration of contract
Appropriate maintenance of all vehicles of the contractor must be ensured.	Contractor	Duration of contract
All vehicles of the contractor travelling on public roads must adhere to the specified speed limits and all drivers must be in possession of an appropriate valid driver's license.	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
Keep hard road surfaces as narrow as possible.	Contractor	Duration of contract

Performance Indicator	» Vehicles keeping to the speed limits. » Vehicles are in good working order and safety standards are implemented. » Local residents and road users are aware of vehicle movements and schedules. » No construction traffic related accidents are experienced. » Local road conditions and road surfaces are up to standard. » Complaints of residents are not received (e.g. concerning the speeding of heavy vehicles).
Monitoring	» Developer and or appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE: To avoid and or minimise the potential impact of the activities during the construction on the safety of local communities and the potential loss of stock and damage to farm infrastructure

An inflow of workers could, as a worst case scenario and irrespective of the size of the workforce, pose some security risks. Criminals could also use the opportunity due to "outsiders" being in the area to undertake their criminal activities.

Project Component/s	» Construction and establishment activities associated with the establishment of the PV facility, including infrastructure etc.
Potential Impact	» Impact on safety of farmers and communities (increased crime etc.) and potential loss of livestock due to stock theft by construction workers and also damage to farm infrastructure, such as gates and fences.
Activities/Risk Sources	» The presence of construction workers on the site can pose a potential safety risk to local farmers and communities and may result in stock thefts. The activities of construction workers may also result in damage to farm infrastructure.
Mitigation: Target/Objective	» To avoid and or minimise the potential impact on local communities and their livelihoods.

Mitigation: Action/Control	Responsibility	Timeframe
The housing of construction workers on the site should be limited to security personnel.	Contractor	Construction
The construction site should be fenced and access to	Rodicon Solar	All phases of

Mitigation: Action/Control	Responsibility	Timeframe
the area controlled.	Energy Facility and Contractor	project
Procedures and measures to prevent, and in worst cases, attend to fires should be developed in consultation with the surrounding property owners and the local municipality	Rodicon Solar Energy Facility, Local Municipality, and local communities	Pre-construction and when required
Contact details of emergency services should be prominently displayed on site.	Rodicon Solar Energy Facility, and Contractor	Construction
Appropriate fire-fighting equipment must be present on site and members of the workforce should be appropriately trained in using this equipment in the fighting of veld fires	Rodicon Solar Energy Facility, and Contractor	Construction

Performance Indicator	» No criminal activities and theft of livestock are reported. » No fires or on-site accidents occur.
Monitoring	» Rodicon Solar Energy Facility, and appointed ECO must monitor indicators listed above to ensure that they have been implemented.

OBJECTIVE: Management of dust and air emissions

During the construction phase, limited gaseous or particulate emissions are anticipated from exhaust emissions from construction vehicles and equipment on-site, as well as vehicle entrained dust from the movement of vehicles on the main and internal access roads.

Project Component/s	» Construction activities associated with the area and linear infrastructure.
Potential Impact	» Dust and particulates from vehicle movement to and on-site, foundation excavation, road construction activities, road maintenance activities, temporary stockpiles, and vegetation clearing affecting the surrounding residents and visibility. » Release of minor amounts of air pollutants (for example NO_2, CO and SO_2) from vehicles and construction equipment
Activities/Risk Sources	» Clearing of vegetation and topsoil. » Excavation, grading, scraping, levelling, digging, drilling. » Transport of materials, equipment, and components on internal access roads.

	» Re-entrainment of deposited dust by vehicle movements. » Wind erosion from topsoil and spoil stockpiles and unsealed roads and surfaces. » Fuel burning vehicle and construction engines.
Mitigation: Target/Objective	» To ensure emissions from all vehicles and construction engines are minimised, where possible, for the duration of the construction phase » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements for the duration of the construction phase

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Roads must be maintained in a manner that will ensure that nuisance from dust emissions from road or vehicle sources are not visibly excessive.	Contractor	Site establishment and construction
Ensure that any damage to roads because of construction activities is repaired before completion of the construction phase.	Contractor	Site establishment and construction
Appropriate dust suppressant must be applied on all exposed areas and stockpiles as required to minimise/control airborne dust.	Contractor	Duration of contract
Haul vehicles moving outside the construction site carrying material that can be wind-blown must be covered with tarpaulins if required by the wind conditions.	Contractor	Duration of contract
Speed of construction vehicles must be restricted, as defined by the ECO.	Contractor	Duration of contract
Dust-generating activities or earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased during periods of high winds if visible dust is blowing toward nearby residences outside the site.	Contractor	Duration of contract
Strictly control vibration pollution from compaction plant or excavation plant.	Contractor	Duration of contract
Disturbed areas must be re-vegetated as soon as practicable once construction in an area is completed.	Contractor	Completion of construction
Vehicles and equipment must be maintained in a road-worthy condition at all times.	Contractor	Duration of contract

Performance Indicator	» No complaints from affected residents or community regarding dust or vehicle emissions. » Dust suppression measures implemented for all heavy vehicles that require such measures during the construction phase commences.

	» Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed. » All heavy vehicles equipped with speed monitors before they are used in the construction phase in accordance with South African vehicle legislation. » Road worthy certificates in place for all heavy vehicles at outset of construction phase and up-dated on a monthly basis.
Monitoring	Monitoring must be undertaken to ensure emissions are not exceeding the prescribed levels via the following methods: » Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager. » A complaints register must be maintained, in which any complaints from residents/the community will be logged, and thereafter complaints will be investigated and, where appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMP.

OBJECTIVE: Minimisation of development footprint and disturbance to topsoil

In order to minimise impacts on flora, fauna, and ecological processes, the development footprint should be limited.

Project Component/s	» PV panels. » Power line. » Ancillary buildings. » Access roads.
Potential Impact	» Impacts on natural vegetation. » Impacts on soil. » Loss of topsoil.
Activity/Risk Source	» Site preparation and earthworks. » Excavation of foundations. » Construction of site access road. » Site preparation (e.g. compaction). » Power line construction activities. » Stockpiling of topsoil, subsoil and spoil material.
Mitigation: Target/Objective	» To retain natural vegetation, where possible. » To minimise footprints of disturbance of vegetation/habitats. » Remove and store all topsoil on areas that are to be excavated; and use this topsoil in subsequent rehabilitation of disturbed areas. » Minimise spoil material.

Mitigation: Action/Control	Responsibility	Timeframe
Areas to be cleared must be clearly marked on-site to eliminate the potential for unnecessary clearing.	Contractor in consultation with Specialist	Pre-construction
The extent of clearing and disturbance to the native vegetation must be kept to a minimum so that impact on flora and fauna and their habitats is restricted.	Contractor	Site establishment & duration of contract
Construction activities must be restricted to demarcated areas so that impact on flora and fauna is restricted.	Contractor	Site establishment & duration of contract
Any fill material required must be sourced from a commercial off-site suitable/permitted source, quarry or borrow pit. Where possible, material from foundation excavations must be used as fill on-site.	Contractor	Duration of contract
Excavated topsoil must be stockpiled in designated areas separate from base material and covered until replaced during rehabilitation. As far as possible, topsoil must not be stored for longer than 3 months.	Contractor	Site establishment & duration of contract
Topsoil must not be stripped or stockpiled when it is raining or when the soil is wet as compaction will occur.	Contractor	Site establishment Maintenance: for duration of contract
As far as possible, the maximum topsoil stockpile height must not exceed 2 m in order to preserve micro-organisms within the topsoil, which can be lost due to compaction and lack of oxygen.	Contractor	Duration of contract

Performance Indicator	» Minimal disturbance outside of designated work areas. » Minimise clearing of existing vegetation. » Topsoil appropriately stored.
Monitoring	» Observation of vegetation clearing and soil management activities by ECO throughout construction phase. » Supervision of all clearing and earthworks. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Minimise the impacts on and loss of indigenous vegetation and faunal habitat

Although the vegetation types present on site are classified as Least Threatened and not considered to be of high conservation value, impacts on natural vegetation must be limited in order to minimise impacts on vegetation and fauna habitats.

Project Component/s	» Any infrastructure or activity that will result in disturbance to natural areas.
Potential Impact	» Loss of indigenous natural vegetation due to construction activities, or poor behaviour on the part of the construction team.
Activity/Risk Source	» Vegetation clearing. » Construction of access roads. » Placement of power line towers. » Chemical contamination of the soil by vehicles and machinery. » Operation of construction camps. » Storage of materials required for construction.
Mitigation: Target/Objective	» Minimise footprints of disturbance of vegetation/habitats. » Minimise loss of indigenous vegetation. » Minimise loss of species of conservation concern.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Areas to be cleared must be clearly marked in the field to eliminate unnecessary clearing.	Contractor	Construction
Limit unnecessary impacts on surrounding natural vegetation, e.g. driving around in the veld, use access roads only.	Contractor	Construction
Fire breaks should be established, where appropriate, to limit both incoming and outgoing veld fires.	Contractor	Construction
A site rehabilitation programme must be implemented (refer Chapter 6).	Contractor in consultation with Specialist	Duration of contract
Animals that cannot flee from the affected areas by themselves (e.g. tortoises, amphibians, small mammals) must be removed from the affected areas before the start of site clearing/construction and relocated to safe areas.	Specialist	Pre-construction

Performance Indicator	» Minimal disturbance outside of designated work areas. » Minimised clearing of existing/natural vegetation and faunal habitats. » Limited impacts on areas of identified and demarcated sensitive habitats/vegetation.
Monitoring	» Observation of vegetation clearing activities by ECO throughout construction phase. » Monitoring of vegetation clearing activities in terms of permit

	conditions. » Supervision of all clearing and earthworks. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Minimise the establishment and spread of alien invasive plants

It is not known to what extent the site contains alien plants. There is, however, the potential for alien plants to invade areas of the site following disturbance on site or spread into surrounding landscapes. This could potentially affect areas surrounding the site. No protected trees were encountered on the site, and the only TOPS listed plant species/CITES II listed plant species was an Euphorbia sp. (Euphorbia cf. rectirama).

Project Component/s	» Any infrastructure or activity that will result in disturbance to natural areas.
Potential Impact	» Invasion of natural vegetation surrounding the site by declared weeds or invasive alien species.
Activities/Risk Sources	» Construction, environmental management.
Mitigation: Target/Objective	» There is a target of no alien plants within project control area during the construction and operation phases.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Avoid creating conditions in which alien plants may become established: » Keep disturbance of indigenous vegetation to a minimum. » Rehabilitate disturbed areas as quickly as possible. » Do not import soil from areas with alien plants.	Contractor	Construction and operation
Establish an ongoing monitoring programme to detect and quantify any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act and Biodiversity Act).	Contractor	Construction and operation
Immediately control any alien plants that become established using registered control methods.	Contractor	Construction and operation

Performance Indicator	» For each alien species: number of plants and aerial cover of plants within project area and immediate surroundings.

Monitoring	» Ongoing monitoring of area by ECO during construction. » Annual audit of project area and immediate surroundings by qualified botanist. » If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of plants or concentrations of plants), number of individuals (whole site or per unit area), age and/or size classes of plants and aerial cover of plants. » The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area. » The environmental manager should be responsible for driving this process. » Reporting frequency depends on legal compliance framework.

OBJECTIVE: Minimise soil degradation and erosion

The soil on site may be impacted in terms of:

- » Soil degradation including erosion (by wind and water) and subsequent deposition elsewhere (i.e. into the drainage lines)
- » Uncontrolled run-off relating to construction activity (excessive wetting, uncontrolled discharge, etc.) will also lead to accelerated erosion and possible sedimentation of the drainage lines.
- » Degradation of the natural soil profile due to excavation, stockpiling, compaction, pollution and other construction activities will affect soil forming processes and associated ecosystems. Degradation of parent rock is considered low as there are no deep excavations envisaged.

Project Component/s	» PV panels » Power line. » Access roads.
Potential Impact	» Soil and rock degradation. » Soil erosion. » Increased deposition of soil into drainage systems. » Increased run-off over the site.
Activities/Risk Sources	» Removal of vegetation, excavation, stockpiling, compaction, and pollution of soil. » Rainfall - water erosion of disturbed areas. » Wind erosion of disturbed areas. » Concentrated discharge of water from construction activity.
Mitigation: Target/Objective	» Minimise extent of disturbance areas. » Minimise activity within disturbance areas.

	» Minimise soil degradation (mixing, wetting, compaction, etc). » Minimise soil erosion. » Minimise deposition of soil into drainage lines. » Minimise instability of embankments/excavations.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Identify disturbance areas and restrict construction activity to these areas.	Contractor	Before and during construction
Rehabilitate disturbance areas as soon as practicable when construction in an area is complete.	Contractor	During and after construction
Access roads to be carefully planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement, and compaction of soil.	Engineer, ECO, and Contractor	Design and construction
Where access roads cross natural drainage lines, culverts must be designed to allow free flow and regular maintenance must be carried out.	Engineer, ECO, and, Contractor	Design, before and during construction
Dust control on construction site (i.e. wetting of denuded areas).	Contractor	Construction
Minimise removal of vegetation which adds stability to soil.	ECO/Contractor	Construction
Soil conservation: Stockpile topsoil for re-use in rehabilitation phase, protect stockpile from erosion	Contractor	Before and during construction
Erosion control measures (i.e. run-off attenuation on slopes (sand bags, logs), silt fences, storm water catch-pits, shade nets, or temporary mulching over denuded area as required).	Contractor, and ECO	Erection: Before construction Maintenance: Duration of contract
Control depth of excavations and stability of cut faces/sidewalls.	Engineer, ECO, and, Contractor	Before construction and Maintenance Duration of contract

Performance Indicator	» No activity outside demarcated disturbance areas. » Acceptable level of activity within disturbance areas, as determined by the ECO. » Acceptable level of soil erosion around site, as determined by the ECO. » Acceptable level of increased siltation in drainage lines, as determined by the ECO.

	» Acceptable state of excavations, as determined by the ECO. » No activity in restricted areas.
Monitoring	» Monthly inspections of the site by the ECO. » Monthly inspections of sediment control devices. » Monthly inspections of surroundings, including drainage lines. » Immediate reporting of ineffective sediment control systems. » An incident reporting system will record non-conformances.

OBJECTIVE: Protection of heritage resources

The development area has noted surface scatters of predominantly Middle Stone Age (MSA) stone artefacts extend over the proposed area for the Rodicon Solar Energy Facility and the adjacent rocky outcrop to the east. Denser scatters were observed within the large surface exposed and eroded areas within the south-western extent of the proposed development. No associated archaeological material or organic remains were documented with the stone artefact surface scatters. No other archaeological heritage remains, features or sites were observed within the area proposed for development.

Project Component/s	» PV panels. » Substation. » Power line. » Ancillary buildings. » Access roads.
Potential Impact	» Heritage objects or artefacts found on site are inappropriately managed or destroyed
Activity/Risk Source	» Site preparation and earthworks » Foundations or plant equipment installation » Mobile construction equipment movement on site » Power line and access roads construction activities.
Mitigation: Target/Objective	» To ensure that any heritage objects found on site are treated appropriately and in accordance with the relevant legislation.

Mitigation: Action/control	Responsibility	Timeframe
A grid would need to be established across the sites with artefacts collected from the squares. Limited excavation should take place in order to try to understand the nature of the relationship between the artefacts and the heuweltjies. This work must be undertaken in accordance with the conditions of the required permit from HWC.	Rodicon Solar Energy Facility in consultation with Specialist	Pre-construction
Areas required to be cleared during construction	Contractor in	Pre-

Mitigation: Action/control	Responsibility	Timeframe
must be clearly marked in the field to avoid unnecessary disturbance of adjacent areas (which will not be surveyed in detail by a heritage specialist).	consultation with Specialist	construction
Familiarise all staff and contractors with procedures for dealing with heritage objects/sites.	ECO/specialist	Pre-construction
Project employees and any contract staff will maintain, at all times, a high level of awareness of the possibility of discovering heritage sites.	Rodicon Solar Energy Facility / Contractor	Duration of contract
If a heritage object is found, work in that area will be stopped immediately, and appropriate specialists brought in to assess to site, notify the administering authority of the item/site, and undertake due/required processes.	Rodicon Solar Energy Facility, and Contractor in consultation with Specialist	Duration of contract
Apply for sampling permits from SAHRA for work on any archaeological sites identified as needing intervention.	Rodicon Solar Energy Facility in consultation with Specialist	Pre-construction
Once the final layout (including the positions of the solar panels; underground cabling; overhead power line; additional internal access roads, and the workshop area) of the proposed Rodicon Solar Energy Facility has been finalised an archaeological ground-truthing should be conducted and further recommendations be made to protect the archaeological heritage within the area proposed for development; and / or	Rodicon Solar Energy Facility in consultation with Specialist	Pre-construction
A professional archaeologist (with an already authorised collection and excavation permit) must be appointed during all construction and development activities including vegetation clearing and the excavation activities to monitor and identify possible archaeological material remains and features that may occur below the surface and make further appropriate recommendations on removing and / or protecting the archaeological material remains and features.	Rodicon Solar Energy Facility in consultation with Specialist	construction
If concentrations of archaeological heritage material and human remains are uncovered during construction, all work must cease immediately and be reported to the Albany Museum (046 622 2312) and/or the South African Heritage Resources Agency (SAHRA) (021 642 4502) so that systematic and professional investigation/ excavation can be undertaken.	Rodicon Solar Energy Facility in consultation with Specialist	construction

Performance Indicator	» Zero disturbance outside of designated work areas. » All heritage items located are dealt with as per the legislative guidelines.
Monitoring	» Observation of excavation activities by ECO throughout construction phase. » Supervision of all clearing and earthworks. » Due care taken during earthworks and disturbance of land by all staff and any heritage objects found reported. » Appropriate permits obtained from SAHRA prior to the disturbance or destruction of heritage sites. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Minimisation of visual impacts associated with construction

During the construction phase heavy vehicles, components, equipment and construction crews will frequent the area and may cause, at the very least, a cumulative visual nuisance to landowners and residents in the area as well as road users (i.e. in light of the existing visual impact from the Hydra Substation and associated power line). The placement of lay-down areas and temporary construction camps should be carefully considered in order to not negatively influence the future perception of the facility. Secondary visual impacts associated with the construction phase, such as the sight of construction vehicles, dust and construction litter must be managed to reduce visual impacts. The use of dust-suppression techniques on the access roads (where required), timely removal of rubble and litter, and the erection of temporary screening will assist in doing this.

Project Component/s	» Construction site and construction accommodation.
Potential Impact	» Visual impact of general construction activities and construction accommodation, and the potential scarring of the landscape due to vegetation clearing.
Activity/Risk Source	» The viewing of the above mentioned by observers on or near the site.
Mitigation: Target/Objective	» Minimal visual intrusion by construction activities and construction accommodation and intact vegetation cover outside of immediate works areas.

Project Component/s	Construction site	
Potential Impact	Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing and resulting erosion.	
Activity/Risk Source	The viewing of the above mentioned by observers on or near the site (i.e. within 2 km of the site).	
Mitigation: Target/Objective	Minimal visual intrusion by construction activities and intact vegetation cover outside of immediate works areas.	
Mitigation: Action/control	**Responsibility**	**Timeframe**
Ensure that vegetation is not unnecessarily cleared or removed during the construction period.	Rodicon Trading Investments (Pty) / contractor	Early in the construction phase.
Reduce the construction period through careful logistical planning and productive implementation of resources.	Rodicon Trading Investments (Pty) / contractor	Early in the construction phase.
Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.	Rodicon Trading Investments (Pty) / contractor	Early in and throughout the construction phase.
Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.	Rodicon Trading Investments (Pty) / contractor	Throughout the construction phase.
Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.	Rodicon Trading Investments (Pty) / contractor	Throughout the construction phase.
Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).	Rodicon Trading Investments (Pty) / contractor	Throughout the construction phase.
Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.	Rodicon Trading Investments (Pty) / contractor	Throughout the construction phase.
Rehabilitate all disturbed areas, construction areas, servitudes etc. immediately after the completion of construction works. Consult an ecologist to give input into rehabilitation specifications.	Rodicon Trading Investments (Pty) / contractor	Throughout and at the end of the construction phase.
Performance Indicator	Vegetation cover on and in the vicinity of the site is intact (i.e. full cover as per natural vegetation within the environment) with no evidence of degradation or erosion.	
Monitoring	Monitoring of vegetation clearing during construction (by contractor as part of construction contract). Monitoring of rehabilitated areas quarterly for at least a year following the end of construction (by contractor as part of construction contract).	

OBJECTIVE: Appropriate handling and management of waste

The main wastes expected to be generated by the construction of the solar energy facility will include general construction waste, hazardous waste (i.e. fuel), and liquid waste (including grey water and sewage)

In order to manage the wastes effectively, guidelines for the assessment, classification, and management of wastes, along with industry principles for minimising construction wastes must be implemented.

Project Component/s	» PV panels » Power line. » Ancillary buildings. » Access roads.
Potential Impact	» Inefficient use of resources resulting in excessive waste generation. » Litter or contamination of the site or water through poor waste management practices.
Activity/Risk Source	» Packaging. » Other construction wastes. » Hydrocarbon use and storage. » Spoil material from excavation, earthworks, and site preparation.
Mitigation: Target/Objective	» To comply with waste management legislation. » To minimise production of waste. » To ensure appropriate waste storage and disposal. » To avoid environmental harm from waste disposal. » A waste manifests should be developed for the ablutions showing proof of disposal of sewage at appropriate water treatment works.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.	Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor	Duration of contract
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap), and contaminated waste as required. Location of such areas must seek to minimise the potential for	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.		
Where practically possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation, and storage of waste streams (such as wood, metals, general refuse etc.).	Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
Uncontaminated waste will be removed at least weekly for disposal; other wastes will be removed for recycling/ disposal at an appropriate frequency.	Contractor	Duration of contract
Disposal of waste will be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area.	Contractor	Duration of contract
Waste must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	Contractor	Duration of contract
Documentation (waste manifest) must be maintained detailing the quantity, nature, and fate of any regulated waste. Waste disposal records must be available for review at any time.	Contractor	Duration of contract
Regularly serviced chemical toilets facilities will be used to ensure appropriate control of sewage.	Contractor	Duration of contract
Upon the completion of construction, the area must be cleared of potentially polluting materials.	Contractor	Completion of construction
Dispose of all solid waste collected at an appropriately registered waste disposal site. Waste disposal shall be in accordance with all relevant legislation and under no circumstances may waste be burnt on site.	Contractor	Duration of construction
Where a registered waste site is not available close to the construction site, provide a method statement with regard to waste management.	Contractor	Duration of construction

Performance Indicator	» No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests for all waste streams.

Monitoring	» Observation and supervision of waste management practices throughout construction phase. » Waste collection will be monitored on a regular basis. » Waste documentation completed. » A complaints register will be maintained, in which any complaints from the community will be logged. Complaints will be investigated and, if appropriate, acted upon. » An incident reporting system will be used to record non-conformances to the EMP.

OBJECTIVE: Appropriate handling and storage of chemicals, hazardous substances

The construction phase will involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents.

Project Component/s	» Storage and handling of chemicals, hazardous substances.
Potential Impact	» Release of contaminated water from contact with spilled chemicals. » Generation of contaminated wastes from used chemical containers.
Activity/Risk Source	» Vehicles associated with site preparation and earthworks. » Construction activities of area and linear infrastructure. » Hydrocarbon use and storage.
Mitigation: Target/Objective	» To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons. » To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Contractor	Duration of contract
Corrective action must be undertaken immediately if a complaint is made, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures.	Contractor	Duration of contract
In the event of a major spill or leak of contaminants, the relevant administering authority must be	Contractor	Duration of contract

Mitigation: Action/Control	Responsibility	Timeframe
immediately notified as per the notification of emergencies/incidents.		
Spilled cement must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	Contractor	Duration of contract
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	Contractor	Duration of contract
Routine servicing and maintenance of vehicles must not to take place on-site (except for emergencies). If repairs of vehicles must take place, an appropriate drip tray must be used to contain any fuel or oils.	Contractor	Duration of contract
All stored fuels to be maintained within a bund and on a sealed surface.	Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity, and function.	Contractor	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	Contractor	Duration of contract
Oily water from bunds at the substation must be removed from site by licensed contractors.	Contractor	Duration of contract
The storage of flammable and combustible liquids such as oils will be in designated areas which are appropriately bunded, and stored in compliance with Material Safety Data Sheets (MSDS) files.	Contractor	Duration of contract
Any storage and disposal permits/approvals which may be required must be obtained, and the conditions attached to such permits and approvals will be compiled with.	Contractor	Duration of contract
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations	Contractor	Duration of contract
The sediment control and water quality structures used on-site must be monitored and maintained in an operational state at all times.	Contractor	Duration of contract
Upon the completion of construction, the area must be cleared of potentially polluting materials.	Contractor	Completion of construction

Performance Indicator	» No chemical spills outside of designated storage areas. » No unattended water or soil contamination by spills. » No complaints received regarding waste on site or indiscriminate dumping.
Monitoring	» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase. » A complaints register must be maintained, in which any

	complaints from the community will be logged. » An incident reporting system will be used to record non-conformances to the EMP.

6.3 Detailing Method Statements

OBJECTIVE: Ensure all construction activities are undertaken with the appropriate level of environmental awareness to minimise environmental risk

The environmental specifications are required to be underpinned by a series of Method Statements, within which the Contractors and Service Providers are required to outline how any identified environmental risks will practically be mitigated and managed for the duration of the contract, and how specifications within this EMP will be met. That is, the Contractor will be required to describe how specified requirements will be achieved through the submission of written Method Statements to the Site Manager and ECO.

A Method Statement is defined as "a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager is able to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications". The Method Statement must cover applicable details with regard to:

» Construction procedures;
» Materials and equipment to be used;
» Getting the equipment to and from site;
» How the equipment/material will be moved while on-site;
» How and where material will be stored;
» The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
» Timing and location of activities;
» Compliance/non-compliance with the Specifications; and
» Any other information deemed necessary by the Site Manager.

The Contractor may not commence the activity covered by the Method Statement until it has been approved, except in the case of emergency activities and then only with the consent of the Site Manager. Approval of the Method Statement will not absolve the Contractor from their obligations or responsibilities in terms of their contract.

6.4 Awareness and Competence: Construction Phase of the Solar Energy Facility

OBJECTIVE: To ensure all construction personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm

To achieve effective environmental management, it is important that Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMP. The Contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts.

The Contractors obligations in this regard include the following:

- » Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
- » Ensuring that a copy of the EMP is readily available on-site, and that all site staff are aware of the location and have access to the document.
- » Employees will be familiar with the requirements of the EMP and the environmental specifications as they apply to the construction of the facility.
- » Employees must undergo training for the operation and maintenance activities associated with a PV plant and have a basic knowledge of the potential environmental impacts that could occur and how they can be minimised and mitigated.
- » Ensuring that, prior to commencing any site works, all employees and sub-contractors have attended an Environmental Awareness Training course.
- » The course should be sufficient to provide the site staff with an appreciation of the project's environmental requirements, and how they are to be implemented.
- » Awareness of any other environmental matters, which are deemed necessary by the ECO.
- » Ensuring that employee information posters, outlining the environmental "do's" and "don'ts" (as per the environmental awareness training course) are erected at prominent locations throughout the site.
- » Ensure that construction workers have received basic training in environmental management, including the storage and handling of hazardous substances, minimisation of disturbance to sensitive areas, management of waste, and prevention of water pollution.
- » Records must be kept of those that have completed the relevant training.

» Training should be done either in a written or verbal format but must be appropriate for the receiving audience.
» Refresher sessions must be held to ensure the contractor staff are aware of their environmental obligations as practically possible.

6.5 Monitoring Programme: Construction Phase

OBJECTIVE: To monitor the performance of the control strategies employed against environmental objectives and standards

A monitoring programme must be in place not only to ensure conformance with the EMP, but also to monitor any environmental issues and impacts which have not been accounted for in the EMP that are, or could result in significant environmental impacts for which corrective action is required. The period and frequency of monitoring will be stipulated by the Environmental Authorisation (once issued). Where this is not clearly dictated, Rodicon Solar Energy Facility will determine and stipulate the period and frequency of monitoring required in consultation with relevant stakeholders and authorities. The Project Manager will ensure that the monitoring is conducted and reported.

The aim of the monitoring and auditing process would be to routinely monitor the implementation of the specified environmental specifications, in order to:

» Monitor and audit compliance with the prescriptive and procedural terms of the environmental specifications.
» Ensure adequate and appropriate interventions to address non-compliance.
» Ensure adequate and appropriate interventions to address environmental degradation.
» Provide a mechanism for the lodging and resolution of public complaints.
» Ensure appropriate and adequate record keeping related to environmental compliance.
» Determine the effectiveness of the environmental specifications and recommend the requisite changes and updates based on audit outcomes, in order to enhance the efficacy of environmental management on site.
» Aid communication and feedback to authorities and stakeholders.

The ECO will ensure compliance with the EMP, will conduct monitoring activities, and will report any non-compliance or where corrective action is necessary to the Site Manager and/or any other monitoring body stipulated by the regulating authorities. The ECO must have the appropriate experience and qualifications to undertake the necessary tasks.

MANAGEMENT PROGRAMME: REHABILITATION CHAPTER 7

Overall Goal: Undertake the rehabilitation measures in a way that:

» Ensures rehabilitation of disturbed areas following the execution of the works, such that residual environmental impacts are remediated or curtailed.

7.1. Objectives

In order to meet this goal, the following objective, actions and monitoring requirements are relevant:

OBJECTIVE: Ensure appropriate rehabilitation of disturbed areas such that residual environmental impacts are remediated or curtailed

Areas requiring rehabilitation will include all areas disturbed during the construction phase and that are not required for regular operation and maintenance operations. Rehabilitation should be undertaken in an area as soon as possible after the completion of construction activities within that area.

Project Component/s	» Area and linear infrastructure.
Potential Impact	» Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion and increased runoff, and the requirement for on-going management intervention.
Activity/Risk Source	» Temporary construction areas. » Temporary access roads/tracks. » Power line servitudes. » Other disturbed areas/footprints.
Mitigation: Target/Objective	» Ensure and encourage site rehabilitation of disturbed areas. » Ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
All temporary facilities, equipment, and waste materials must be removed from site.	Contractor	Following execution of the works
All temporary fencing and danger tape must be removed once the construction phase has been completed.	Contractor	Following completion of construction

Mitigation: Action/Control	Responsibility	Timeframe
		activities in an area
The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these should be cleaned up.	Contractor	Following completion of construction activities in an area
All hardened surfaces within the construction camp area should be ripped, all imported materials removed, and the area shall be top soiled and re-vegetated.	Contractor	Following completion of construction activities in an area
Temporary roads must be closed and access across these blocked.	Contractor	Following completion of construction activities in an area
Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.	Contractor	Following completion of construction activities in an area
A rehabilitation plan should be drawn up that specifies the rehabilitation process and should be approved by the ECO.	Contractor, Rodicon Solar Energy Facility and ECO	Pre-construction
Disturbed areas must be rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix. Re-use of native/indigenous plant species removed from disturbance areas in the rehabilitation phase to be determined by a botanist as applicable.	Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.	Rodicon Solar Energy Facility in consultation with rehabilitation specialist	Post-rehabilitation
Erosion control measures should be used in sensitive areas such as steep slopes, hills, and drainage lines is necessary.	Rodicon Solar Energy Facility in consultation with rehabilitation specialist	Post-rehabilitation
On-going alien plant monitoring and removal must be undertaken on all areas of natural vegetation on	Rodicon Solar Energy Facility	Post-rehabilitation

Mitigation: Action/Control	Responsibility	Timeframe
an annual basis.	in consultation with rehabilitation specialist	

Performance Indicator	» All portions of site, including construction equipment camp and working areas, cleared of equipment and temporary facilities. » Topsoil replaced on all areas and stabilised where practicable or required after construction and temporally utilised areas. » Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites. » Completed site free of erosion and alien invasive plants.
Monitoring	» On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented during the operational lifespan of the facility. » On-going alien plant monitoring and removal should be undertaken on an annual basis.

MANAGEMENT PROGRAMME: OPERATION CHAPTER 8

Overall Goal: To ensure that the operation of the solar energy facility does not have unforeseen impacts on the environment and to ensure that all impacts are monitored and the necessary corrective action taken in all cases. In order to address this goal, it is necessary to operate the facility in a way that:

» Ensures that operation activities are properly managed in respect of environmental aspects and impacts.
» Enables the solar energy facility operation activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to farming practices, traffic and road use, and effects on local residents.
» Minimises impacts on fauna using the site.

An environmental manager must be appointed during operation whose duty it will be to ensure the implementation of the operational EMP.

8.1. Objectives

In order to meet this goal, the following objectives have been identified, together with necessary actions and monitoring requirements.

OBJECTIVE: Protection of indigenous natural vegetation, fauna and maintenance of rehabilitation

Indirect impacts on vegetation and fauna during operation could result from maintenance activities and the movement of people and vehicles on site and in the surrounding area. In order to ensure the long-term environmental integrity of the site following construction, maintenance of the areas rehabilitated post-construction must be undertaken until these areas have successfully re-established.

Project component/s	» Areas requiring regular maintenance. » Route of the security team. » Areas disturbed during the construction phase and subsequently rehabilitation at its completion.
Potential Impact	» Disturbance to or loss of vegetation and/or habitat. » Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention.

Activity/Risk Source	» Movement of employee vehicles within and around site.
Mitigation: Target/Objective	» Maintain minimised footprints of disturbance of vegetation/habitats on-site. » Ensure and encourage plant regrowth in non-operational areas of post-construction rehabilitation.

Mitigation: Action/Control	Responsibility	Timeframe
Vehicle movements must be restricted to designated roadways.	Rodicon Solar Energy Facility	Operation
No disturbance of vegetation outside of the project site must occur.	Rodicon Solar Energy Facility	Operation
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.	Rodicon Solar Energy Facility	Operation
An on-going alien plant monitoring and eradication programme must be implemented, where necessary.	Rodicon Solar Energy Facility	Operation

Performance Indicator	» No further disturbance to vegetation or terrestrial faunal habitats. » Continued improvement of rehabilitation efforts. » No disturbance of vegetation outside of project site.
Monitoring	» Observation of vegetation on-site by facility manager and environmental manager. » Regular inspections to monitor plant regrowth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas.

OBJECTIVE: Protection of avifauna

During the operation of the facility, the threat of collision with the power line is the biggest potential threat to avifauna, particularly sensitive, collision prone species that may occur in the study area. The threat of electrocution while perching on the power line and associated infrastructure serves as a threat to certain sensitive species, depending on the power line structures implemented.

Project Component/s	» Power line
Potential Impact	» Collision and electrocution events with the overhead power line.
Activities/Risk	» Operation of the power line without mitigation measures. .

Sources	
Mitigation: Target/Objective	» Maintain a low number of collision, and electrocution events.

Mitigation: Action/Control	Responsibility	Timeframe
Ensure bird-friendly tower designs are implemented to minimise the risk of electrocutions	Rodicon Solar Energy Facility	Construction
Notes of electrocution and collision events must be sent to a qualified Ornithologist for the recommendation of further mitigation measures if necessary.	ECO	Operation

Performance Indicator	» Minimal collision, or electrocution events.
Monitoring	» Observation of electrocution or collision events with the power line. » Monitor power line servitudes for mortalities.

OBJECTIVE: Minimisation of visual impacts

The primary visual impact of the facility and its ancillary infrastructure, including the power line, is not possible to mitigate. The functional design of the structures cannot be changed in order to reduce visual impacts.

Project Component/s	SEF and ancillary infrastructure (i.e. access road, power lines, switching station and workshop).
Potential Impact	Visual impact of facility degradation and vegetation rehabilitation failure.
Activity/Risk Source	The viewing of the above mentioned by observers on or near the site (i.e. within 2 km of the site).
Mitigation: Target/Objective	Well maintained and neat facility.

Mitigation: Action/control	Responsibility	Timeframe
Maintain the general appearance of the facility as a whole, including the turbines the internal roads, servitudes and the ancillary buildings.	Rodicon Trading Investments (Pty) / operator	Throughout the operational phase.
Maintain roads to forego erosion and to suppress dust.	Rodicon Trading Investments (Pty) / operator	Throughout the operational phase.
Monitor rehabilitated areas, and implement remedial action as and when required.	Rodicon Trading Investments (Pty) / operator	Throughout the operational phase.

Performance Indicator	Well maintained and neat facility with intact vegetation on and in the vicinity of the facility.
Monitoring	Monitoring of the entire site on an ongoing basis (by operator).

OBJECTIVE: Minimise soil degradation and erosion

The soil on site may be impacted in terms of:

» Soil degradation including erosion (by wind and water) and subsequent deposition elsewhere is of a concern across the entire site which is underlain by fine grained soil which can be mobilised when disturbed, even on relatively low slope gradients (accelerated erosion).
» Uncontrolled run-off relating to construction activity (excessive wetting, uncontrolled discharge, etc.) will also lead to accelerated erosion and possible sedimentation of drainage systems.
» Degradation of the natural soil profile due to pollution.

Project Component/s	» PV panels. » Power line. » Ancillary buildings. » Access roads.
Potential Impact	» Soil degradation. » Soil erosion. » Increased deposition of soil into drainage systems. » Increased run-off over the site.
Activities/Risk Sources	» Poor rehabilitation of cleared areas. » Rainfall - water erosion of disturbed areas. » Wind erosion of disturbed areas. » Concentrated discharge of water from construction activity.
Mitigation: Target/Objective	» Ensure rehabilitation of disturbed areas is maintained. » Minimise soil degradation (i.e. wetting). » Minimise soil erosion and deposition of soil into drainage lines. » Ensure continued stability of embankments/excavations.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
Rehabilitate disturbance areas should the previous attempt be unsuccessful.	Rodicon Solar Energy Facility	Operation
Maintain erosion control measures implemented during the construction phase (i.e. run-off attenuation on slopes (sand bags, logs), silt fences, storm water catch-pits, and shade nets).	Rodicon Solar Energy Facility	Operation

Performance Indicator	» Acceptable level of soil erosion around site, as determined by the site manager.

	» Acceptable level of increased siltation in drainage lines, as determined by the site manager.
Monitoring	» Inspections of site on a bi-annual basis. » Water management plan

OBJECTIVE: Minimise dust and air emissions

During the operational phase, limited gaseous or particulate emissions are anticipated from exhaust emissions (i.e. from operational vehicles), and from the augmentation plant. Windy conditions and the movement of vehicles on site may lead to dust creation.

Project Component/s	» Hard engineered surfaces. » On-site vehicles.
Potential Impact	» Dust and particulates from vehicle movement to and on-site. » Release of minor amounts of air pollutants (for example NO_2, CO and SO_2) from vehicles and the augmentation plant.
Activities/Risk Sources	» Re-entrainment of deposited dust by vehicle movements. » Wind erosion from unsealed roads and surfaces. » Fuel burning vehicle and construction engines.
Mitigation: Target/Objective	» To ensure emissions from all vehicles are minimised, where possible. » To minimise nuisance to the community from dust emissions and to comply with workplace health and safety requirements.

Mitigation: Action/Control	Responsibility	Timeframe
Roads must be maintained to a manner that will ensure that nuisance to the community from dust is not visibly excessive.	Rodicon Solar Energy Facility	Operation
Appropriate dust suppressant must be applied to the roads as required to minimise/control airborne dust.	Rodicon Solar Energy Facility	Duration of contract
Speed of vehicles must be restricted, as defined by the Environmental Manager.	Rodicon Solar Energy Facility	Duration of contract
Vehicles and equipment must be maintained in a road-worthy condition at all times.	Rodicon Solar Energy Facility	Duration of contract

Performance Indicator	» No complaints from affected residents or community regarding dust or vehicle emissions. » Dust suppression measures implemented for where required. » Drivers made aware of the potential safety issues and enforcement of strict speed limits when they are employed.
Monitoring	» Immediate reporting by personnel of any potential or actual issues with nuisance dust or emissions to the Site Manager.

	» A complaints register must be maintained, in which any complaints from residents/the community will be logged, and thereafter complaints will be investigated and, where appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMP.

OBJECTIVE: Ensure the implementation of an appropriate fire management plan during the operation phase

The increased presence of people on the site could increase the risk of veld fires, particularly in the dry season.

Project Component/s	» Operation and maintenance of the solar energy facility and associated infrastructure.
Potential Impact	» Veld fires can pose a personal safety risk to local farmers and communities, and their homes, crops, livestock and farm infrastructure, such as gates and fences. In addition, fire can pose a risk to the solar energy facility infrastructure.
Activities/Risk Sources	» The presence of operation and maintenance personnel and their activities on the site can increase the risk of veld fires.
Mitigation: Target/Objective	» To avoid and or minimise the potential risk of veld fires on local communities and their livelihoods.

Mitigation: Action/Control	Responsibility	Timeframe
Provide adequate fire fighting equipment on site.	Rodicon Solar Energy Facility	Operation
Provide fire-fighting training to selected operation and maintenance staff.	Rodicon Solar Energy Facility	Operation
Ensure that appropriate communication channels are established to be implemented in the event of a fire.	Rodicon Solar Energy Facility	Operation
Fire breaks should be established where and when required. Cognisance must be taken of the relevant legislation when planning and burning firebreaks (in terms of timing, etc.).	Rodicon Solar Energy Facility	Operation
Upon completion of the construction phase, an emergency evacuation plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency.	Rodicon Solar Energy Facility	Operation
Contact details of emergency services should be prominently displayed on site.	Rodicon Solar Energy Facility	Operation

Performance Indicator	» Fire fighting equipment and training provided before the operational phase commences. » Appropriate fire breaks in place and maintained.
Monitoring	» Rodicon Solar Energy Facility must monitor indicators listed above to ensure that they have been met.

OBJECTIVE: Maximise local employment and business opportunities

The facility is expected to be operational for more than 25 years during which time approximately 30 - 50 staff members are expected to be required on-site. Of this, 20% will be for skilled positions (i.e. electrical engineers and maintenance/plant engineers), and 80% for semi to low skilled positions (i.e. plant cleaning, security and maintenance). Therefore, long-term direct job opportunities for locals could exist, although limited. However, in an area with such high unemployment figures, these limited opportunities should still be seen as a positive impact on the quality of life of those benefiting from the employment.

Some local procurement of goods, materials and services could occur which would result in positive economic spin-offs. These opportunities for local service providers to render services to the proposed facility could include maintenance of the guardhouse, gardening at the guardhouse, cleaning services, security services and maintenance or replacement of general equipment

Project Component/s	» Day to day operational activities associated with the PV facility, including maintenance etc.
Potential Impact	» The opportunities and benefits associated with the creation of local employment and business should be maximised.
Activities/Risk Sources	» Locals are not employed where the skills exist. » Local procurement is not undertaken if possible. » Local businesses are not supported.
Mitigation: Target/Objective	» In the medium to long term employ as many locals as possible to fill the full time employment opportunities.

Mitigation: Action/Control	**Responsibility**	**Timeframe**
A skills development plan should be developed which should concentrate on the transfer of skills to employees to increase their capacity and to equip them with alternative skills should they wish to be employed elsewhere.	Rodicon Solar Energy Facility	Operation
Identify local members of the community who are suitably qualified or who have the potential to be	Rodicon Solar Energy Facility	Operation

Mitigation: Action/Control	Responsibility	Timeframe
employed full time.		
The skill requirements should be communicated to the local community leaders and community based organisations.	Rodicon Solar Energy Facility	Operation
Local sourcing of materials, general services to assist in providing economic, and employment opportunities for the local people.	Rodicon Solar Energy Facility	Operation

Performance Indicator	» An employee list drawn up indicating the percentage of locals employed. » Local procurement is undertaken.
Monitoring	» Rodicon Solar Energy Facility should be able to demonstrate that the above indicators are implemented.

OBJECTIVE: Appropriate handling and management of waste

The operation of the facility will involve the storage of chemicals and hazardous substances, as well as the generation of limited waste products. The main wastes expected to be generated by the operation activities includes general solid waste, and liquid waste.

Project Component/s	» Substation. » Operation and maintenance staff. » Workshop.
Potential Impact	» Inefficient use of resources resulting in excessive waste generation. » Litter or contamination of the site or water through poor waste management practices. » Contamination of water or soil because of poor materials management.
Activity/Risk Source	» Transformers and switchgear for the substation. » Ancillary buildings.
Mitigation: Target/Objective	» Comply with waste management legislation. » Minimise production of waste. » Ensure appropriate waste disposal. » Avoid environmental harm from waste disposal. » Ensure appropriate storage of chemicals and hazardous substances.

Mitigation: Action/Control	Responsibility	Timeframe

Mitigation: Action/Control	Responsibility	Timeframe
Hazardous substances (such as used/new transformer oils, etc.) must be stored in sealed containers within a clearly demarcated designated area.	Rodicon Solar Energy Facility	Operation
Storage areas for hazardous substances must be appropriately sealed and bunded.	Rodicon Solar Energy Facility	Operation
All structures and/or components replaced during maintenance activities must be appropriately disposed of at an appropriately licensed waste disposal site or sold to a recycling merchant for recycling.	Rodicon Solar Energy Facility	Operation
Care must be taken to ensure that spillage of oils and other hazardous substances are limited during maintenance. Handling of these materials should take place within an appropriately sealed and bunded area. Should any accidental spillage take place, it must be cleaned up according to specified standards regarding bioremediation.	Rodicon Solar Energy Facility	Operation and maintenance
Spill kits must be made available on-site for the clean-up of spills and leaks of contaminants.	Rodicon Solar Energy Facility	Operation and maintenance
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Rodicon Solar Energy Facility / waste management contractor	Operation
Waste handling, collection, and disposal operations must be managed and controlled by a waste management contractor.	Rodicon Solar Energy Facility / waste management contractor	Operation
Used oils and chemicals: » Appropriate disposal must be arranged with a licensed facility in consultation with the administering authority » Waste must be stored and handled according to the relevant legislation and regulations	Rodicon Solar Energy Facility	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	Rodicon Solar Energy Facility	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	Rodicon Solar Energy Facility	Operation
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Rodicon Solar Energy Facility	Operation

Performance Indicator	» No complaints received regarding waste on site or indiscriminate dumping. » Internal site audits identifying that waste segregation recycling and reuse is occurring appropriately. » Provision of all appropriate waste manifests. » No contamination of soil or water.
Monitoring	» Waste collection must be monitored on a regular basis. » Waste documentation must be completed and available for inspection » An incidents/complaints register must be maintained, in which any complaints from the community must be logged. » Complaints must be investigated and, if appropriate, acted upon. » Regular reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor and monitored by the ECO. » All appropriate waste disposal certificates accompany the monthly reports.

MANAGEMENT PROGRAMME: DECOMMISSIONING CHAPTER 9

The solar infrastructure which will be utilised for the proposed solar energy facility is expected to have a lifespan of >25 years (i.e. with maintenance). Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. It is most likely that decommissioning activities of the infrastructure of the facility would comprise the disassembly and replacement of the solar infrastructure with more appropriate technology/infrastructure available at that time.

The relevant mitigation measures contained under the construction section should be applied during decommissioning and therefore is not repeated in this section. It must be noted that decommissioning activities will need to be undertaken in accordance with the legislation applicable at that time, which may require this section of the EMP to be revisited and amended.

9.1. Site Preparation

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

9.2 Disassemble and Replace Infrastructure

Disassembled components will be reused, recycled, or disposed of in accordance with regulatory requirements.

OBJECTIVE: To avoid and or minimise the potential impacts associated with the decommissioning phase

Project Component/s	» Decommissioning phase of the solar energy facility.
Potential Impact	» Decommissioning will result in job losses, which in turn can result in a number of social impacts, such as reduced quality of life. » Decommissioning is similar to the construction phase in that it will also create temporary employment opportunities.
Activity/Risk Source	» Decommissioning of the solar energy facility.
Mitigation:	» To avoid and or minimise the potential social impacts

Target/Objective	associated with decommissioning phase of the solar energy facility.

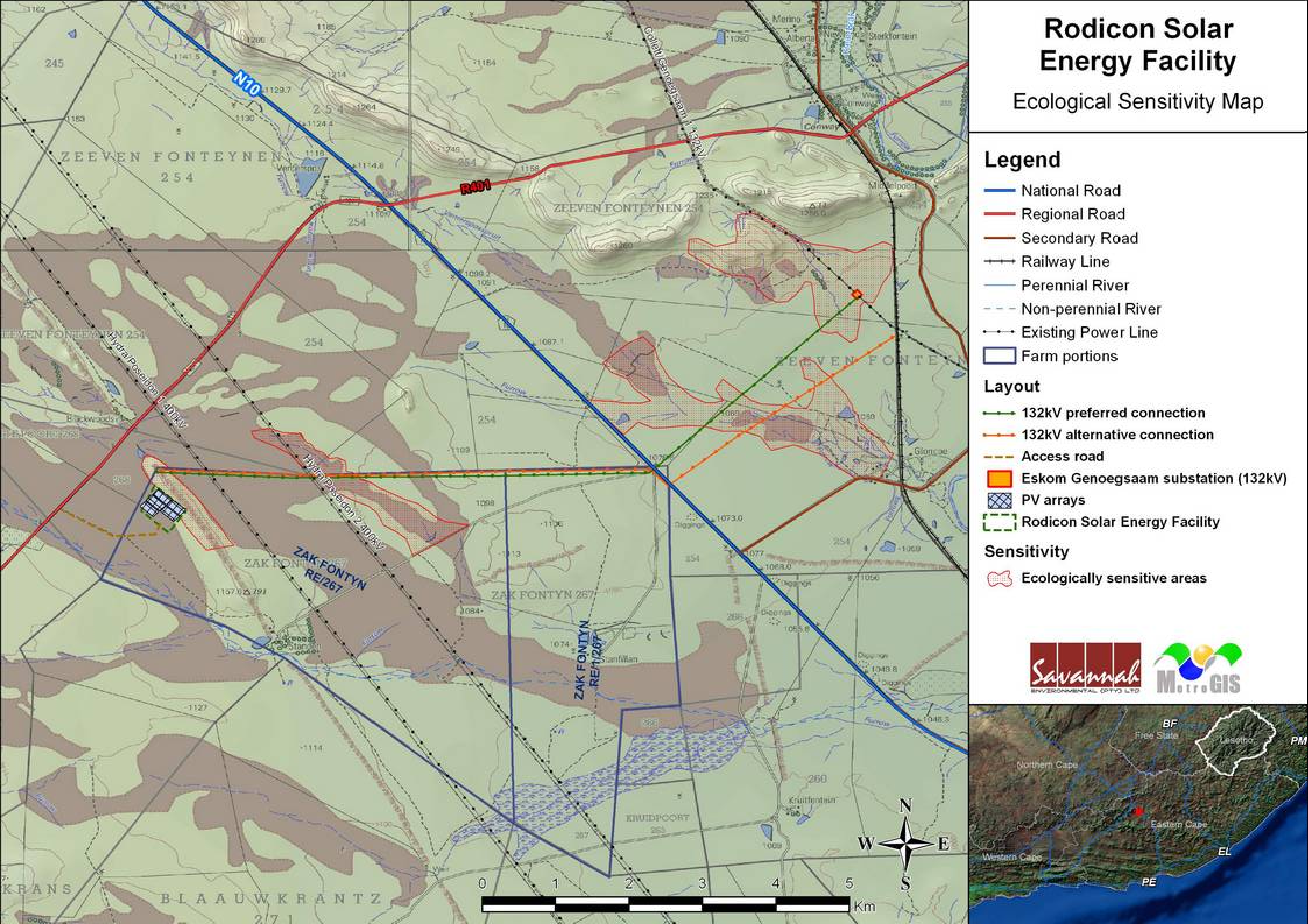
Mitigation: Action/control	**Responsibility**	**Timeframe**
Retrenchments should comply with current South African Labour Legislation.	Rodicon Solar Energy Facility	Decommissioning

Performance Indicator	Relevant South African Labour Legislation.
Monitoring	No occurrences of dismissals not in-line with South African Labour Legislation.

FINALISATION OF THE EMP CHAPTER 10

The EMP is a dynamic document, which must be updated to include any additional specifications as and when required. It is considered critical that this draft EMP be updated to include site-specific information and specifications following the final walk-through survey by specialists of the power line, and development site. This will ensure that the construction and operation activities are planned and implemented considering sensitive environmental features.

Appendix G:
Sensitivity Map



Rodicon Solar Energy Facility
Ecological Sensitivity Map
Legend
National Road
Regional Road
Secondary Road
Railway Line
Perennial River
Non-perennial River
Existing Power Line
Farm portions
Layout
132kV preferred connection
132kV alternative connection
Access road
Eskom Genoegsaam substation (132kV)
PV arrays
Rodicon Solar Energy Facility
Sensitivity
Ecologically sensitive areas
Savannah ENVIRONMENTAL (PTY) LTD
MetroGIS
N10
R401
ZEEVEN FONTEYNEN 254
ZEEVEN FONTEYNEN 254
ZAK FONTYN RE/267
ZAK FONTYN RE/1/267
ZAK FONTYN 267
KRUIDPOORT
BLAAUWKRANTZ
Hydra/Poseidon 1 400kV
Hydra/Poseidon 2 400kV
Collett/Genoegsaam 1 132kV
N
W
E
S
0
1
2
3
4
5
Km
Northern Cape
Free State
Lesotho
Eastern Cape
Western Cape
BF
PM
EL
PE

Rodicon Solar Energy Facility

Heritage Sensitivity Map

Legend

- National Road
- Regional Road
- Secondary Road
- Railway Line
- Perennial River
- Non-perennial River
- Existing Power Line
- Farm portions

Layout

- 132kV preferred connection
- 132kV alternative connection
- Access road
- PV arrays
- Rodicon Solar Energy Facility

Sensitivity

- Stone artefact occurrence