TERRESTRIAL BIODIVERSITY COMPLIANCE STATEMENT

ROMA ENERGY, VANRHYNSDORP

THE PROPOSED DEVELOPMENT OF A 10MW PV SOLAR- AND A HYDROGEN PLANT ON PORTION 7 OF THE FARM DUINEN NO 258, NEAR VANRHYNSDORP, MATZIKAMA LOCAL MUNICIPALITY, WESTERN CAPE PROVINCE.

PREPARED FOR:

ENVIROAFRICA CC

PREPARED BY:

PJJ BOTES (PRI. SCI. NAT.)

31 JANUARY 2023

22 Buitekant Street
Bredasdorp
7280

Cell: 082 921 5949
Fax: 086 611 0726
Email: peet@pbconsult.co.za

EXECUTIVE SUMMARY

VEGETATION TYPE	**Vanrhynsdorp Gannabosveld** The vegetation type is considered **Least Threatened** in terms of the "*Revised List of ecosystems that are threatened and in need of protection*" (GN 47526 of 18 November 2022). According to the 2004 National Spatial Biodiversity Assessment (NSBA), approximately 79% of the Vanrhynsdorp Gannabosveld vegetation remains, with the main reasons for the transformation of the remainder being cultivation and open-cast gypsum mining. A conservation target of 28% has been set for this vegetation type (none of which was formally conserved during 2004), but with the recent proclamation of the Knersvlakte Nature Reserve, some of this vegetation type is now formally conserved.
LAND-USE	The proposed development will impact on a small area used for grazing by the landowner. Loss of grazing will be barely perceptible within the larger property.
VEGETATION ENCOUNTERED	The recent ongoing drought left its mark on the veld, and many plants within the study area and surroundings showed signs of being severely affected by the dry spell. At the time of the study the vegetation was described as a low open shrubland (< 0.5 m high), supporting a disturbed version of Gannabosveld, dominated by *Salsola zeyheri* (Gannabos), and hardy *Mesembryanthemum* species. Gannabosveld is normally not known to have a high species turnover, but even so, the number of plant species encountered was lower than expected, which is probably a combination of the ongoing drought (leaf succulents being very susceptible to extended dry spells) together with historic and present grazing practices. Apart from the vegetation itself, no other biodiversity feature of note was observed within the study area (e.g., no streams or watercourses, "heuweltjies" – Termite mounds, or true quartz patches). Scattering of quartz pebbles were sometimes exposed, but no true quartz patches was observed (Refer to Heading 4.2 & 4.3 for a full description of vegetation and flora).
CONSERVATION PRIORITY AREAS	The proposed site falls within the **Knersvlakte Centre of Endemism**, but is located on the sandy soils, dominated by Gannabos (*Salsola* species), to the south of the true quarts-field flora and although it is likely that the veld will support a number of annual and geophyte flora (which can result in spectacular flower displays in spring after good rains), it is unlikely that the proposed development (given its relative small size and location) will result in any significant impact on the true Knersvlakte vegetation. According to the Western Cape Biodiversity Spatial Plant, the site is located within an **ecological support area** identified as a water recharge area. In this case the proposed site is located on a sandy plain sloping towards the Droë River to its northwest), but with developed vineyards adjacent and directly in the path of any surface drainage. Underground water recharge will not be significantly hampered by the proposed development; since the surface area is very small and will not be impregnable (underground water recharge will still be able from the site).
CONNECTIVITY	The location (adjacent to existing agricultural land) and relatively small size of the site will also not lead to a significant reduction in connectivity.
PROTECTED PLANT SPECIES	No Red list species was encountered (Heading 4.6.1), or species protected in terms of NEMBA (Heading 4.6.2), or species protected in terms of the NFA (Heading 4.6.3). A small number of the alien *Prosopis* trees and the shrub *Atriplex lindleyi* were observed and an alien eradication plan should be implemented to ensure the control of these species within the development footprint.
ANIMAL SPECIES THEME SENSITIVITY	According to the **NEMA EIA Sensitivity** scan for the site generated on 03/05/2022 by EnviroAfrica the Animal Species Theme Sensitivity is **high sensitive** because of the potential presence of two bird species (two invertebrate species (Refer to Table 5) and one sensitive species 13: They are: Aves – *Circus maurus* (Black Harrier): With regards to this species the sensitivity rating should be **low sensitive** (Refer to Table 7); Aves – *Neotis ludwigii* (Ludwig's Bustard): With regards to this species the sensitivity rating should be **low sensitive**. (Refer to Table 7);

Reptile – Sensitive species 13: With regards to this species the sensitivity rating should be **low sensitive**. (Refer to Table 6);

Invertebrate – *Brinckiella mauerbergerorum* (The Sandveld Winter Katydid): With regards to this species the sensitivity rating should be **low sensitive**. (Refer to Table 5);

Invertebrate – *Brinckiella aptera* (The Mute Winter Katydid): With regards to this species the sensitivity rating should be **low sensitive**. (Refer to Table 5);

WATER COURSES AND WETLANDS

There are no watercourses or wetlands on or nearby the site. The nearest watercourse is the Droë River, approximately 850m north-north-west of the proposed site.

TERRESTRIAL BIODIVERSITY THEME SENSITIVITY

According to the **NEMA EIA Sensitivity** scan for the site generated on 03/05/2022 by EnviroAfrica the Terrestrial Biodiversity Theme Sensitivity is **very high sensitive** because of it being located within a ESA 1 and within the Knersvlakte Centre of Endemism. The CBA is discussed under Heading 4.4 and Knersvlakte under Heading 4.5. The overall impact on terrestrial biodiversity is discussed under Heading 7. The proposed development site is not considered sensitive in terms of terrestrial biodiversity.

Because of the small scale of the development, the impact on the CBA, the Knersvlakte Centre of Endemism and Connectivity will be minimal. The vegetation is considered disturbed, and no protected or endangered fauna or flora was observed. In addition, the potential impact on fauna and avifauna is expected to be very low to insignificant. As a result, the overall impact on **Terrestrial Biodiversity Sensitivity should be Low sensitive** (Refer to Table 15).

MAIN CONCLUSION

The proposed development will result in the permanent transformation of <20ha of natural veld covered by a vegetation type considered least threatened. There are no special habitats within or near the proposed footprint that will be impacted by the development (even though it falls within the Knersvlakte Centre of Endemism). It is highly unlikely that the proposed development will have any significant impact on protected or endangered fauna or flora.

According to the impact assessment given in Table 15, the proposed development is unlikely to result in any significant impact and with good environmental control, the development is likely to result in a Low impact on the environment.

With the correct mitigation it is considered highly unlikely that the proposed development will contribute significantly to any of the following:

- Significant loss of vegetation type and associated habitat.
- Loss of ecological processes (e.g., migration patterns, pollinators, river function etc.) due to construction and operational activities.
- Loss of local biodiversity and threatened plant species.
- Loss of ecosystem connectivity.

WITH THE AVAILABLE INFORMATION IT IS RECOMMENDED THAT PROJECT BE APPROVED SINCE IT IS UNLIKELY TO RESULT IN A SIGNIFICANT TERRESTRIAL BIODIVERSITY IMPACT.

NO-GO OPTION

The "No-Go Alternative" alternative will not result in significant gain in regional conservation targets, the conservation of rare & endangered species or gain in connectivity. At the best the No-Go alternative will only support the "*status quo*" on the site. On the other hand, the pressure on Eskom facilities, most of which is currently still dependant on fossil fuel electricity generation, will remain. Solar power remains a much cleaner and more sustainable option for electricity production.

DETAILS OF THE AUTHOR

This is a specialist report compiled by Peet Botes from PB Consult.

COMPANY NAME: PB Consult Sole Proprietor
PHYSICAL ADDRESS: 22 Buitekant Street, Bredasdorp, 7280
CELL PHONE: +27 (82) 921 5949
EMAIL: peet@pbconsult.co.za
FAX: 086 – 611 0726

INDEPENDENCE & CONDITIONS

PB Consult is an independent entity with no interest in the activity other than fair remuneration for services rendered. Remunerations for services are not linked to approval by decision making authorities and the company have no interest in secondary or downstream development because of the authorization of this project. There are no circumstances that compromise the objectivity of this report. The findings, results, observations and recommendations given in this report are based on the author's best scientific and professional knowledge and available information. The author reserves the right to modify aspects of this report, including the recommendations if new information become available which may have a significant impact on the findings of this report.

RELEVANT QUALIFICATIONS & EXPERIENCE OF THE AUTHOR

Mr. Peet Botes holds a BSc. (Hons.) degree in Plant Ecology from the University of Stellenbosch (Nature Conservation III & IV as extra subjects). Since qualifying with his degree, he had worked for more than 20 years in the environmental management field, first at the Overberg Test Range (a Division of Denel) managing the environmental department of OTR and being responsible for developing and implementing an ISO14001 environmental management system, ensuring environmental compliance, performing environmental risk assessments with regards to missile tests and planning the management of the 26 000 ha of natural veld, working closely with CapeNature (De Hoop Nature Reserve).

In 2005 he joined Enviroscientific, an independent environmental consultancy specializing in wastewater management, botanical and biodiversity assessments, developing environmental management plans and strategies, environmental control work as well as doing environmental compliance audits and was also responsible for helping develop the biodiversity part of the Farming for the Future audit system implemented by Woolworths. During his time with Enviroscientific he performed more than 400 biodiversity en environmental legal compliance audits.

During 2010 he joined EnviroAfrica in order to move back to the biodiversity aspects of environmental management. Experience with EnviroAfrica includes NEMA EIA applications, environmental management plans for various industries, environmental compliance audits, environmental control work as well as more than 70 biodiversity & botanical specialist studies.

Towards the end of 2017, Mr Botes started his own small environmental consulting business focusing on biodiversity & botanical assessments, biodiversity management plans and environmental compliance audits.

Mr. Botes is a registered Professional Botanical, Environmental and Ecological Scientists at SACNASP (South African Council for Natural Scientific Professions) as required in terms of Section 18(1)(a) of the Natural Scientific Professions Act, 2003, since 2005 (SACNASP no. 400184/05).

DECLARATION OF INDEPENDENCE

THE INDEPENDENT PERSON WHO COMPILED A SPECIALIST REPORT OR UNDERTOOK A SPECIALIST PROCESS

I Petrus, Jacobus, Johannes Botes, as the appointed independent specialist hereby declare that I:

- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014, as amended, and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2014 (specifically in terms of regulation 13 of GN No. R. 326) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- have ensured that the names of all interested and affected parties that participated in terms of the specialist input/study were recorded in the register of interested and affected parties who participated in the public participation process;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 13 of GN No. R. 326.

Note: The terms of reference must be attached.

Signature of the specialist:

PB Consult (Sole Proprietor)

Name of company:

31 January 2023

Date:

COMPLIANCE WITH APPENDIX 6 OF GN. 982 (4 DECEMBER 2014)

Specialist reports

1. A specialist report prepared in terms of these regulations must contain -	
a) Details of –	**Refer to:**
(i) The specialist who prepared the report; and	Refer to Page iii, iv & Appendix 1
(ii) The expertise of the specialist to compile a specialist report including a curriculum vitae;	Refer to Page iii, iv & Appendix 1
b) A declaration that the specialist is independent in a form as may be specified by the competent authority;	Refer to Page iv
c) An indication of the scope of, and the purpose for which the report was prepared;	Refer to Heading 1.2
d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Refer to Heading 3
e) A description of the methodology adopted in preparing the report or carrying out the specialist process inclusive of equipment and modeling used;	Refer to Heading 3
f) Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructures, inclusive of a site plan identifying site alternative;	Refer to Headings 7 & 8
g) An identification of any areas to be avoided, including buffers;	Refer to Heading 7, Figure 14
h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Refer to Heading 7, Figure 14
i) A description of any assumptions made and any uncertainties or gaps of knowledge;	Refer to Heading 3.1
j) A description of the findings and potential implications of such findings on the impact of the proposed activity, [including identified alternatives on the environment] or activities;	Refer to Heading 4, 5 & 7, Figure 14
k) Any mitigation measures for inclusion in the EMPr;	Heading 8.1
l) Any conditions for inclusion in the environmental authorization;	None
m) Any monitoring requirements for inclusion in the EMPr or environmental authorization;	Refer to Heading 8.1
n) A reasoned opinion -	
(i) [as to] whether the proposed activity, activities or portions thereof should be authorized;	Refer to the "*Executive Summary*" (Page i & ii)
(iA) regarding the acceptability of the proposed activity or activities; and	
(ii) if the opinion is that the proposed activity, activities or portions thereof should be authorized, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable the closure plan;	Refer to the "*Executive Summary*" (Page i & ii)
o) A description of any consultation process that was undertaken during the course of preparing the specialist report;	N/a
p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/a
q) Any information requested by the competent authority.	N/a
2. Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	

CONTENTS

LIST OF TABLES:

LIST OF FIGURES

LIST OF PHOTOS

ABBREVIATIONS

BAR	Basic Assessment Report
BGIS	Biodiversity Geographical Information System
CBA	Critical biodiversity area (in terms of the 2017 City of Cape Town Biodiversity Network)
DEA	Department of Environmental Affairs
EA	Environmental Authorization (Record of Decision)
EAP	Environmental assessment practitioner
ECO	Environmental Control Officer
EIA	Environmental impact assessment
EMP	Environmental Management Plan or Program
EMS	Environmental management system
EN	Endangered
ESA	Ecological support area (in terms of the 2017 City of Cape Town Biodiversity Network)
LT	Least Threatened
NSBA	National Spatial Biodiversity Assessment
NEMA	National Environmental Management Act, 1998 (Act no. 107 of 1998)
SANBI	South African National Biodiversity Institute
VU	Vulnerable

1. INTRODUCTION

Roma Energy Vanrhynsdorp is proposing the establishment of a 10 MW concentrated photovoltaic solar energy facility and an electrolysis hydrogen plant on portion 7 of the farm Duinen No 258, near Vanrhynsdorp, (Western Cape Province). The farm Duinen 258/7 is approximately 271.7 ha in size. The proposed PV Solar- and Hydrogen Plant will be located within a 20 ha portion of this farm (refer to Figure 2). The purpose of the proposed facility is to sell electricity to Eskom as part of the Renewable Energy Independent Power Producers Procurement Programme. This programme has been introduced by the Department of Energy to promote the development of renewable power generation facilities.

PB Consult had previously done two botanical/biodiversity assessments on the same property and basically for the same project. During 2012, PB Consult was appointed by EnviroAfrica to assessed and reported on the potential biodiversity impacts of this project on the proposed footprint (Refer to Botes, 2012) as part an environmental impact assessment application to the Department of Environmental Affairs. Environmental authorisation (EA) was granted but the EA expired before physical work on the site could commence. During 2017, PB Consult was again appointed to submit an updated report for the same project (Refer to Botes, 2017), but the solar plant had been reduced to a 5 MW plant to be located within the same 20 ha portion of land. This application was lawfully approved by the then National Department of Environmental Affairs for the development of the Vanrhynsdorp Solar Photovoltaic (PV) Facility (DEA Ref no. 14/12/16/3/3/1/1854) on the same 20 .

The applicant would now like to increase the Solar PV plant to a 10MW plant and also add a Hydrogen Plant within the same 20 ha portion of land. The DEA&DP advised that a substantive amendment application would have to be submitted and that all specialists reports needs to be updated (which could be in the form of a statement).

PB Consult was again appointed to submit an updated report that must consider the new project description and the latest legal requirements for specialist reports. Since the proposed site had been visited twice on previous occasions no further site visit was performed. To ensure that all requirements for specialist reports are met, the previous reports was re-written into this report, which replaces all previous reports.

Only one vegetation type is expected, namely Vanrhynsdorp Gannabosveld, a vegetation type that is still considered “Least Threatened” in terms of the revised National list of ecosystems that are threatened and in need of protection (2022). . The vegetation on site is described as an arid landscape supporting a *Salsola* dominated low open shrubland with a sparse vegetation cover. There are no watercourses or wetlands on or nearby the site. The nearest watercourse is the Droë River, approximately 850m north-north-west of the proposed site.

1.1. LEGISLATION GOVERNING THIS REPORT

The proposed development will trigger listed activities under the National Environmental Management Act, (Act 107 of 1998) (NEMA) and the EIA regulations (as amended). EnviroAfrica was appointed as the Environmental Assessment Practitioners (EAP) to facilitate the NEMA EIA application. PB Consult was appointed to conduct a terrestrial biodiversity scan of the proposed footprint area and

its immediate surroundings.

This is a 'specialist report', compiled in terms of:

- The National Environmental Management Act, Act. 107 of 1998 (NEMA);
- Appendix 6 of the Environmental Impact Assessment Regulations, 2014 (as amended);
- The "Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes" in terms of Sections 24(5)(a) and (h) and 44 of the NEMA (Government Notice No. 320 of 20 March 2020).
- The National Environmental Management: Biodiversity Act, Act 10 of 2004, which allows for the conservation of endangered ecosystems and restriction of activities according to the status of the ecosystem;
- The National Forest Act, Act 84 of 1998, which provide a list of protected trees species in SA;

1.2. TERMS OF REFERENCE

The terms of reference for this appointment were to:

- Evaluate the proposed site(s) to determine whether any significant botanical or other terrestrial biodiversity features will be impacted as a result of the proposed development.
- Determine and record the position of any plant species of special significance (e.g., protected species, or rare or endangered species) that should be avoided or that may require "search & rescue" intervention.
- Locate and record sensitive areas from a terrestrial biodiversity perspective within the proposed development footprint that may be interpreted as obstacles to the proposed development.
- Make recommendations on impact minimization should it be required
- Consider short- to long-term implications of impacts on biodiversity and highlight irreversible impacts or irreplaceable loss of species.

2. STUDY AREA

2.1. LOCATION & LAYOUT

Vanrhynsdorp falls within the Matzikama Local Municipality of the Western Cape Province, and is located just off the N7, just north of Klawer. Portion 7 of the Farm Duinen no. 258 is located about 2 km north of the Vanrhynsdorp urban edge and about 1.3 km west-northwest of Maskamsig (refer to Figure 1 & Figure 2). The farm itself is about 271, 7 , located to the east of the N7. The proposed solar and hydrogen plant will be located within a 20 ha portion of the larger farm (the same 20 ha area already lawfully approved for the establishment of a 5 MW solar plant).

Figure 2, shows the location of the farm (in green) and the proposed development footprint (red) in relation to Vanrhynsdorp and Maskamsig, existing agriculture and the nearest water courses.

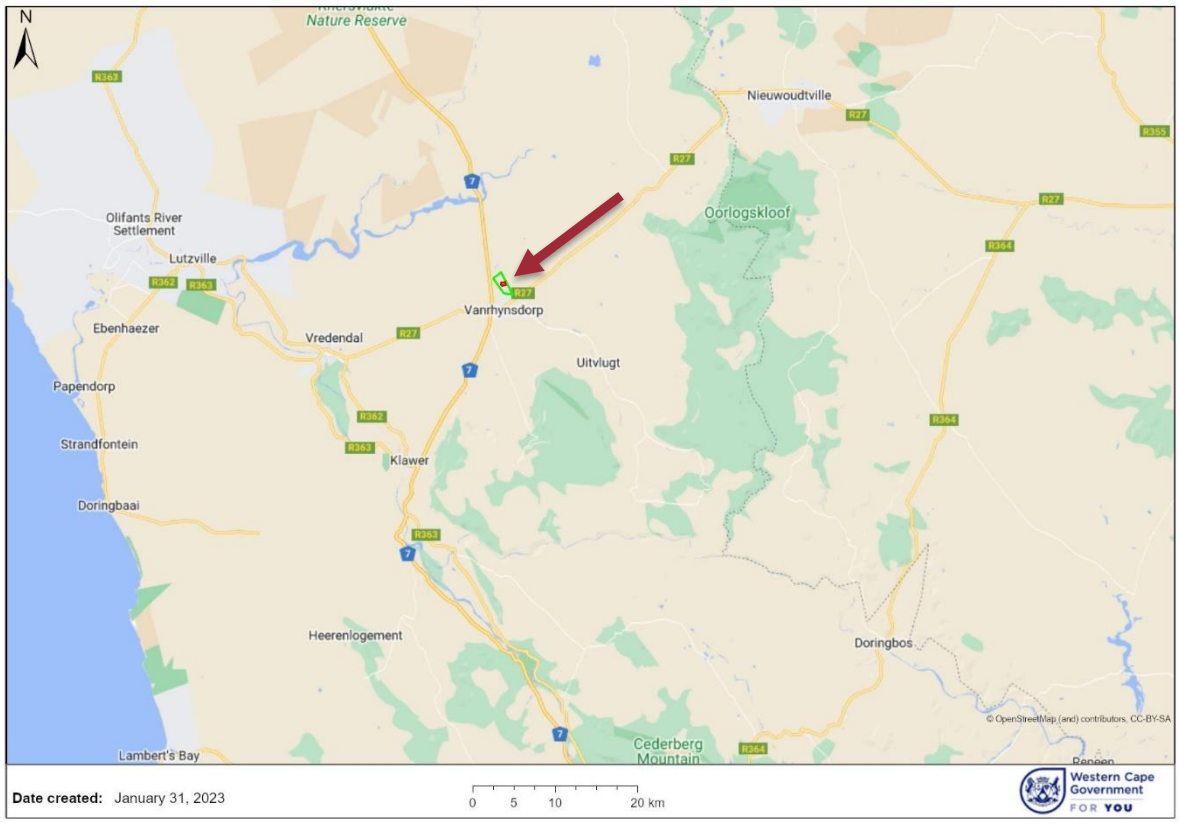


Figure 1: A map showing the location of the farm (Green) and the proposed development site (red) in the Western Cape

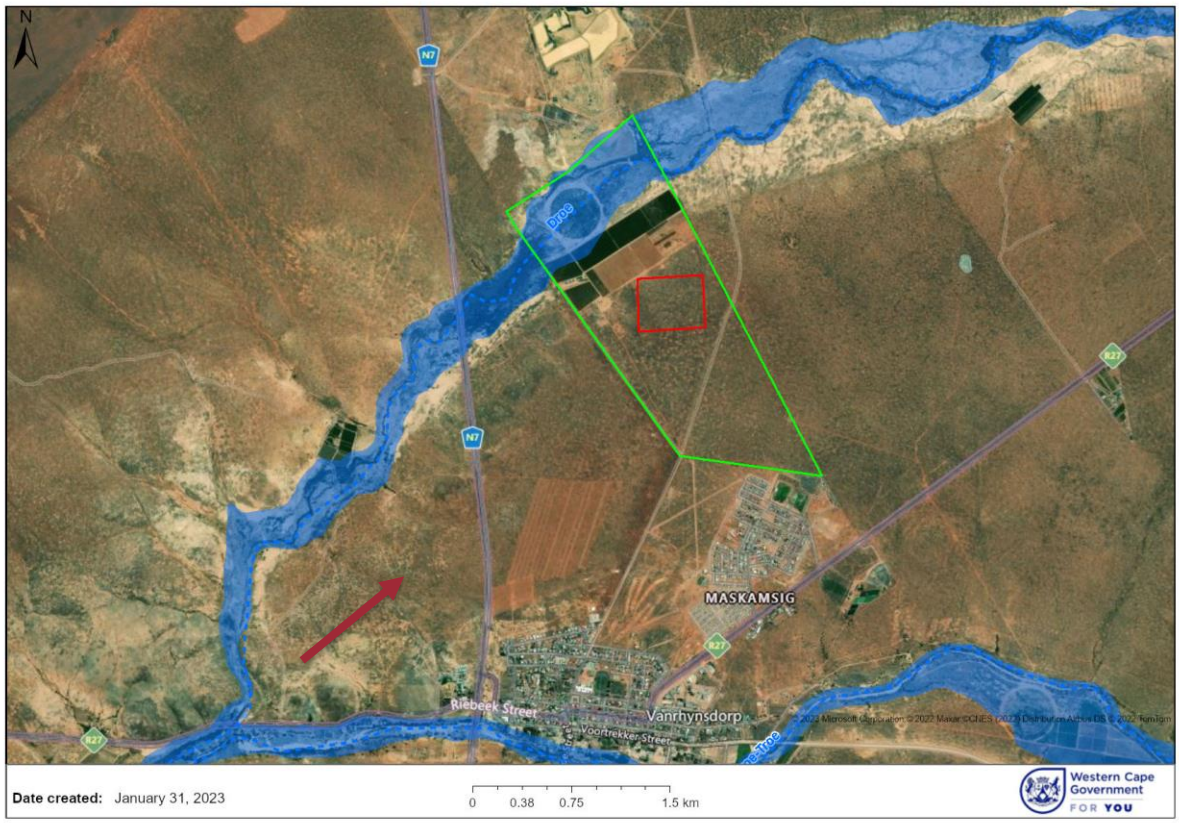


Figure 2: The location of the farm (green) and the proposed footprint (red) in relation to Vanrhynsdorp and Maskamsig

Table 1: GPS coordinates for the boundaries of the proposed solar & hydrogen plant location (WGS 84 format)

DESCRIPTION	LATITUDE AND LONGITUDE
North-west corner	S31° 34' 44.0" E18° 44' 32.0"
North-east corner	S31° 34' 43.6" E18° 44' 43.2"
South-east corner	S31° 34' 57.1" E18° 44' 44.3"
South-west corner	S31° 34' 57.0" E18° 44' 32.4"

2.2. ACTIVITY DESCRIPTION

Roma Energy Vanrhynsdorp proposes the establishment of a 10 MW concentrated photovoltaic solar energy facility and an electrolysis hydrogen plant on portion 7 of the farm Duinen No 258, near Vanrhynsdorp, (Western Cape Province). The facility will be established within an area of less than 20 ha on the Farm (Figure 1).

The proposed facility will utilise Concentrated Photovoltaic (CPV) technology, which aims to concentrate the light from the sun, using Fresnel lenses, onto individual PV cells. This method increases the efficiency of the PV panels as compared to conventional PV technology. An inverter is then used to convert the direct current electricity produced into alternating current for connection into the Eskom grid. A single solar generator produces approximately 66kV. In order to produce 10 MW, the proposed facility will require a number of generators arranged in multiples/arrays. The CPV panels will be elevated by a support structure, and will be able to track the path of the sun during the day for maximum efficiency. Approximately 1.8 ha is required per installed MW. A 10 MW capacity facility will thus require a development footprint of approximately 20 ha (including associated infrastructure – ancillary infrastructure).

The typical footprint of a 5MW electrolysis hydrogen plant is aproximately 120 m x 60 m.

The site can be accessed from Vanrhynsdorp, taking the Maskamsig road north onto the existing secondary road leading north towards the Farm De Duinen (Figure 3). Site preparation will include clearance of vegetation within the footprint to support the following infrastructure:

- Support structures (approximately 148 units are proposed) (excavations of 1 m^2 by 5 m deep)
- Switchgear
- Inverters
- Workshops
- Trenches for the underground cabling
- The hydrogen plant with a footprint of approximately 120 m x 60 m.

The activities will require the stripping of topsoil, which will need to be stockpiled, backfilled and/or spread on site.

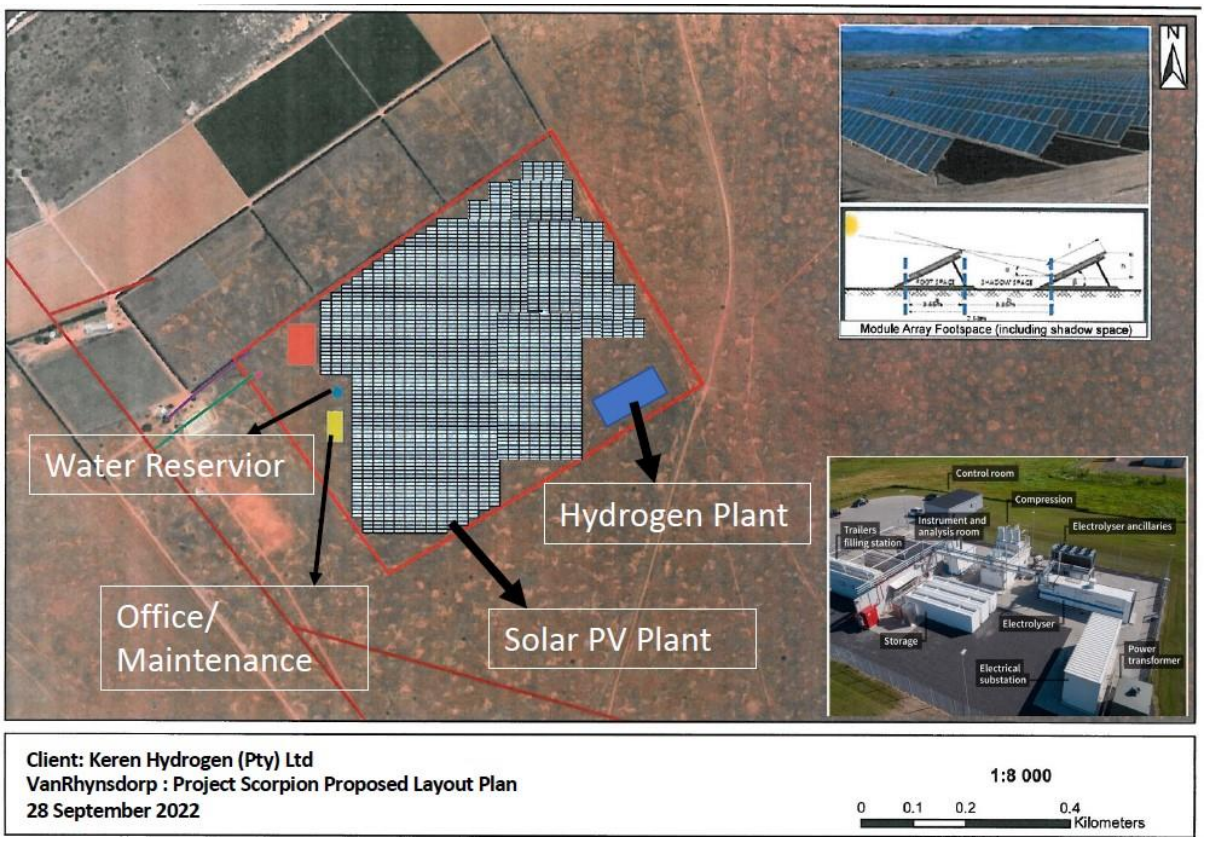


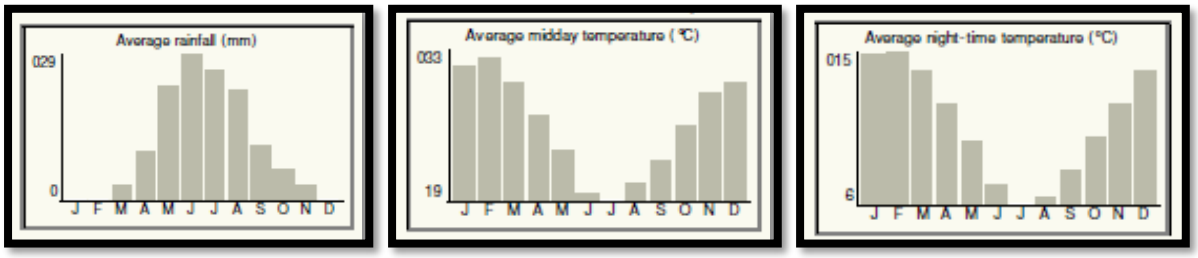
Figure 3: A schematic layout (as an example) of the proposed development footprint

2.3. CLIMATE

The Succulent Karoo Biome is primarily determined by the presence of low winter rainfall and extreme summer aridity. Rainfall varies between 20 and 290 mm per year. The rains are cyclonic and not in the form of thunderstorms, which means that its erosive power is far less than what is experienced in the summer rainfall biomes and the rain itself is more penetrative. During summer, temperatures in excess of 40°C are common. Fog is common nearer the coast. Frost is infrequent. Desiccating, hot, Berg Winds may occur throughout the year. However, the main feature of this climate is the predictability of its rainy season (Van Wyk & Smith, 2001 and Mucina *et al*, 2006).

All regions with a rainfall of less than 400 mm per year are regarded as arid. Vanrhynsdorp normally receives about 133 mm of rain per year and because it receives most of its rainfall during winter it has a Mediterranean climate. It receives the lowest rainfall (0 mm) in January and February and the highest (29 mm) in June. The monthly distribution of average daily maximum temperatures (centre chart below) shows that the average midday temperatures for Vanrhynsdorp range from 19.3°C in July to 32.3°C in February. The region is the coldest during July when the temperature drops to 5.9°C on average during the night (www.saexplorer.co.za).

Figure 4: A summary of climate data as given by saexplorer



2.4. TOPOGRAPHY

The landscape is mainly flat, or only slightly undulating, supporting succulent shrubland dominated by *Salsola* species (ganna), including representatives of the genera *Galenia*, *Psilocaulon*, *Caulipsolon* and *Mesembryanthemum*. The footprint of the proposed solar site is almost flat, but with a slight slope towards the Droë River (Figure 5). Elevation varies from 138 m at the south-east corner (the higher point) to approximately 129 m at the north-western corner of the site (lowest point) with an average slope of 1.5% and an elevation loss of about 9 m.

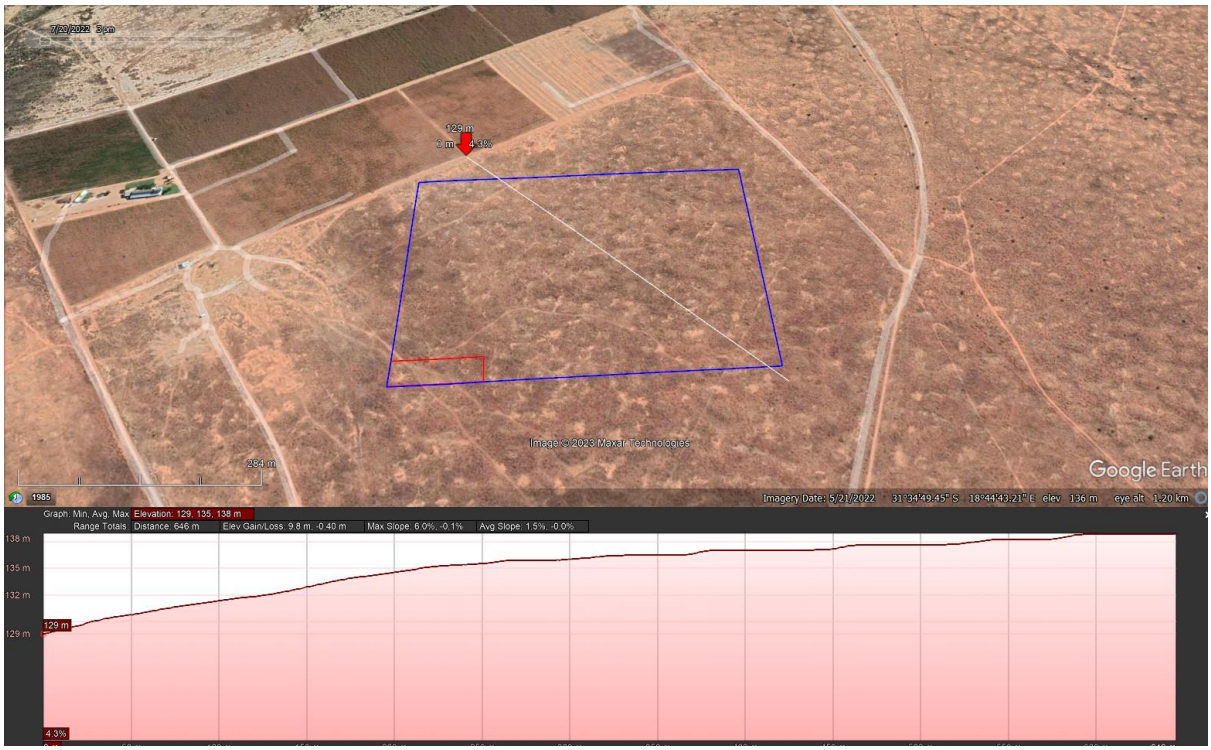


Figure 5: Google image, showing the topography of the site as it site slopes from east to west (towards the Droë River).

There are no watercourses or wetlands on or nearby the site. The nearest watercourse is the Droë River, approximately 850m north-north-west of the proposed site.

It is highly unlikely that topography will have a significant impact on plant or animal communities within this relatively small and level site.

2.5. GEOLOGY AND SOILS

According to Mucina and Rutherford (2006) and the SANBI Biodiversity Geographical Information System, the greater part of this area is underlain by schist's, phyllite and sandstones of the Gariep Supergroup, which outcrop when they are not covered by recent superficial deposits of alluvium and duripan crusts (calcrete). Soils are described as soils with minimal development usually shallow on hard weathered rock, with intermitted diverse soils (lime generally present in part or most of the landscape). Soils are generally sandy-loamy, slightly acid to alkaline, with high skeletal content. More than half of the area is classified as Ag land type, followed by Fc land type, with Db and Ae land types only of minor importance. This correlates with the Geology map of South Africa (Figure 6) which described the Lithology of the site as "Alluvium, colluvium, eluvium, boulder gravel, gravel, scree, sand, soil, debris" (Council for Geoscience Interactive Web Portal - https://maps.geoscience.org.za/) (Figure 6).

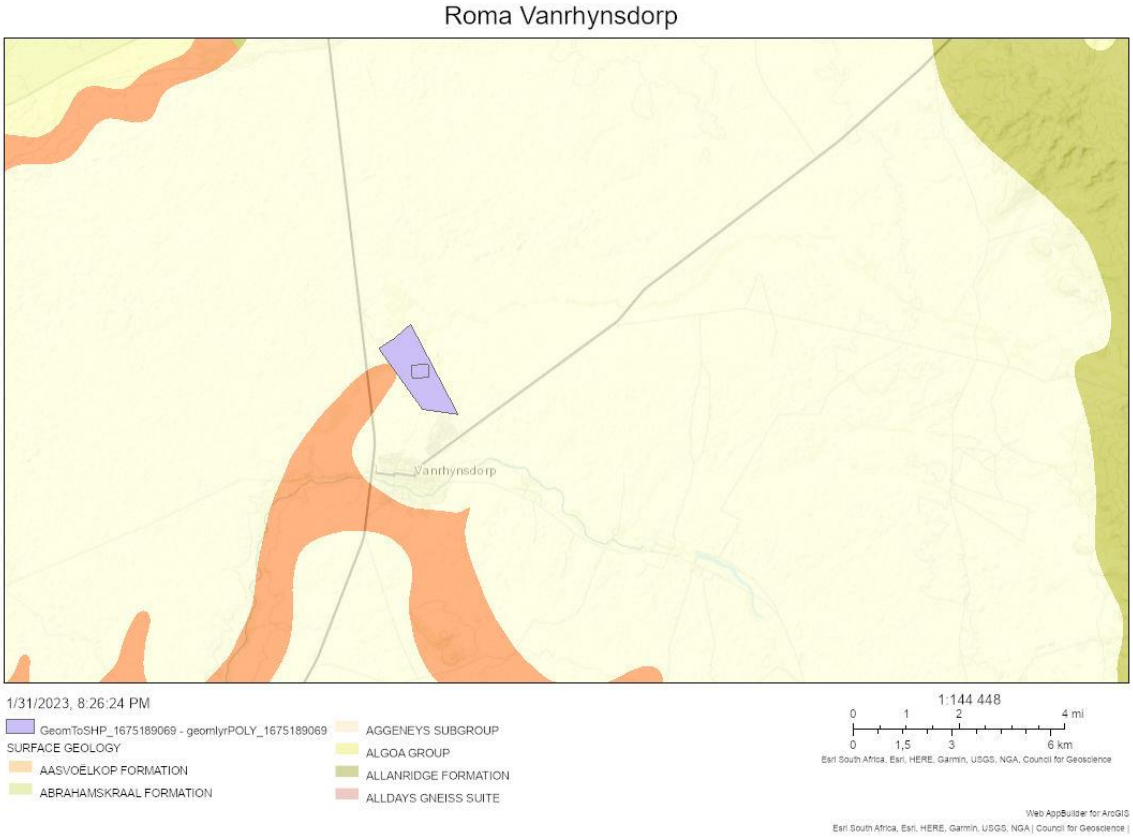


Figure 6: Geology of South Africa showing the site location (Council for Geoscience Interactive Web Portal)

2.6. LANDUSE AND COVER

The study area is located on an almost level area in a slightly undulating landscape, just north of Vanrhynsdorp and south-east of the Droë River. The property is zoned as agriculture and used for stock grazing. Smaller game species is still expected in the larger area (refer to).

Vanrhynsdorp is situated at the outskirts of the immense, semi-desert Nama-Karoo with its vegetation of succulents and semi-arid climate. It has a prominent tourism sector and socio-economic

development is supported by this industry. Due to the availability of land, it has been reported that industrial land near Vanrhynsdorp is intended for power generation, manufacturing, industrial plants, distribution hubs, or major infrastructural facilities. Such developments require sizeable capital investment and often generate consequential economic growth in terms of labour and peripheral industries. The proposed site is geographically close to Vanrhynsdorp. The main land use of the study area is grazing, with power transmission lines running to the south and west of the proposed site. Natural vegetation can be described as an open sparse shrub layer, dominated by *Salsola* over a shorter grassy/shrub layer. Occasional individuals of the invasive alien tree, *Prosopis,* were encountered. The site is adjacent to an area which is intensively cultivated but will not impact on the existing agricultural footprint (Refer to Figure 2 - Figure 5).

3. APPROACH & METHODOLOGY

Various a desktop studies of the proposed footprint and its immediate surroundings was conducted over the years (since 2012). Spatial information from online databases such as CapeFarmMapper, SANBI BGIS and Google Earth were used to evaluate the site in terms of vegetation, critical biodiversity areas and other potential significant features that might be encountered (e.g., variations in soil type, rocky outcrops etc.) and obvious differences in landscape or vegetation densities, which might indicate differences in plant community or species composition. This information is used to prepare a study area map, which is used as a reference during the physical site visit.

Plant species lists (of the expected plant species for this vegetation type) are prepared and species of special significance are flagged (used as reference during the site visit). The desktop study led to the following conclusions:

- It is almost certain that the proposed footprint still supports indigenous vegetation;
- The vegetation type is expected to be Vanrhynsdorp Gannabosveld, which is considered “Least Threatened” in terms of the revises National list of threatened terrestrial ecosystems (2022);
- According to CapeFarmMapper the proposed footprint does not overlap Critical Biodiversity Area’s, but is considered an Ecological Support Area (Refer to Figure 9);

Two formal site visits were performed, one during 2012 (27/02/2012) and one during 2017 (02/06/2017), but the site was also visited on various other occasions over the recent years. The site assessment surveys were conducted by walking the site and sampling the vegetation, using a modified approach, based on the Braun-Blanquet vegetation survey method (Werger, 1974). During the site visit areas or plants of specific significance was, marked, and photographed (Figure 7). A hand-held Garmin GPSMAP 62s was used to track the sampling route and for recording waypoints of locations of specific importance. During the survey notes, and photographic records were collected. The author endeavoured to identify and locate all significant botanical features, including special plant species and or specific soil conditions which might indicate special botanical features (e.g., rocky outcrops or heuweltjies) and watercourses.

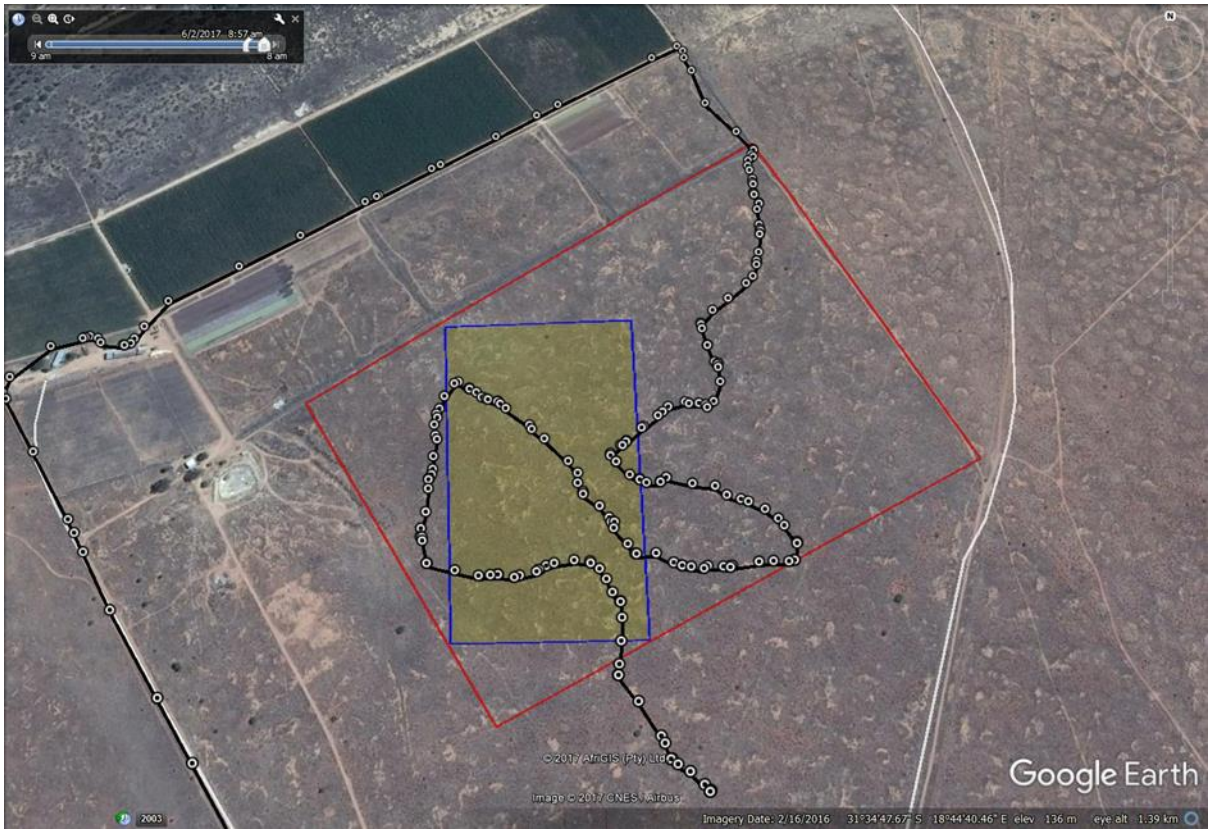


Figure 7: Google overview, showing the footprint area (red) and the routes walked (black) during the site visit.

3.1. ASSUMPTIONS AND UNCERTAINTIES

Botanical assessments were based on two one-day site assessments (one during January 2012, and one during June 2017). At the time of the second site visit the veld still showed the aftereffects of a severe drought period (although recent rains had fallen over the area). Because of the long term drought very few annual plants were visible, and some plants were difficult to identify to species level (no flowers and sometimes even no leaves). However, the author is confident that a good understanding of the biodiversity status of the site was still possible, because of the previous site visit and other work done in the vicinity of the site. The Vanrhynsdorp Gannabosveld is part of the Succulent Karoo Biome (Mucina & Rutherford, 2006) and is strongly influenced by winter rainfall and fog.

The timing of the site visit was relatively good, in that recent rains had already fallen, but they were still struggling to alleviate the effects of the severe long term drought period. Fortunately, most of the perennial plant species were identifiable and together with the previous studies in the same site, a good understanding of the status of the vegetation and plant species in the study areas was obtained, although there is always the possibility that a few plant species might have been missed (some of which may only flower for short periods of time or after rains).

However, there should be no limiting factors which could significantly alter the outcome of this study (keeping in mind that this assessment is not based on long term repetitive sampling).

4. THE VEGETATION & FLORA

According to the 2018 update of the Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006) only one broad vegetation type is expected in the proposed area and its immediate vicinity, namely Vanrhynsdorp Gannabosveld (Figure 8). Acocks (1953) described this vegetation as Succulent Karoo while Low & Rebelo (1996) described this vegetation as Lowland Succulent Karoo. Photo 1 & 2 gives an indication of the vegetation encountered during the site visit.

The site visit confirmed that only Vanrhynsdorp Gannabosveld is present in the larger study area. This vegetation type occurs in the Western Cape Province: Namaqualand, southern Knersvlakte between Vredendal and Vanrhynsdorp at the foot of the Matsikamma and Gifberg Mountains as well as northeast of Vanrhynsdorp. About half of the area lies at altitudes between 100–200 m and most of the rest at altitudes of between 200–300 m. It occurs mainly on flat or only slightly undulating landscapes supporting succulent shrubland dominated by *Salsola* (over large stretches), *Drosanthemum, Ruschia* and some disturbance indicators such as (mainly) short-lived Aizoaceae, including representatives of the genera *Galenia, Psilocaulon, Caulipsolon* and *Mesembryanthemum*. In the south, the shale plains can acquire a grassland appearance through seasonal dominance of *Bromus pectinatus* and *Stipa capensis*. Spectacular annual and geophyte flora can appear in spring after good winter rains.

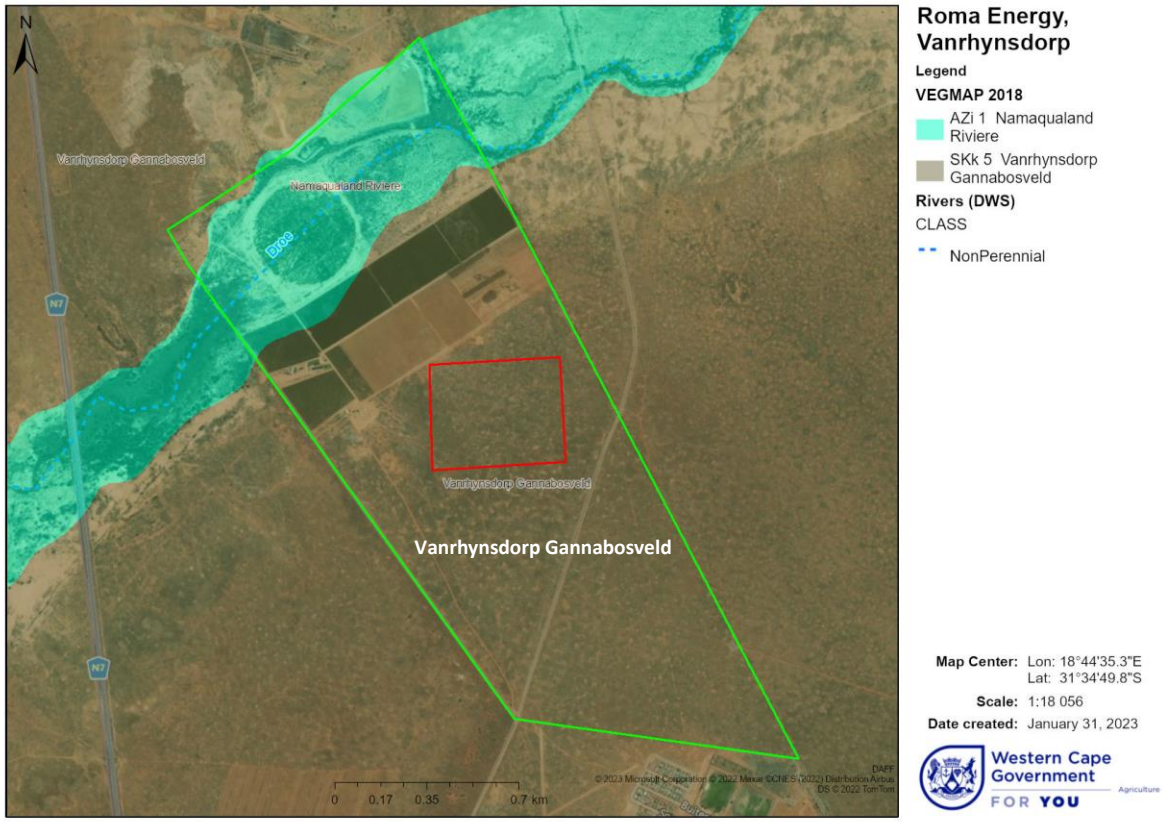


Figure 8: Vegetation map of South Africa (2018), showing the expected vegetation in the vicinity of the footprint.

According to the 2004 National Spatial Biodiversity Assessment (NSBA), approximately 79% of the Vanrhynsdorp Gannabosveld vegetation remains, with the main reasons for the transformation of the remainder being cultivation and open-cast gypsum mining. A conservation target of 28% has been set

for this vegetation type (none of which was formally conserved during 2004), but with the recent proclamation of the Knersvlakte Nature Reserve, at least some of this vegetation type should now be formally conserved. The 2004 NSBA originally classified this vegetation type as vulnerable. However, with more information now available, it was declassified to "least threatened" in the *National list of ecosystems that are threatened and in need of protection* (GN 1002, December 2011).

During 2022 the "*Revised List of ecosystems that are threatened and in need of protection*" (GN 47526 of 18 November 2022), was promulgated in terms of the National Environmental Management Biodiversity Act, Act 10 of 2004. Vanrhynsdorp Gannabosveld vegetation remains classified as "**Least Threatened**" in terms of this updated classification.

4.1. ECOLOGICAL DRIVERS AND THE VEGETATION IN CONTEXT

Vanrhynsdorp Gannabosveld is part of the Succulent Karoo Biome (Mucina & Rutherford, 2006). The Succulent Biome vegetation is strongly influenced by winter rainfall and fog and has been compared to a desert rich in succulents. It is located at altitudes mostly below 800 m, but in the east, it may reach 1 500 m. A variety of geological units occur in the region. There is little difference between the soils of the Succulent Karoo and Nama Karoo Biomes - both are lime-rich, weakly developed soils on rock.

The vegetation is dominated by dwarf, succulent shrubs, of which the Vygies (Mesembryanthemaceae) and Stonecrops (Crassulaceae) are particularly prominent. Mass flowering displays of annuals (mainly Daisies, Asteraceae) occur in spring, often on degraded or fallow lands. Grasses are rare, except in some sandy areas, and are of the C3 type. The number of plant species (mostly succulents) is very high and unparalleled elsewhere in the world for an arid area of this size (Mucina et al, 2006). The unique plant species diversity is thought to be maintained and even thrive because of the reliable rainy season, with prolonged droughts almost non-existent. This climatic predictability is considered one of the main reasons for the remarkably rapid diversification of at least one of the key plant families, namely the Aizoaceae. One viewpoint is that succulents (with their limited water storage capacity and shallow root system) are highly successful in the Namaqualand, because of its predictable rainfall patterns and because extensive droughts periods are almost non-existent, since succulents are also highly sensitive to periodic drought (Mucina et al, 2006).

The Karoo used to support millions of antelope, mainly springbuck, but also numerous other larger antelope. These animals roamed the vast plains of the Karoo, utilizing different selections of plants and allowing for long "rest" periods as they move around, and as a result preventing overgrazing (Shearing, 1994). The Succulent Karoo has little agricultural potential due to the lack of water. The scarcity of grasses limits grazing, and the low carrying capacity requires extensive supplementary feeds.

In semi-arid environments such as the Succulent Karoo, nutrients are generally located near the soil surface, making it vulnerable to sheet erosion and it is generally accepted that much of the topsoil has already been lost, through sheet erosion, because of nearly 200 years of grazing. It is important to note that less than 0.5% of the Succulent Karoo Biome is formally conserved. The high species richness, high number of rare and Red Data Book species and unique global status of the biome require urgent conservation attention (Mucina *et. al*., 2006). Tourism, is a major industry with the coastal scenery and the spring mass flower displays the main attractions, while mining, although to a lesser degree is also important, especially in the north (Mucina *et al*, 2006).

4.2. VEGETATION ENCOUNTERED

The recent ongoing drought left its mark on the veld, and many plants within the study area and surroundings showed signs of being severely affected by the dry spell (Refer to Photo 1 & Photo 2), so much so that most of the Mesembryanthemaceae and even the *Euphorbia* plants had died back. Recent rains brought some relieve with few plants starting to bud and grasses growing in the open areas.

The impact of the drought made positive identification of some species difficult (no flowers and plants without leaves). Gannabosveld is normally not known to have a high species turnover, but even so, the number of plant species encountered was lower than expected, which is probably a combination of the ongoing drought (leaf succulents being very susceptible to extended dry spells) together with historic and present grazing practices. Apart from the vegetation itself, no other biodiversity feature of note was observed within the study area (e.g., no streams or watercourses, "heuweltjies" – Termite mounds, or true quartz patches). Scattering of quartz pebbles were sometimes exposed, but no true quartz patches was observed.

Photo 1: Typical low open shrubland encountered on site, dominated by *Salsola zeyheri* and lower grasses (grazed). Note the Prosopis trees in the far background.

At the time of the study the vegetation was described as a low open shrubland (< 0.5 m high), supporting a disturbed version of Gannabosveld, dominated by *Salsola zeyheri* (Gannabos), and hardy *Mesembryanthemum* species, most notably *Drosanthemum* cf. *hispidum, Mesembryanthemum* cf. *noctiflorum* (=*Aridaria* species) and *Mesembryanthemum junceum* (=Psilocaulon) . The following species were also encountered scattered throughout the site: *Aloe claviflora* (occasionally), *Asparagus* cf. *capensis, Euphorbia mauritania*, *Galenia africana, Mesembryanthemum barkly, M. guerichianum* and *Pteronia* species (no flowers and only dried out remains of the leaves). Grasses were showing in the open areas. The most noteworthy being *Bromus pectinatus*, the spiny *Cladoraphis spinosa* and *Stipa capensis*.

Several alien *Prosopis* trees and some *Atriplex* cf. *lindleyi* (Klappiesbrak) were also observed.

Photo 2: A grassy bottom layer sometimes dominates open patches between the shrubs (probably the result of grazing pressure and the recent rains).

Species like *Galenia africana*, many of the Aizoaceae and *Atriplex* cf. *lindleyi* are normally pioneer species and often disturbance indicators. Together with the observations of *Bromus pectinatus* and *Stipa capensis* it is very likely that the veld has been subjected to grazing (over grazing) over a long period of time by domestic stock (which is more specialized in their grazing habits and tends to have a more severe impact on the veld).

Photo 3: Looking from southeast to northwest over the site, standing in the middle of the site. Note the agricultural area in the background.

Photo 4: Looking from northwest to southeast from the middle of the site. Note the existing power lines running along the entrance road to the site.

4.3. FLORA ENCOUNTERED

Table 2 gives a list of the plant species encountered during this study. Plant species diversity was lower than expected, most likely a combination of long term grazing practices together with the ongoing severe drought experienced in the northern parts of the country. The drought had left its mark on the veld, and many plants within the study area and surroundings showed signs of being severely affected by the dry spell (many of them only showing dried out remains). No red-listed or protected plant species were observed.

Table 2: List of plant species encountered within or near the proposed footprint.

NO.	SPECIES NAME	FAMILY	STATUS	LOCATION
1.	*Aloe claviflora*	ASPHODELACEAE	LC	Circle forming patches of Aloe, occasionally observed.
2.	*Asparagus* cf. *capensis*	ASPARAGACEAE	LC	Occasionally in between some thicker shrubs.
3.	*Atriplex* cf. *lindleyi*	AMARANTHACEAE	**CARA, Cat 3 invader, NEMBA, Cat. 1b invader**	Scattered throughout
4.	*Bromus pectinatus*	POACEAE	LC	Within the open patches.
5.	*Cladoraphis spinosa*	POACEAE	LC	Occasionally within open patches.
6.	*Drosanthemum* cf. *hispidum*	AIZOACEAE	LC	Relatively common, but in poor condition.
7.	*Euphorbia mauritanica*	EUPHORBIACEAE	LC	Larger shrub occasionally observed.
8.	*Galenia africana*	AIZOACEAE	LC (disturbance indicator)	Common throughout, especially the disturbed open areas.
9.	*Mesembryanthemum barkly*	AIZOACEAE	LC (disturbance indicator)	Mostly in disturbed open areas.
10.	*Mesembryanthemum* cf. *noctiflorum* (= *Aridaria* species).	AIZOACEAE	LC	Relatively common within the larger site.
11.	*Mesembryanthemum guerichianum*	AIZOACEAE	LC (disturbance indicator)	Mostly in disturbed open areas.
12.	*Mesembryanthemum junceum*	AIZOACEAE	LC (disturbance indicator)	Occasionally observed throughout, but usually affected by the drought.
13.	*Prosopis* species	FABACEAE	**CARA, Cat 2 invader, NEMBA, Cat. 1b invader**	A few individuals scattered over the site.
14.	*Pteronia* species (no flowers and only occasionally with leaves).	ASTERACEAE	LC	Occasionally observed throughout the ite.
15.	*Salsola zeyheri*	AMARANTHACEAE	LC	A dwarf semi-succulent shrub dominating the study area
16.	*Stipa capensis*	POACEAE	LC	In open areas between shrubs.

4.4. CRITICAL BIODIVERSITY AREAS MAPS

Critical biodiversity areas (CBA's) are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services (SANBI 2007). The primary purpose of CBA's is to inform land-use planning in order to promote sustainable development and protection of important natural habitat and landscapes. CBA's can also be used to inform protected area expansion and development plans. The CBA's underneath is based on the

definition laid out in the guideline for publishing bioregional plans (Anon, 2008):

- **Critical biodiversity areas (CBA's)** are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses.
- **Ecological support areas (ESA's)** are areas that are not essential for meeting biodiversity representation targets/thresholds but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree of restriction on land use and resource use in these areas may be lower than that recommended for critical biodiversity areas.

From a land-use planning perspective it is useful to think of the difference between CBA's and ESA's in terms of where in the landscape the biodiversity impact of any land-use activity action is most significant:

- For CBA's the impact on biodiversity of a change in land-use that results in a change from the desired ecological state is most significant locally at the point of impact through the direct loss of a biodiversity feature (e.g. loss of a populations or habitat).
- For ESA's a change from the desired ecological state is most significant elsewhere in the landscape through the indirect loss of biodiversity due to a breakdown, interruption or loss of an ecological process pathway (e.g. removing a corridor results in a population going extinct elsewhere or a new plantation locally results in a reduction in stream flow at the exit to the catchment which affects downstream biodiversity).

4.4.1. CBA'S ENCOUNTERED

Vanrhynsdorp and the proposed site location fall within the Western Cape Biodiversity Spatial Plan (WCBSP). The WCBSP aims at the most efficient selection of planning units required to meet all biodiversity, ecological sustainability, and climate resilience targets, while favouring persistence and avoiding areas of competing land-uses.

According to the WCBSP (Refer to Figure 9) the proposed site overlaps an area identified as an ecological support area (ESA 1), identified as a water recharge area. The larger area is not essential for meeting biodiversity targets but can play an important role in supporting the functioning of protected areas or critical biodiversity area.

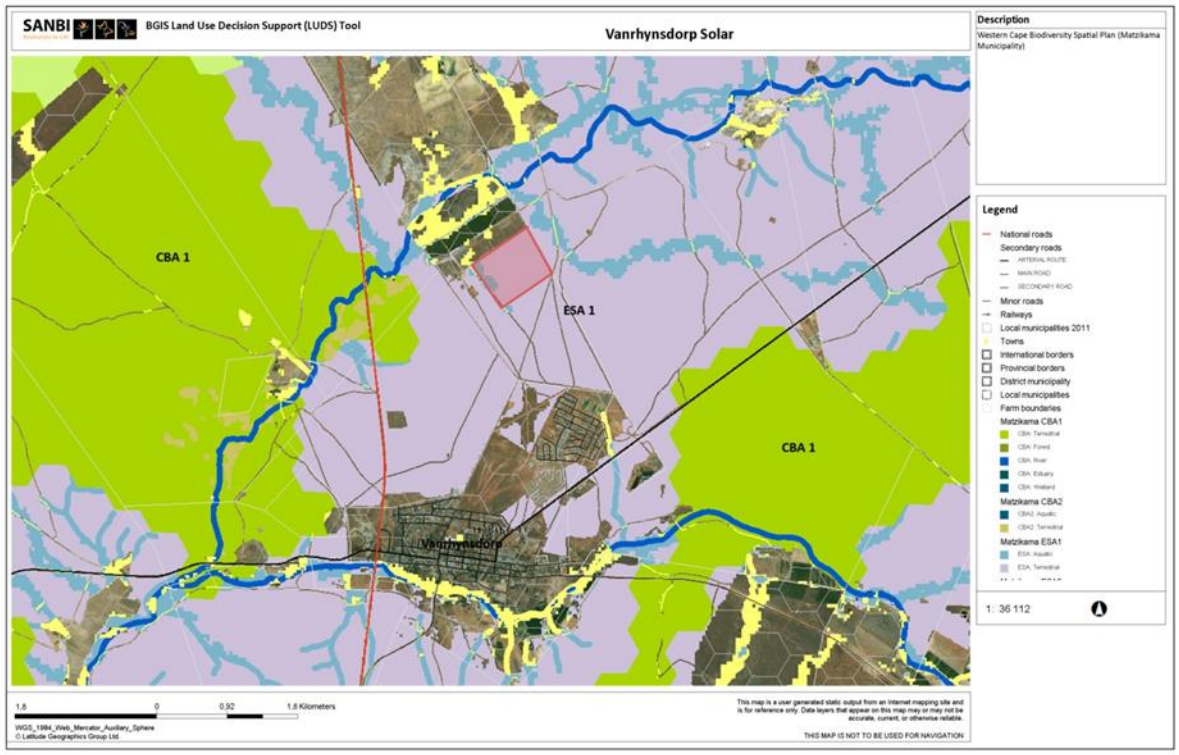


Figure 9: The Western Cape Biodiversity spatial plan showing the location of the proposed development footprint (Red)

4.5. KNERSVLAKTE CENTRE OF ENDEMISM

The Knersvlakte is known for its characteristic white quartzite gravel that can conceal a myriad of succulent species (many of them rare dwarf plants). Of the 1 500 plant species in the Knersvlakte, about 190 species are endemic to the region, while approximately 155 of are threatened with extinction, as they succumb easily to climatic conditions and changes (www.capenature.co.za/knersvlakte-nature-reserve-proclaimed-vital-biodiversity-hotspot). The Knersvlakte Centre (KVC) of endemism is named after the Knersvlakte north of Vanrhynsdorp.

There are various explanations for origin of its name. One of the common views is that it originates from the crunching noise made by the wagon wheels of old when driving over the extensive fields of hard quartz pebbles commonly found in the area north of Vanrhynsdorp. The KVC is demarcated by Van Wyk & Smith (2001) as the extensive plain bounded in the south by the Olifants River, in the east by the Bokkeveld Escarpment and in the west by the Sandveld and granite hills of the Spektakel and Little Namaqualand Suite (the Hardeveld), and in the north by the Namaqualand Rocky Hills (near Bitterfontein). It is encountered on an area of mostly level plains and rolling, generally low relief hills.

Topographically it is one of the most featureless of all the centres of endemism's in South Africa. The climate is mild, with light frost in winter. Offshore bergwind conditions can result in high temperatures and very arid conditions, even in winter. Rainfall occurs mainly in winter, while the prevailing onshore winds from the Atlantic Ocean produce occasional fog (providing additional precipitation for the plants). The geology is complex, but the KVC corresponds roughly with the various litho-stratigraphic units of the Vanrhynsdorp Group.

Soils are usually clayey, alkaline and saline in places and can play an important role in the distribution

of plant species. The extensive fields of small white quartz pebbles encountered to the north of Vanrhynsdorp is one of the most conspicuous features of this landscape. The vegetation is typically low and dominated by succulents, with grasses more prominent in sandy areas. Trees are almost absent and are only encountered along watercourses and its tributaries. Pebble strewn areas can appear almost without vegetation, but, they support a multitude of almost subterranean dwarf succulents. The KVC is especially rich in dwarf succulents, most of which is associated with the quartz pebble fields and rocky areas, while the sandy plains have a less specialised flora (Van Wyk en Smith, 2001).

The KVC is considered the **centre of diversity of the quartz-field flora of Southern Africa** and is clearly linked to the other centres of high endemism in the Succulent Karoo region, notably the Gariep Centre and to a lesser degree the Little Karoo. The flora of the KVC is threatened mainly by selective overgrazing and trampling by sheep, especially during periods of drought.

According to Van Wyk & Smith (2001) Vanrhynsdorp, and its immediate surroundings, falls within the Knersvlakte Centre of Endemism, meaning that the proposed development will also fall within larger demarcation of the KVC. However, the proposed development is located on the sandy soils to the south of the true quarts-field flora and although it is likely that the veld will support a number of annual and geophyte flora (which can result in spectacular flower displays in spring after good rains), it is unlikely that the proposed development (given its relative small size and location) will result in any significant impact on the true Knersvlakte vegetation.

4.6. THREATENED AND PROTECTED PLANT SPECIES

South Africa has become the first country to fully assess the status of its entire flora. Major threats to the South African flora are identified in terms of the number of plant taxa Red-Listed as threatened with extinction as a result of threats like, habitat loss (e.g. infrastructure development, urban expansion, crop cultivation and mines), invasive alien plant infestation (e.g. outcompeting indigenous plant species), habitat degradation (e.g. overgrazing, inappropriate fire management etc.), unsustainable harvesting, demographic factors, pollution, loss of pollinators or dispersers, climate change and natural disasters (e.g. such as droughts and floods). South Africa uses the internationally endorsed IUCN Red List Categories and Criteria in the Red List of South African plants. However, due to its strong focus on determining risk of extinction, the IUCN system does not highlight species that are at low risk of extinction, but may nonetheless be of high conservation importance. As a result a SANBI uses an amended system of categories in order to highlight species that may be of low risk of extinction but are still of conservation concern (SANBI, 2015).

In the Northern Cape, species of conservation concern are also protected in terms of national and provincial legislation, namely:

- The National Environmental Management: Biodiversity Act, Act 10 of 2004, provides for the protection of species through the "*Lists of critically endangered, endangered, vulnerable and protected species*" (GN. R. 152 of 23 February 2007).
- National Forest Act, Act 84 of 1998, provides for the protection of forests as well as specific tree species through the "*List of protected tree species*" (GN 908 of 21 November 2014).

4.6.1. RED LIST OF SOUTH AFRICAN PLANT SPECIES

The Red List of South African Plants online provides up to date information on the national conservation status of South Africa's indigenous plants (SANBI, 2015). Categories marked with [N] are non-IUCN, national Red List categories for species not in danger of extinction, but considered of conservation concern (Refer to **Error! R eference source not found.**). The IUCN equivalent of these categories is Least Concern (LC) (SANBI, 2015).

Table 3: Definitions of the South African national red list categories (SANBI, 2015)

Extinct (EX): A species is Extinct when there is no reasonable doubt that the last individual has died. Species should be classified as Extinct only once exhaustive surveys throughout the species' known range have failed to record an individual.
Extinct in the Wild (EW): A species is Extinct in the Wild when it is known to survive only in cultivation or as a naturalized population (or populations) well outside the past range.
Regionally Extinct (RE): A species is Regionally Extinct when it is extinct within the region assessed (in this case South Africa), but wild populations can still be found in areas outside the region.
Critically Endangered, Possibly Extinct (CR PE): Possibly Extinct is a special tag associated with the category Critically Endangered, indicating species that are highly likely to be extinct, but the exhaustive surveys required for classifying the species as Extinct has not yet been completed. A small chance remains that such species may still be rediscovered.
Critically Endangered (CR): A species is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction.
Endangered (EN): A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that the species is facing a very high risk of extinction.
Vulnerable (VU): A species is Vulnerable when the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that the species is facing a high risk of extinction.
Near Threatened (NT): A species is Near Threatened when available evidence indicates that it nearly meets any of the IUCN criteria for Vulnerable, and is therefore likely to become at risk of extinction in the near future.
[N]Critically" Rare A species is Critically Rare when it is known to occur at a single site, but is not exposed to any direct or plausible potential threat and does not otherwise qualify for a category of threat according to one of the five IUCN criteria.
[N]Rare: A species is Rare when it meets at least one of four South African criteria for rarity, but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to one of the five IUCN criteria. The four criteria are as follows: ➢ Restricted range: Extent of Occurrence (EOO) <500 km2, OR ➢ Habitat specialist: Species is restricted to a specialized microhabitat so that it has a very small Area of Occupancy (AOO), typically smaller than 20 km2, OR ➢ Low densities of individuals: Species always occurs as single individuals or very small subpopulations (typically fewer than 50 mature individuals) scattered over a wide area, OR ➢ Small global population: Less than 10 000 mature individuals.
[N]Declining: A species is Declining when it does not meet or nearly meet any of the five IUCN criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes causing a continuing decline of the species.
Least Concern (LC): A species is Least Concern when it has been evaluated against the IUCN criteria and does not qualify for any of the above categories. Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.
Data Deficient - Insufficient Information (DDD): A species is DDD when there is inadequate information to make an assessment of its risk of extinction, but the species is well defined. Listing of species in this category indicates that more information is required and that future research could show that a threatened classification is appropriate.
Data Deficient - Taxonomically Problematic (DDT): A species is DDT when taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of risk of extinction is not possible.
Not Evaluated (NE): A species is Not Evaluated when it has not been evaluated against the criteria. The national Red List of South African plants is a comprehensive assessment of all South African indigenous plants, and therefore all species are assessed and given a national Red List status. However, some species included in Plants of southern Africa: an online checklist are species that do not qualify for national listing because they are naturalized exotics, hybrids (natural or cultivated), or synonyms. These species are given the status Not Evaluated and the reasons why they have not been assessed are included in the assessment justification.

Red listed plant species associated with this veld type

According to the Red List of South African Plants (version 2017.1., www.redlist.sanbi.org, accessed on 2017/06/30) several listed plant species is associated with Vanrhynsdorp Gannabosveld namely:

- *Agathosma elata* Sond. EN
- *Aspalathus cuspidata* R.Dahlgren VU
- *Aspalathus obtusata* Thunb. VU
- *Babiana salteri* G.J.Lewis VU
- *Babiana toximontana* J.C.Manning & Goldblatt EN
- *Bulbine melanovaginata* G.Will. VU
- *Cephalophyllum pulchrum* L.Bolus VU
- *Eriospermum attenuatum* P.L.Perry DDD
- *Eriospermum eriophorum* P.L.Perry CR
- *Eriospermum spirale* Schult. VU
- *Euphorbia fasciculata* Thunb. VU
- *Euphorbia pedemontana* L.C.Leach VU
- *Euphorbia schoenlandii* Pax VU
- *Haemanthus lanceifolius* Jacq. VU
- *Heliophila leptophylla* Schltr. VU
- *Lachenalia minima* W.F.Barker VU
- *Moraea quartzicola* Goldblatt & J.C.Manning VU
- *Ornithogalum hallii* Oberm. EN
- *Oxalis blastorrhiza* T.M.Salter EN
- *Oxalis dines* Ornduff VU
- *Phyllobolus tenuiflorus* (Jacq.) Gerbaulet VU
- *Quaqua pulchra* (Bruyns) Plowes EN
- *Romulea multisulcata* M.P.de Vos VU
- *Steirodiscus linearilobus* DC. CR
- *Tylecodon suffultus* Bruyns ex Toelken Critically Rare

No red list plant species was encountered on the proposed site.

4.6.2. NEM:BA PROTECTED PLANT SPECIES

The National Environmental Management: Biodiversity Act, Act 10 of 2004, provides for the protection of species through the "Lists of critically endangered, endangered, vulnerable and protected species" (GN. R. 152 of 23 February 2007).

- No species protected in terms of NEM: BA was observed.

4.6.3. NFA PROTECTED SPECIES

The National Forests Act (NFA) of 1998 (Act 84 of 1998) provides for the protection of forests as well as specific tree species their List of Protected tree species, updated on a yearly basis.

- No species protected in terms of NFA (as updated) was encountered.

4.7. INVASIVE ALIEN PLANTS

Alien and invasive plant (AIP) species were introduced into South Africa more than 1 000 years ago *via* trading routes from other countries in southern Africa (Alberts & Moolman, 2013). Since the arrival of settlers from Europe these numbers have increased dramatically. At present, AIPs are encountered on large portions of land in South Africa (10 million hectares) and it is reportedly consuming nearly 330 million cubic meters of water annually, or 7% of the annual run-off. But what is scary is that this water consumption levels are increasing rapidly and could reach 50% of the mean annual run-off in the not too distant future (Alberts & Moolman, 2013). The aggressive behaviour of the AIPs in their unnatural habitat is a direct threat to the vast wealth of biodiversity in South Africa. South Africa is a relatively small country that comprises only 2% of the total surface of the Earth, but it contains 10% of the plant species, 7% of the vertebrates, and is home to a number of biodiversity hotspots.

In South Africa, alien plant species is regulated by two regulations promulgated in terms of CARA and NEM:BA, namely:

- The list of weeds and invader plants declared in terms of Regulations 15 and 16 (as Amended, March 2001) of the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA) administered by the Department of Agriculture, Forestry and Fisheries (DAFF);
- Alien and invasive species list 2016 (GN R. 864 of 29 July 2016) promulgated in terms of sections 66(1), 67(1), 70(1)(a), 71(3) and 71A of the National Environmental Management, Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA), administered by the Department of Environmental Affairs (DEA).

4.7.1. CONSERVATION OF AGRICULTURAL RESOURCES ACT

The **CARA** sets out the regulations (amended March 2001) regarding the control of weeds and invasive plants and provides a list of declared plants. The amended regulations make provision for four groups of invader plants. The first three groups consist of undesirable alien plants and are covered by Regulation 15, namely:

- **Category 1** declared weeds (Section 15A of the amended act) are prohibited plants that will no longer be tolerated on land or on water surfaces, neither in rural or urban areas. These plants may no longer be planted or propagated, and all trade in their seeds, cuttings or other propagative material is prohibited. Plants included in this category because their harmfulness outweighs any useful properties or purpose they may have.
- **Category 2** declared plant invaders (Section 15B of the amended act) are plants with a proven potential of becoming invasive, but which nevertheless have certain beneficial properties that warrant their continued presence in certain circumstances. May be grown in demarcated areas provided that there is a permit and that steps are taken to prevent their spread.
- **Category 3** declared plant invaders (Section 15C of the amended act) are undesirable because they have the proven potential of becoming invasive, but most of them are nevertheless popular ornamentals or shade trees that will take a long time to replace. May no longer be planted. Existing plants may be retained as long as all reasonable steps are taken to prevent

the spreading thereof, provided they are not within 30 metres of the 1:50 year flood line of a river, stream, lake or other type of inland water body. The "executive officer" can impose further conditions on Category 3 plants already in existence, which might include removing them if the situation demands it.

- **Bush encroachers**, which are indigenous plants that require sound management practices to prevent them from becoming problematic, are covered separately by Regulation 16.

4.7.2. NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT

NEMBA aims to provide the framework, norms, and standards for the conservation, sustainable use, and equitable benefit-sharing of South Africa's biological resources. The purpose of NEMBA as it relates to Alien and Invasive Species (AIS) is to prevent the unauthorised introduction and spread of such species to ecosystems and habitats where they do not naturally occur; manage and control such species to prevent or minimise harm to the environment and to biodiversity in particular; and to eradicate alien invasive species from ecosystems and habitats where they may harm such ecosystems or habitats. The Regulations on Alien and Invasive Species, referred to as the "**AIS Regulations"** combine invasive species already listed in the CARA, with two new lists relating to invasive species and prohibited species.

The AIS Regulations list 4 different categories of invasive species that must be managed, controlled or eradicated from areas where they may cause harm to the environment, or that are prohibited to be brought into South Africa, namely:

- **Category 1a:** invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. These species need to be controlled on your property, and officials from the Department of Environmental Affairs must be allowed access to monitor or assist with control.
- **Category 1b**: invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. Category 1b species are major invaders that may need government assistance to remove. All Category 1b species must be contained, and in many cases, they already fall under a government sponsored management programme.
- **Category 2**: These are invasive species that can remain in your garden, but only with a permit, which is granted under very few circumstances.
- **Category 3:** These are invasive species that can remain in your garden. However, you cannot propagate or sell these species and must control them in your garden. In riparian zones or wetlands all Category 3 plants become Category 1b plants.

4.7.3. ALIEN AND INVASIVE PLANTS ENCOUNTERED

A number of *Prosopis* trees as well as a number of Atriplex shrubs were observed on the property and they seems to be spreading (Refer to Table 4). It has been observed that the alien invader *Prosopis glandulosa* is becoming dominant in some sections of the Gannabosveld, especially towards the southern parts of the Knersvlakte (CapeNature 2020).

Table 4: List of alien and invasive species encountered within the proposed development site.

SPECIES	CARA	NEM: BA	MANAGEMENT RECOMMENDATIONS
Atriplex cf. *lindleyi*	Category 3 invader	Category 1b AIP	Remove all plants physically and burn
Prosopis glandulosa	Category 2 invader	Category 1B AIP (Western Cape)	Remove all plants physically (including root system) and burn or use registered herbicide on the cut-stump as treatment. Leave-spray smaller plants with registered herbicide.

4.8. VELD FIRE RISK

The revised veldfire risk classification (Forsyth, 2010) in terms of the National Veld and Forest Fire Act 101 of 1998 was promulgated in March 2010. The purpose of the revised fire risk classification is to serve as a national framework for implementing the National Veld and Forest Fire Act, and to provide a basis for setting priorities for veldfire management interventions such as the promotion of and support to Fire Protection Associations. In the fire-ecology types and municipalities with High to Extreme fire risk, comprehensive risk management strategies are needed.

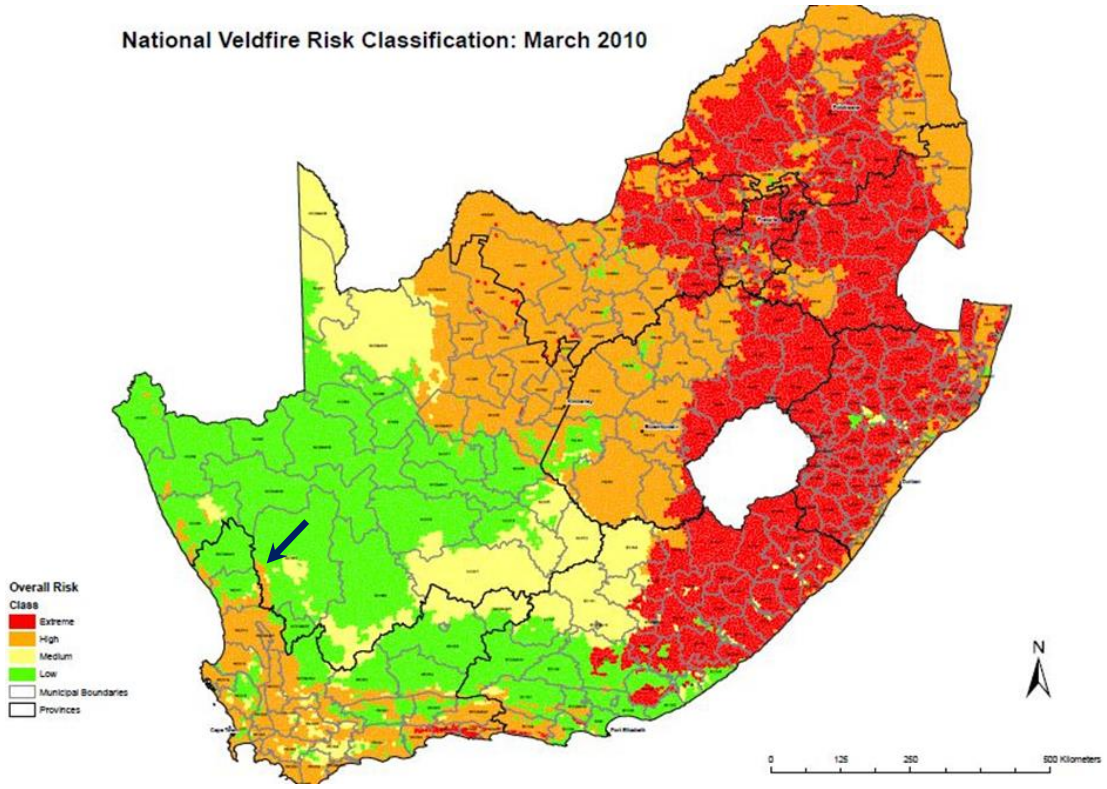


Figure 10: South African National Veldfire Risk Classification (March 2010)

The proposed site is located in an area supporting a very sparse semi-desert low shrubland which has been classified with a **High fire risk classification** (Refer to Figure 10). It is important that during construction and operatio n the site must adhere to all the requirements of the local Fire Protection Association (FPA), if applicable, or must adhere to responsible fire prevention and control measures.

5. FAUNA AND AVIFAUNA

Because of its aridity and unpredictable rainfall patterns, the Succulent-Karoo region (in which this site falls) favours free moving herbivores such as ostrich and springbok, nomadic birds and invertebrates with variable dormancy cued by rain. Plant defence against herbivores and seed adaption for dispersal by mammals are relatively uncommon, except along rivers and seasonal pans, suggesting the transient nature of herbivores, except near water where they would have lingered longer. However, since the 19th century the vast herds of migratory ungulates indigenous to this biome have been almost completely replaced by domestic stock. Once farmers started fencing their properties into camps (following the Fencing Act of 1912), stock numbers were dramatically increased with dire consequences to plant diversity. Grazing during and immediately after droughts periods is regarded as a major cause of detrimental change in vegetation composition and were ultimately responsible for the decline of large numbers of palatable plants (Mucina *et. al*., 2006).

No fauna or avi-fauna screening was done as part of this study, but observations were made during the site visit. The location of the study area, relatively near to areas of intensive agriculture, the current land-use (livestock grazing), and the adjacent farming practices would all have contributed to a disturbance factor. It is considered highly unlikely that a true reflection of potential game species can still be encountered on the property. This in turn would have affected the food chain and ultimately the density of tertiary predators, particularly mammals and larger birds of prey, while smaller predators and scavengers such as jackal and caracal would have been eradicated by farmers in fear of their livestock. Because of the long-term impact of human settlement on the larger areas a comprehensive faunal or avi-fauna survey is not deemed necessary.

However, according to the **NEMA EIA Sensitivity** scan for the site generated on 03/05/2022 by EnviroAfrica the:

- Animal Species Theme Sensitivity is high sensitive because of the potential presence of two bird species (Refer to Table 7), two invertebrate species (Refer to Table 5) and one sensitive species 13, a reptile species (Refer to Table 6);
- Plant Species Theme Sensitivity is medium sensitive because of the potential presence of various plant species (Refer to Heading 4.2 & 4.3 for a full discussion of the vegetation encountered);
- Terrestrial Biodiversity Theme Sensitivity is **very high** sensitive because of the site overlapping an ESA1 area. The CBA is discussed under Heading 4.4.

5.1. MAMMALS

According to the Protected areas management plan for the Knersvlakte Nature Reserve (CapeNature, 2020) the Knersvlakte has a diverse mammal species community but no species endemic or near-endemic to the province. Most species are representative of the arid landscape and well adapted to survive in the Succulent Karoo Biome. Currently there are 20 mammal species recorded from the Knersvlakte Nature Reserve (some indicated in Figure 2.14) with at least 14 additional species expected to occur in the reserve. The majority of the mammal species known from the reserve are small to medium sized carnivore species (e.g., small spotted genet (*Genetta genetta*), bat-eared fox (*Otocyon megalotis*) etc.), with shrews, rodents, even-toed ungulates such as springbok (*Antidorcas*

marsupialis marsupialis), hares and aardvark (*Orycteropus afer*) making up the rest of the species component. Two ecotypical games species occur on the reserve, namely the common duiker (*Sylvicapra grimmia grimmia*) and the steenbok (*Raphicerus campestris*).

These species are currently listed as Least Concern but are a priority for data collection and monitoring on population trends to inform the next red list assessment. Several other species may be present or migratory within the Knersvlakte Nature Reserve. The reserve is located within the historical range of the brown hyena (*Parahyaena brunnea*) (Stuart & Stuart, 1988). No records post 1999 has been detected in or near the reserve (Yarnell *et al*. 2016) and their presence has not been recorded to date. This species is currently listed as Near Threatened (Yarnell *et al*. 2016). Species listed as Vulnerable that may occur on the reserve include the leopard (Panthera pardus pardus) and the black footed cat (Felis nigripes) (Birss, 2017). Leopards are unlikely to be resident as this species is dependent on available open water, but dispersing animals may cross through the reserve. Similarly, greater kudu (*Tragelaphus strepsiceros strepsiceros*) is likely to disperse through the reserve and a single distribution record was recorded in the Bitterfontein area just north of the reserve (CapeNature, 2020).

No mammals, large or small was observed on the larger farm during any of the site visits performed for this scan. The only evidence of any mammal activity was droppings of what is expected to be genet and a bat-eared fox (which will roam the whole farm and its surroundings). Two to three deserted aardvark burrows were also observed, but none of these showed any signs of recent activity (not even by from other animals).

Thus, although the site is likely to contain at least some smaller mammals (e.g., rodents and other fauna) none was observed, apart from the droppings mentioned above. Considering that the site is located next to an area intensively cultivated and in close vicinity of Vanrhynsdorp (with its associated anthropogenic impacts), while the veld itself is considered degraded (supporting mostly unpalatable plant species) the site is not expected to support any significant number of mammal species.

5.2. INVERTEBRATE

Invertebrates are a vital component of terrestrial and aquatic ecosystems (McGeoch 2002; Samways et al. 2010; Samways et al. 2012) and constitute more than 80% of all animal diversity, yet they are grossly under-represented in studies of African diversity (Veldtman *et al.* 2017). They are essential for nutrient recycling *via* leaf-litter and wood degradation, carrion and dung disposal and soil turnover. Moreover, they play integral roles in plant pollination, especially in the Cape Floristic Region where the flora is dependent on specialised pollination guilds. In addition, this group maintains plant community structure *via* phytophagy (including seed feeding), and supports insectivorous animals, such as many birds, mammals and reptiles.

It is speculated that the area in which the Knersvlakte Nature Reserve is situated constitutes the southern end of a south-west African centre of tenebrionid endemism and diversity (Scholtz & Holm 1985; Penrith 1986a & b; Penrith & Endrödy-Younga 1994). Furthermore, narrow flowers of plants such as *Lycium cinereum*, *Hermannia cuneifolia* and *Conophytum* spp. that occur in the Knersvlakte will attract specialist pollinators with long mouth parts (Struck 1995). Struck (1995) observed a wide range of bees (14 solitary species plus the honey bee), masarine wasps (eight species), flies (seven species), beetles (13 species) and butterflies (three species) that pollinate flowers in the area. Bees, masarine wasps and bee flies (Bombyliidae) were the most important in terms of diversity and

abundance, while butterflies occurred in a highly erratic fashion. However, some plant species (e.g. *Conophytum* spp.) are dependent on butterfly species as pollinators (Struck, 1995). In addition, *Fidelia paradoxa* bees are specialist pollinators of *Mesembryanthemum fastigiatum* (Whitehead 1984). Many of these pollinators are endemic to the area, possibly because their distributions are restricted by their host plants, many of which also show a high degree of endemism.

A total of 966 Arachnida species represented by 365 genera and 68 families have been recorded in the Western Cape (Dippenaar-Schoeman et al. 2015) of which 361 species are endemic to the Western Cape (37.4%). Unfortunately to date very little information has been collected in the Knersvlakte Nature Reserve and there is no spider species list available for the reserve (CapeNature, 2020).

Several scorpion species have been recorded inside the Knersvlakte Nature Reserve, including *Uroplectes carinatus*, *Parabuthus capensis*, *Opistophthalmus granifrons* and a possible new species of *Opistophthalmus*. Observations in the field revealed that scorpions like *Parabuthus capensis* prefer red sand with leafy succulent shrubs e.g., *Drosanthemopsis diversifolia* and *Drosanthemum pulverulentum* as habitat. *Uroplectes carinatus* is more likely to be found on *Phyllobolus* spp. where they hide or wait during full moon nights for prey to pass by. On cold moonless nights *Uroplectes carinatus* predominates because they can cope better with low temperatures. In contrast, *Opistophthalmus granifrons* are more common in areas with clay soil where they occur out in the open between shrubs (CapeNature, 2020).

The main threat to invertebrate populations in this area include habitat destruction and/or degradation and illegal collection. It is likely that a number of invertebrate might be found (or might migrate) within the proposed footprint area. However, the site is already degraded, and the disturbance footprint will be relatively small. The impact on invertebrate is not expected to be high or in any way significant.

Table 5: Animal species theme results: Invertebrate

SENSITIVITY	FEATURES	MOTIVATION
Medium	Invertebrate: *Brinckiella mauerbergerorum*	The Sandveld Winter Katydid is one of South Africa's flightless spring katydids (grasshopper) and considered vulnerable. The name katydid comes from the noise emitted by the small insect. This group of hemimetabolous insects, while common and occasionally abundant in Fynbos vegetation of the Western Cape had been under collected and overlooked by the entomological community for over a century, before being re-discovered in 2002 (Picker et. al. 2002, In Naskrecki & Bazelet, 2009). This is ascribed to the fact that the Mantophasmatodea achieve adulthood during the winter months, and the adult retain an apterous (without wings) nymphal appearance, which at first glance resembles immature forms of other insects. *Brinckiella* appears to be a genus endemic to Western and Northern Cape provinces of South Africa with all its known species restricted to either the fynbos or succulent karoo biomes. It is likely that many additional species of this genus remain undiscovered in different parts of South Africa (Naskrecki & Bazelet, 2009). The Sandveld Winter Katydid was originally collected in the Northern Cape, 10.8 km SE of Port Nolloth (quite a distance away from Vanrhynsdorp). Although this species might occur in this area, it is considered highly unlikely that the establishment of this relatively small-scale solar plant could have any significant impact on the survival of this

SENSITIVITY	FEATURES	MOTIVATION
		species. With regards to this project the sensitivity rating should be **low sensitive**.
Medium	Invertebrate: *Brinckiella aptera*	The Mute Winter Katydid is endemic to the Fynbos and Succulent Karoo Biomes (refer above for further background about this species). It probably feeds on flowers and leaves of a very narrow range of host plants and occurs primarily on low, herbaceous shrubs. This species feeds and stridulates at night but can be found basking in the daytime on sunny days during the winter and early spring, from August until October, a time when very few insects are active. Very unusually for the genus and for katydids in general, this species is the first in its subfamily to display a complete lack of stridulatory organs, raising interesting evolutionary questions regarding mate attraction and intraspecies communication (Naskrecki and Bazelet 2009). The Mute Winter Katydid was originally collected in the Western Cape, near Pearly Beach, Bredasdorp area (the fynbos biome, geographically far removed from- and with a very different vegetation cover than the Vanrhynsdorp site). It is unlikely that the species will occur in this area, and even more unlikely that the establishment of this relatively small-scale solar plant could have any significant impact on the survival of this species. With regards to this project the sensitivity rating should be **low sensitive**.

5.3. REPTILE & AMPHIBIANS

The local occurrences of reptiles and amphibians are closely dependent on broadly defined habitat types, in particular terrestrial, arboreal (tree-living), rupicolous (rock-dwelling) and wetland-associated vegetation cover. It is possible to deduce the presence or absence of reptile and amphibian species by evaluating the habitat types within the proposed footprint in the context of reptile distribution ranges. From a habitat perspective, the proposed Vanrhynsdorp footprint area only supports one of the four major habitats, namely terrestrial. However, there are no rocky outcrops on the site, which minimise the available terrestrial habitat for reptiles significantly. A few deserted aardvark burrows were observed, which might house rodents or snakes (although no evidence of recent activity was seen at any of these burrows).

The Knersvlakte Nature Reserve currently have 17 reptile species recorded. In addition to these, there are at least as many or more species that are expected to occur within the reserve that have not yet been formally recorded. Many of these are associated with rocky outcrops or rocky areas such as the speckled padloper (*Chersobius signatus*), which is one of the threatened reptile species in this area (Hofmeyr et al. 2018). Several reptile species in the reserve are desirable in the pet trade, for example armadillo girdled lizard (*Ouroborus cataphractus*), also only found in rocky areas (CapeNature, 2020).

It is certain that some reptile species will occur on site or visit the site from time-to-time. However, because of the small development footprint and lack of rocky areas the impact on reptile species is likely to be neglectable. No amphibian species are likely to occur due to a lack of aquatic and wetland habitat in the proposed footprint.

Table 6: Animal species theme results: Invertebrate

SENSITIVITY	FEATURES	MOTIVATION
Medium	Sensitive species 13	Sensitive species 13 refers to a small **Endangered** reptile, only occurring in a small area in the Namaqualand (it is endemic to South Africa). These animals live on rocky outcrops and forage among the rocks, where they feed on small succulents. They are reclusive animals, that are most active in the early morning. Because of its habitat and breeding preferences (and the fact that they are not highly mobile), all of which require rocky outcrops, it is highly unlikely that this species will occur within the proposed footprint are or its immediate surroundings. With regards to this project the sensitivity rating should be **low sensitive**.

5.4. AVIFAUNA

According to the Protected areas management plan for the Knersvlakte Nature Reserve (CapeNature, 2020) the Knersvlakte and its immediate surroundings has very little to offer in terms of bird habitat diversity with most of the area dominated by low growing karroid type vegetation interspersed with gravel/quartz patches. Lark and korhaan are typical of these arid areas. At present only about 90 bird species had been recorded in the reserve. Avifaunal species associated with riverine habitat e.g. African Reed-warbler (*Acrocephalus baeticatus*) have been recorded, but in very low numbers. An added complexity is that the reserve is situated just north of the Succulent Karoo/Fynbos interface. The distribution of a number of species e.g. Levaillant's Cisticola (*Cisticola tinniens*), Cape Spurfowl (*Pternistis capensis*) and Cape White-eye (*Zosterops virens*) ends relatively abruptly along the escarpment just south of the reserve.

Seven threatened bird species have been recorded in the Knersvlakte Nature Reserve (Taylor *et a*l. 2015, in CapeNature 2020). These include Black Harrier (*Circus maurus*), Ludwig's Bustard (*Neotis ludwigii*), Secretarybird (*Sagittarius serpentarius*), Southern Black Korhaan (*Afrotis afra*), Lanner Falcon (*Falco biarmicus*), Verreaux's Eagle (*Aquila verreauxii*) and Karoo Korhaan (*Eupodotis vigorsii*).

In terms of distribution, however, the two species that were recorded over a large area were the Ludwig's Bustard and Karoo Korhaan, suggesting that the reserve could be important for these two species. In the case of the Ludwig's Bustard, evidence for this was presented by Shaw (2013) who found that the species occurred in higher concentrations within the Succulent Karoo Biome.

In the original assessment (Botes, 2012) as well as the more resent addendum (Botes, 2017), the author only touched briefly on Avifauna. The main reason being that the solar facility will have a relatively small footprint of which the main aspect will be the construction of < 20 ha of solar panels (at ground level). The only other aspect of the proposed solar project that may potentially impact on bird species will be the addition of new (11KVa) overhead power line. However, the proposed power lines will follow existing overhead lines for the most part (as a result the potential additional impact was considered very low). This coupled with the fact that during four site visits (over various seasons), the author did not observe any significant larger bird species on or in the vicinity of the proposed site especially collision prone larger birds (apart from one Karoo Korhaan to the east of Maskamsig, about 1 km away). The site itself is located near to existing agricultural land (and its associated activities),

and more than 850 m away from the nearest watercourse, which is the seasonal Droë River (a tributary to the Troe-Troe River).

Collision prone birds are generally associated with larger terrestrial bird species with a high ratio of body weight to wing surface (birds with low manoeuvrability) or species that fly at high speed when foraging or commuting through the area.

With regards to the potential impact on bird species:

- The proposed site is not expected to have any significant impact on bird habitat, as no natural roosting or breeding areas were observed (larger birds of prey in this area tend to keep closer to the Maskam and Bokkeveld Mountains – personal observance).
- The proposed site is also located well away from any mountains or ridges that might facilitate natural updrafts, meaning that it is highly unlikely to have any impact on soaring birds (e.g., storks or cranes and most raptors).
- The Droë River is a seasonal stream, which seemingly does not support any significant larger bird life (although this might alter somewhat when the stream is in flow).
- Most importantly, however, is the fact that the proposed development will only add a very small potential additional impact zone as the site and its immediate surroundings are already criss-crossed by existing overhead cables (both electrical infrastructure and telephone lines) (Figure 11 and Photo 5 - Photo 7).
- As precautionary measure bird flappers could be installed on the section of the new line that does not run parallel with existing infrastructure.

Table 7: Animal species theme results: Aves

SENSITIVITY	FEATURES	MOTIVATION
High	Aves – *Circus maurus*	The Black harrier is one of southern Africa's rarest endemic raptors and is currently considered endangered. No Black Harriers were observed during any of the site visits, and the only evidence of these birds, according to the Knersvlakte Protected areas management plan (CapeNature, 2020) are observation made by M. Garcia-Heras 2018 and Percy FitzPatrick Institute of African Ornithology (in CapeNature, 2020). According to these observations there is evidence of Black Harrier breeding in the river courses to the east of the Knersvlakte). Although the breading habitat for Black Harrier is fynbos, renosterveld or low shrubland it has not been observed within the Knersvlakte itself. As a result, it is considered unlikely that the relatively smaal footprint associated with this development will have any significant impact on the breading or feeding patters of these birds. With regards to this project the sensitivity rating is considered **low sensitive.**
High	Aves – *Neotis ludwigii*	Ludwig's Bustard is a near endemic and classified as endangered because of a projected rapid population decline. It has a large range centred on the dry biomes of the Karoo and Namib in southern Africa, being found in the extreme south-west of **Angola**, western **Namibia** and in much of **South Africa** (Del Hoyo *et al.* 1996, Anderson 2000). Today if occurs predominantly in the dry Karoo region of South Africa (Herold, 1988), but historically id is believed that its distribution extended to the eastern and

SENSITIVITY	FEATURES	MOTIVATION
		north-eastern portions of the Grassland Biome (Brooke, 1984). This species inhabits open lowland and upland plains with grass and light thornbush, sandy open shrub veld and semi-desert in the arid and semi-arid Namib and Karoo biomes. The breeding season spans from August-December, with the species nesting on bare ground with a clutch of 2-3 eggs (del Hoyo *et al.* 1996, Jenkins and Smallie 2009) Although not observed, the bird may potentially feed and nest on the farm, but it is highly unlikely that the relatively small quarry and short additional road will have any impact on breading or feeding potential for this bird. With regards to this project the sensitivity rating is considered **low sensitive**.

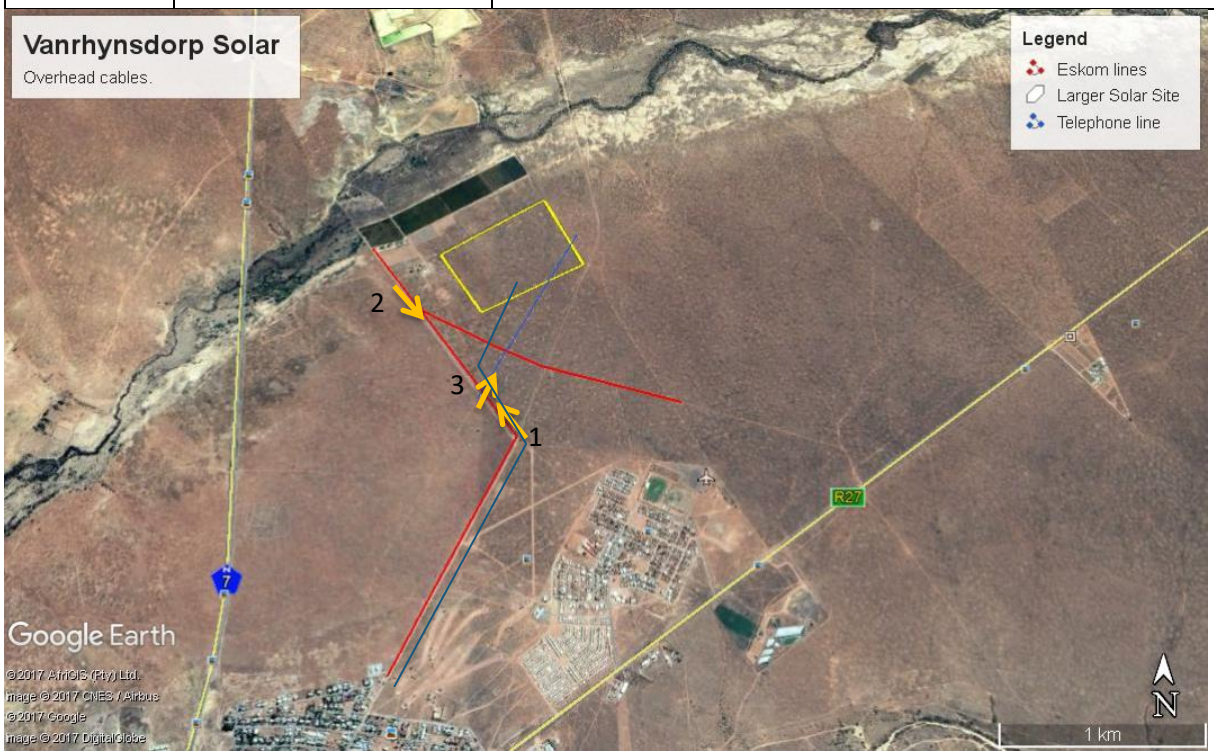


Figure 11: Google image showing the existing overhead cables (red) and the proposed new power line (blue).

Photo 5: A photo showing some of the existing overhead power and telephone lines nearby the proposed solar and hydrogen facilities (Taken from position 1 in Figure 11).

Photo 6: A photo showing a further view of the existing overhead lines in the vicinity of the proposed development (taken from position 2 in Figure 11)

Photo 7: Photo showing telephone lines running next to the (Taken from position 3 in Figure 11).

6. IMPACT ASSESSMENT METHOD

The concept of environmental impact assessment in terms of the National Environmental Management Act, Act 107 of 1998 (NEMA) and the Environmental Impact Assessment (EIA) was developed to identify and evaluate the nature of potential impact to determine whether an activity is likely to cause significant environmental impact on the environment. The concept of significance is at the core of impact identification, evaluation and decision making, but despite this the concept of significance and the method used for determining significance remains largely undefined and open to interpretation (DEAT, 2002).

The objective of this study was to evaluate the remaining biodiversity of the study area to identify significant environmental features which might have been impacted as a result of the development. The Ecosystem Guidelines for Environmental Assessment (De Villiers *et. al*., 2005), were used to evaluate the botanical significance of the property with emphasis on:

- Significant ecosystems
    - Threatened or protected ecosystems
    - Special habitats
    - Corridors and or conservancy networks
- Significant species
    - Threatened or endangered species
    - Protected species.

6.1. DETERMINING SIGNIFICANCE

Determining impact significance from predictions of the nature of the impact has been a source of debate and will remain a source of debate. The author used a combination of scaling and weighting methods to determine significance based on a simple formula. The formula used is based on the method proposed by Edwards (2011). However, the criteria used were adjusted to suite its use for botanical assessment. In this document significance rating was evaluated using the following criteria.

Significance = Conservation Value x (Likelihood + Duration + Extent + Severity) (Edwards 2011)

6.1.1. CRITERIA USED

***Conservation value*:** Conservation value refers to the intrinsic value of an attribute (e.g. an ecosystem, a vegetation type, a natural feature or a species) or its relative importance towards the conservation of an ecosystem or species or even natural aesthetics. Conservation status is based on habitat function, its vulnerability to loss and fragmentation or its value in terms of the protection of habitat or species (Refer to Table 8 for categories used).

Likelihood refers to the probability of the specific impact occurring because of the proposed activity (Refer to Table 9, for categories used).

Duration refers to the length in time during which the activity is expected to impact on the environment (Refer to Table 10).

Extent refers to the spatial area that is likely to be impacted or over which the impact will have

influence, should it occur (Refer to Table 11).

Severity refers to the direct physical or biophysical impact of the activity on the surrounding environment should it occur (Refer to Table 12).

Table 8: Categories used for evaluating conservation status.

CONSERVATION VALUE	
Low (1)	The attribute is transformed, degraded not sensitive (e.g. Least threatened), with unlikely possibility of species loss.
Medium/low (2)	The attribute is in good condition but not sensitive (e.g. Least threatened), with unlikely possibility of species loss.
Medium (3)	The attribute is in good condition, considered vulnerable (threatened), or falls within an ecological support area or a critical biodiversity area, but with unlikely possibility of species loss.
Medium/high (4)	The attribute is considered endangered or, falls within an ecological support area or a critical biodiversity area, or provides core habitat for endemic or rare & endangered species.
High (5)	The attribute is considered critically endangered or is part of a proclaimed provincial or national protected area.

Table 9: Categories used for evaluating likelihood.

LIKELIHOOD	
Highly Unlikely (1)	Under normal circumstances it is almost certain that the impact will not occur.
Unlikely (2)	The possibility of the impact occurring is very low, but there is a small likelihood under normal circumstances.
Possible (3)	The likelihood of the impact occurring, under normal circumstances is 50/50, it may or it may not occur.
Probable (4)	It is very likely that the impact will occur under normal circumstances.
Certain (5)	The proposed activity is of such a nature that it is certain that the impact will occur under normal circumstances.

Table 10: Categories used for evaluating duration.

DURATION	
Short (1)	Impact is temporary and easily reversible through natural process or with mitigation. Rehabilitation time is expected to be short (1-2 years).
Medium/short (2)	Impact is temporary and reversible through natural process or with mitigation. Rehabilitation time is expected to be relative short (2-5 years).
Medium (3)	Impact is medium-term and reversible with mitigation, but will last for some time after construction and may require ongoing mitigation. Rehabilitation time is expected to be longer (5-15 years).
Long (4)	Impact is long-term and reversible but only with long term mitigation. It will last for a long time after construction and is likely to require ongoing mitigation. Rehabilitation time is expected to be longer (15-50 years).
Permanent (5)	The impact is expected to be permanent.

Table 11: Categories used for evaluating extent.

EXTENT	
Site (1)	Under normal circumstances the impact will be contained within the construction footprint.
Property (2)	Under normal circumstances the impact might extent outside of the construction site (e.g., within a 2 km radius), but will not affect surrounding properties.
Surrounding properties (3)	Under normal circumstances the impact might extent outside of the property boundaries and will affect surrounding landowners or –users, but still within the local area (e.g., within a 50 km radius).
Regional (4)	Under normal circumstances the impact might extent to the surrounding region (e.g., within a 200 km radius), and will impact on land owners in the larger region (not only surrounding the site).
Provincial (5)	Under normal circumstances the effects of the impact might extent to a large geographical area (>200 km radius).

Table 12: Categories used for evaluating severity.

SEVERITY	
Low (1)	It is expected that the impact will have little or no affect (barely perceptible) on the integrity of the surrounding environment. Rehabilitation not needed or easily achieved.
Medium/low (2)	It is expected that the impact will have a perceptible impact on the surrounding environment, but it will maintain its function, even if slightly modified (overall integrity not compromised). Rehabilitation easily achieved.
Medium (3)	It is expected that the impact will have an impact on the surrounding environment, but it will maintain its function, even if moderately modified (overall integrity not compromised). Rehabilitation easily achieved.
Medium/high (4)	It is expected that the impact will have a severe impact on the surrounding environment. Functioning may be severely impaired and may temporarily cease. Rehabilitation will be needed to restore system integrity.
High (5)	It is expected that the impact will have a very severe to permanent impact on the surrounding environment. Functioning irreversibly impaired. Rehabilitation often impossible or unfeasible due to cost.

6.2. SIGNIFICANCE CATEGORIES

The formal NEMA EIA application process was developed to assess the significance of impacts on the surrounding environment (including socio-economic factors), associated with any specific development proposal to allow the competent authority to make informed decisions. Specialist studies must advise the environmental assessment practitioner (EAP) on the significance of impacts in his field of specialty. To do this, the specialist must identify all potentially significant environmental impacts, predict the nature of the impact, and evaluate the significance of that impact should it occur.

Potential significant impacts are evaluated, using the method described above, to determine its potential significance. The potential significance is then described in terms of the categories given in Table 13. Mitigation options are evaluated, and comparison is then made (using the same method) of potential significance before mitigation and potential significance after mitigation (to advise the EAP).

Table 13: Categories used to describe significance rating (adjusted from DEAT, 2002)

SIGNIFICANCE	DESCRIPTION
Insignificant or Positive (4-22)	There is no impact, or the impact is insignificant in scale or magnitude because of low sensitivity to change or low intrinsic value of the site, or the impact may be positive.
Low (23-36)	An impact barely noticeable in scale or magnitude because of low sensitivity to change or low intrinsic value of the site or will be of very short-term or is unlikely to occur. Impact is unlikely to have any real effect and no or little mitigation is required.
Medium Low (37-45)	Impact is of a low order and therefore likely to have little real effect. Mitigation is easily achieved. Social, cultural, and economic activities can continue unchanged, or impacts may have medium to short term effects on the social and/or natural environment within site boundaries.
Medium (46-55)	Impact is real, but not substantial. Mitigation is both feasible and easily possible but may require modification of the project design or layout. Social, cultural, and economic activities of communities may be impacted, but can continue (albeit in a different form). These impacts will usually result in medium to long term effect on the social and/or natural environment, within site boundary.
Medium high (56-63)	Impact is real, substantial, and undesirable, but mitigation is feasible. Modification of the project design or layout may be required. Social, cultural, and economic activities may be impacted, but can continue (albeit in a different form). These impacts will usually result in medium to long-term effect on the social and/or natural environment, beyond site boundary within local area.
High (64-79)	An impact of high order. Mitigation is difficult, expensive, time-consuming or some combination of these. Social, cultural, and economic activities of communities are disrupted and may come to a halt. These impacts will usually result in long-term change to the social and/or natural environment, beyond site boundaries, regional or widespread.
Unacceptable (80-100)	An impact of the highest order possible. There is no possible mitigation that could offset the impact. Social, cultural, and economic activities of communities are disrupted to such an extent that these come to a halt. The impact will result in permanent change. Very often these impacts are un-mitigatable and usually result in very severe effects, beyond site boundaries, national or international.

7. BIODIVERSITY SENSITIVITY EVALUATION

The recent ongoing drought left its mark on the veld, and many plants within the study area and surroundings showed signs of being severely affected by the dry spell. At the time of the study the vegetation was described as a low open shrubland (< 0.5 m high), supporting a disturbed version of Gannabosveld, dominated by *Salsola zeyheri* (Gannabos), and hardy *Mesembryanthemum* species. Gannabosveld is normally not known to have a high species turnover, but even so, the number of plant species encountered was lower than expected, which is probably a combination of the ongoing drought (leaf succulents being very susceptible to extended dry spells) together with historic and present grazing practices. Apart from the vegetation itself, no other biodiversity feature of note was observed within the study area (e.g., no streams or watercourses, "heuweltjies" – Termite mounds, or true quartz patches). Scattering of quartz pebbles were sometimes exposed, but no true quartz patches was observed.

In terms of its ecological status the following was considered:

- The proposed development footprint overlaps an area that still supports natural veld, albeit a disturbed version of Gannabosveld. The vegetation was dominated by Gannabos in combination with a few hardy *Mesembryanthemum* species. the veld shows signs of severe drought and having been degraded as a result of decades of grazing by domestic livestock (low species diversity);
- The development footprint will be relatively small (± 20ha) and is located adjacent to existing agricultural land.
- The site still has good connectivity to the south, east and northeast, but borders on intensive cultivation to the northwest.
- The site fall within the larger Knersvlakte Centre of Endemism;
- Vanrhynsdorp Gannabosveld is classified as "*Least Threatened*" with approximately 79% remaining. However, it is unsure whether the conservation target of 28% had been reached with the recent declaration of the Knersvlakte Nature Reserve;
- No protected or red-listed plants were observed, but observations are based on a two day site visit which did not co-inside with the main annual and geophyte flowering time.

7.1. BIOPHYSICAL ENVIRONMENT

Centres of Endemism: The proposed site falls within the Knersvlakte Centre of Endemism, but is located on the sandy soils, dominated by Gannabos (*Salsola* species), to the south of the true quarts-field flora and although it is likely that the veld will support a number of annual and geophyte flora (which can result in spectacular flower displays in spring after good rains), it is unlikely that the proposed development (given its relative small size and location) will result in any significant impact on the true Knersvlakte vegetation.

Heuweltjies: No "heuweltjies" (ascribed as ancient termite mounds with soils more fertile that that of its surroundings) were observed on the site or its immediate surroundings. There is a marked difference in biodiversity on and between these heuweltjies.

CBA or ESA: According to the Western Cape Biodiversity Spatial Plant, the site is located within an ecological support area identified as a water recharge area. In this case the proposed site is located

on a sandy plain sloping towards the Droë River to its northwest), but with developed vineyards adjacent and directly in the path of any surface drainage. Underground water recharge will not be significantly hampered by the proposed development; since the surface area is very small and will not be impregnable (underground water recharge will still be able from the site).

Connectivity: The location (adjacent to existing agricultural land) and relatively small size of the site will also not lead to a significant reduction in connectivity.

Other: The site visit showed no other significant geographical features such as watercourses, wetlands, upland- down land gradients or vegetation boundaries on the site or limited to the site. The site will be located next to existing cultivated lands (vineyards next to the Droë River).

7.2. THREATENED AND PROTECTED ECOSYSTEMS

The Vanrhynsdorp Gannabosveld vegetation type is not vulnerable or threatened with more 79% remaining in its natural state. However, at present little of this vegetation type is formally conserved in South Africa. It is thus important the viable areas are considered for inclusion into Conservation areas or CBA's or ESA's. Although it is located within the larger Knersvlakte Centre of Endemism and within an ecological support area, it is unlikely that the proposed footprint will have any significant impact on local or national conservation targets.

No Red list species was encountered (Heading 4.6.1), or species protected in terms of NEMBA (Heading 4.6.2), or species protected in terms of the NFA (Heading 4.6.3). A small number of the alien *Prosopis* trees and the shrub *Atriplex lindleyi* were observed and an alien eradication plan should be implemented to ensure the control of these species within the development footprint.

7.3. FAUNA AND AVIFAUNA

Mammals: No mammals, large or small was observed on the larger farm during any of the site visits performed for this scan. The only evidence of any mammal activity was droppings of what is expected to be genet and a bat-eared fox (which will roam the whole farm and its surroundings). Two to three deserted aardvark burrows were also observed, but none of these showed any signs of recent activity (not even by from other animals). Smaller mammals (e.g., rodents and other fauna) is still expected on the site (although none was observed), apart from the droppings mentioned above. Considering that the site is located next to an area intensively cultivated and in close vicinity of Vanrhynsdorp (with its associated anthropogenic impacts), while the veld itself is considered degraded (supporting mostly unpalatable plant species) the site is not expected to support any significant number of mammal species.

Invertebrate: The main threat to invertebrate populations in this area include habitat destruction and/or degradation and illegal collection. It is likely that a number of invertebrate might be found (or might migrate) within the proposed footprint area. However, the site is already degraded, and the disturbance footprint will be relatively small. The impact on invertebrate is not expected to be high or in any way significant, including the two invertebrate species flagged by the NEMBA Sensitivity screening tool (Refer to Table 5).

Reptile & amphibians: From a habitat perspective, the proposed Vanrhynsdorp footprint area only

supports one of the four major habitats, namely terrestrial. However, there are no rocky outcrops on the site, which minimise the available terrestrial habitat for reptiles significantly. It is certain that some reptile species will occur on site or visit the site from time-to-time. However, because of the small development footprint and lack of rocky areas the impact on reptile species should be neglectable. No amphibian species are likely to occur due to a lack of aquatic and wetland habitat in the proposed footprint.

Avifauna: The proposed site is not expected to have any significant impact on bird habitat, as no natural roosting or breeding areas were observed (larger birds of prey in this area tend to keep closer to the Mountains and river areas). Including the two invertebrate species flagged by the NEMBA Sensitivity screening tool (Refer to Table 7).The proposed site is located well away from any mountains or ridges that might facilitate natural updrafts, meaning that it is highly unlikely to have any impact on soaring birds (e.g., storks or cranes and most raptors). The Droë River is a seasonal stream, which seemingly does not support any significant larger bird life (although this might alter somewhat when the stream is in flow). Most importantly, however, is the fact that the proposed development will only add a very small potential additional impact zone as the site and its immediate surroundings are already criss-crossed by existing overhead cables (both electrical infrastructure and telephone lines) (Figure 11 and Photo 5 - Photo 7).

7.4. SOLAR DEVELOPMENT - CUMULATIVE IMPACTS

The Department of Environmental Affairs requires that specialist evaluates the accumulative impacts of all other renewable energy sites within a 30 km radius of the proposed development. According to the information obtained from the Department of Environmental Affairs renewable energy database website for South Africa (https://dea.maps.arcgis.com/apps/webappviewer), there are potentially three renewable energy sites within a 30 km radius of the proposed Vanrhynsdorp site (**Error! R eference source not found.**), not including the Keren Vanrhynsdorp site, which refers to this application. Seven potential other renewable energy facilities are mapped within a 30 km radius (Refer to **Error! Reference source not found.** and **Error! Reference source not found.**. However, the Si te 6 application was withdrawn, and the Site 7 application refers to the same site as this application.

Table 14: Potential renewable energy sites within 30km of the proposed Vanrhynsdorp solar site

Name	Type	MW	Vegetation type
1. Orlight SA Solar PV Plant (Approved)	Solar PV	20	Vanrhynsdorp Gannabosveld
2. Romano Solar on Pr. 334 of Farm 292, Vredendal (Approved)	Solar PV	10	Namaqualand Spinescent Grassland Vanrhynsdorp Gannabosveld
3. Matzikama Solar Park on Pr. 414 of Farm 292, Vredendal (Approved)	Solar PV	10	Namaqualand Spinescent Grassland Namaqualand Strandveld
4. Solar plant northwest of Vredendal (Approved)	Solar PV	30	Namaqualand Strandveld Namaqualand Spinescent Grassland
5. Inca Wind Energy facility on Farm 293 (Approved)	Wind	30	Namaqualand Strandveld
6. Proposed Keren Energy Solar (Withdrawn)	-	-	N/a
7. N/a Refers to the same site as this application	-	-	N/a

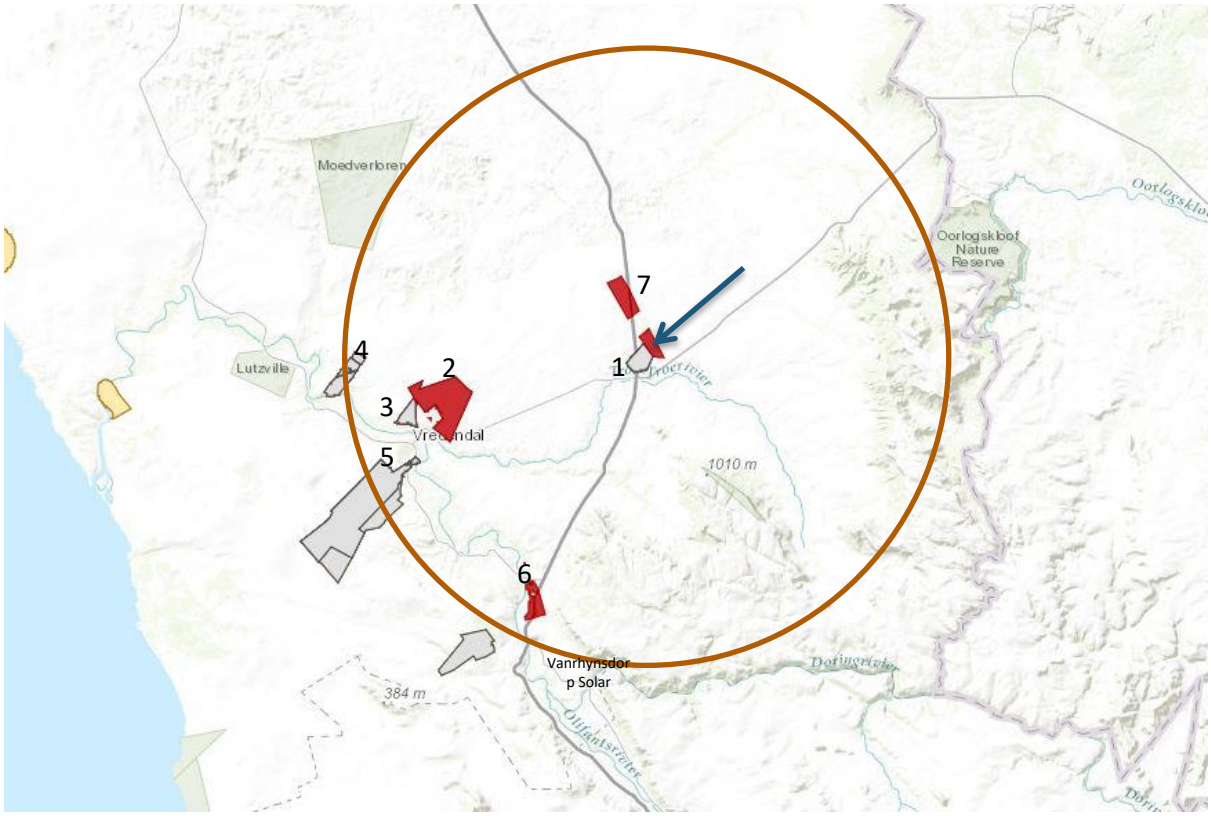


Figure 12: Potential renewable energy sites within 30km radius of the proposed Vanrhynsdorp Solar & Hydrogen site

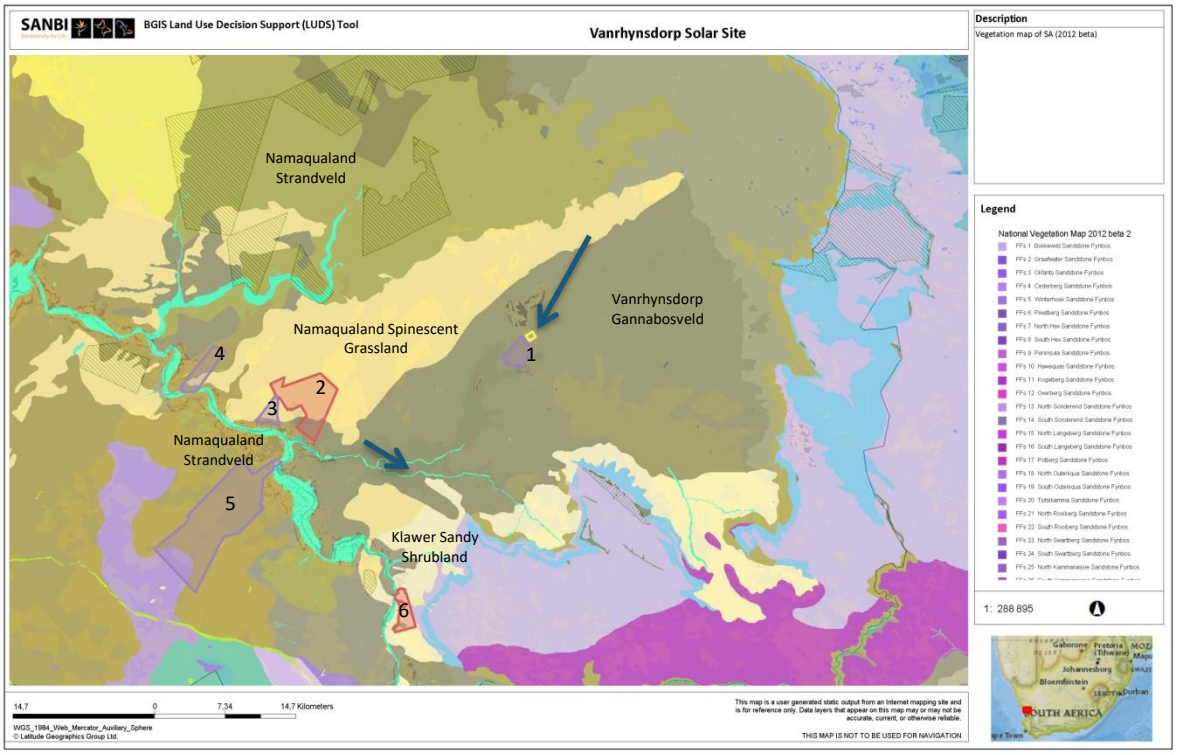


Figure 13: Vegetation map of SA, showing the vegetation types associated with the various RE sites within 30 km from the study area.

The proposed Vanrhynsdorp solar and hydrogen plant will be relatively small (<20ha) and will impact only one vegetation type, namely Vanrhynsdorp Gannabosveld. Vanrhynsdorp Gannabosveld vegetation type is not considered vulnerable or threatened with more 79% still remaining in its natural state. Because of its small size, the proposed footprint is unlikely to have any significant impact on connectivity within the ecological support area. Floristically, no protected plant species or red-listed plant species were encountered. In the case of the Vanrhynsdorp Solar site, two other renewable energy sites, within 30km, may impact on the same vegetation type namely Site 1 and 2 in Figure 12 & Figure 13. Both sites are relatively small (10 MW & 20 MW), which should relate to approximately 30 ha in total. Together with the Vanrhynsdorp Solar site it relates to approximately a 40-50 ha impact on this vegetation type out of roughly 540 700 ha (of which almost 79% are still believed to be fairly natural). The impact of the Vanrhynsdorp solar site is thus roughly 0.0018%, while the cumulative impact is roughly 0.0092%.

Cumulative impacts for this project was calculated taking into account the small size of the proposed development, the impact of similar developments within a 30km radius on the same vegetation type, connectivity, potential critical biodiversity areas or ecological support areas and the impact on protected species as well as land-use, geology and soils, fauna and avi-fauna.

7.5. IMPACT ASSESSMENT

The following table rates the significance of environmental impacts associated with the proposed development. It also evaluates the expected accumulative effect of the proposed development as well as the No-Go option.

Table 15: Impact assessment associated with the proposed development.

Aspect	Short description	CV	Lik	Dur	Ext	Sev	Sig. before Mit.	CV	Lik	Dur	Ext	Sev	Sig. after Mit.	Short discussion
Geology & soils	Possible impact on special habitats (e.g. true quartz or "heuweltjies")	2	1	3	1	1	12	2	1	3	1	1	12	No special features encountered. The impact on geology and soils is expected to be very low. No mitigation required.
Land use and cover.	Possible impact on socio-economic activities as a result of the physical footprint or associated activities.	3	4	3	1	1	27	3	3	3	1	1	24	The proposed development will impact on a small area used for grazing by the landowner. Loss of grazing will be barely perceptible within the larger property.
Vegetation type	Possible loss of vegetation and associated habitat.	3	4	3	1	2	30	3	3	3	1	1	24	More than 79% of this vegetation remains in its natural state, but little formally conserved. Mitigation - Minimise development footprint.
Corridors and conservation priority areas	Possible loss of identified terrestrial and aquatic critical biodiversity areas, ecological support areas or ecological corridors.	3	4	3	1	2	30	3	3	3	1	1	24	The development will impact on an ESA and the Knersvlakte Centre of Endemism. However, because of the small footprint it is not expected to have a significant impact on conservation targets. Mitigation - minimise footprint.
Watercourses and wetlands	Possible impact on natural water resources and its associated ecosystem.	0	0	0	0	0	0	0	0	0	0	0	0	Not applicable
Flora	Possible loss of threatened or protected species.	3	4	3	1	2	30	3	3	3	1	1	24	No protected or red-data species encountered (although it is possible that some annuals or geophytes that could not be observed during the study might be found). However, it is highly unlikely that they will be restricted to this area alone or that any significant impact may result).
Fauna	Possible impact on species as well as potential loss of threatened or protected species.	3	2	3	1	1	21	3	2	3	1	1	21	Unlikely to impact significantly on any single species. No mitigation required.

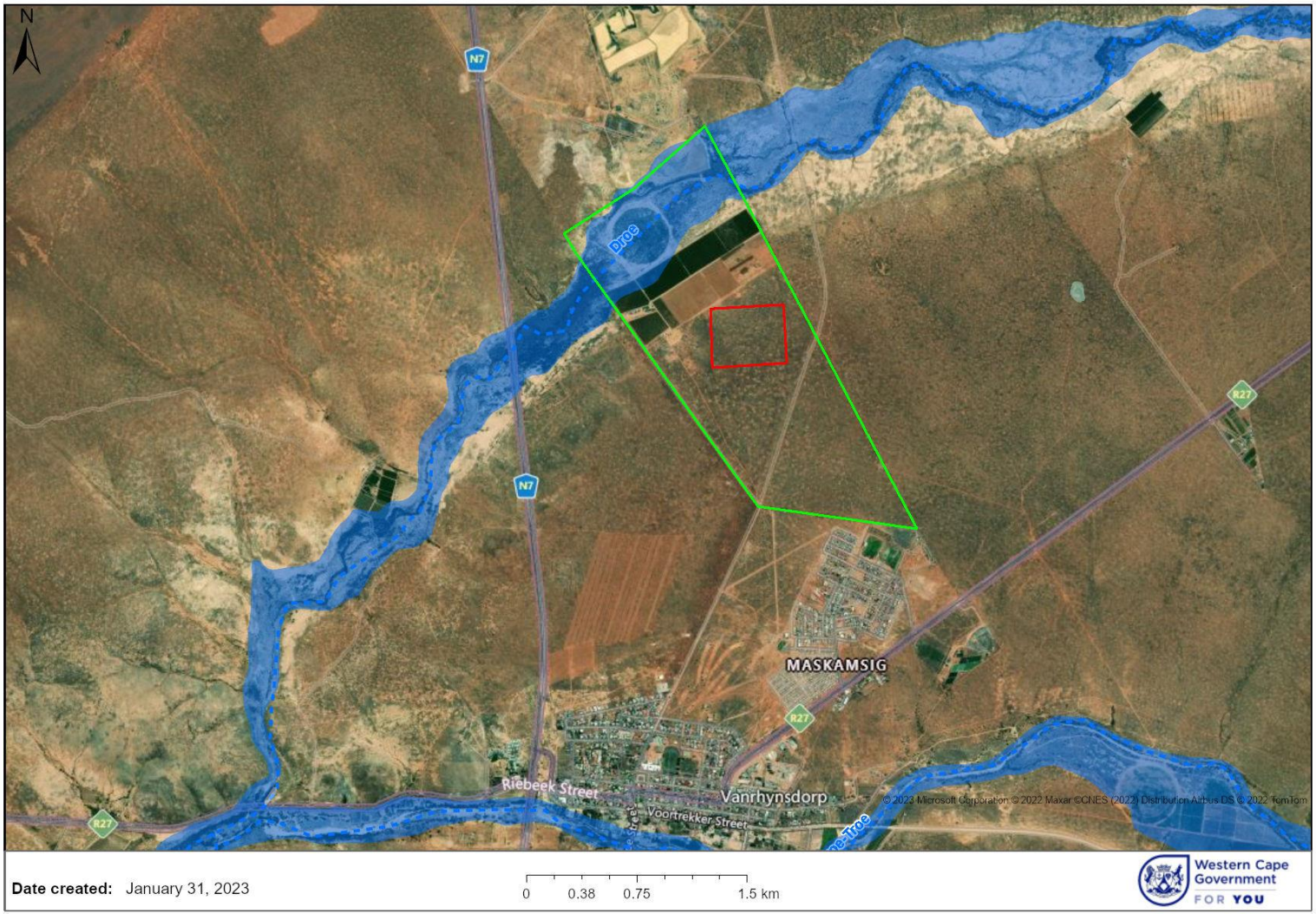
Aspect	Short description	CV	Lik	Dur	Ext	Sev	Sig. before Mit.	CV	Lik	Dur	Ext	Sev	Sig. after Mit.	Short discussion
Avifauna	Possible impact on species as well as potential loss of threatened or protected species.	3	2	3	1	1	21	3	2	3	1	1	21	Unlikely to impact significantly on any single species. No mitigation required.
Invasive alien species	Possible alien infestation as a result of activities.	3	3	3	1	2	27	3	1	3	1	1	18	Both alien species encountered must be eradicated from the footprint as part of construction and an on-going eradication program must be part of maintenance.
Veld fire	The risk of veld fires as a result of the proposed activities.	3	3	2	3	2	30	3	1	2	1	1	15	Veld fire risk is considered high and must be addressed appropriately through the construction EMP.
Accumulative	Accumulative impact associated with the proposed activity.	3	4	3	3	2	36	3	4	3	1	1	27	The overall impact is considered to be relatively low, because of the small size, but good environmental control during construction is imperative.
No-Go alternative	Potential environmental impact associated with the no-go alternative.	3	1	1	1	1	12						0	The above impacts will not occur, and the status quo will remain (livestock grazing as the main land use).

Significance before mitigation: The impact assessment suggests that the proposed Vanrhynsdorp development is expected to have a **Low cumulative** impact (even without mitigation). The evaluation considers the relatively small size of the proposed development and its location adjacent to existing agricultural land (transformed land).

Significance after mitigation: Even though the impact is already considered low it will still be possible to reduce direct impacts during construction. The potential impact on the regional status of the vegetation type and associated biodiversity features (e.g., corridor function or special habitats) is considered low. No irreversible species-loss, habitat-loss, connectivity or associated impact can be foreseen from locating and operating the solar facility on the proposed site. With mitigation the impact on biodiversity features can be reduced but will stay **Low**.

The NO-GO option: The "No-Go Alternative" alternative will not result in significant gain in regional conservation targets, the conservation of rare & endangered species or gain in connectivity. At the best the No-Go alternative will only support the "status quo" on the site. On the other hand, the pressure on Eskom facilities, most of which is currently still dependant on fossil fuel electricity generation, will remain. Solar power remains a much cleaner and more sustainable option for electricity production.

Figure 14: Site sensitivity map: The proposed development footprint is not considered sensitive in terms of terrestrial biodiversity, but it falls within the Knersvlakte Centre of Endemism and as such the focus must be on footprint minimisation (Refer to the impact minimisation recommendations)



8. IMPACT MINIMISATION RECOMMENDATIONS

The proposed development will result in the permanent transformation of <20ha of natural veld covered by a vegetation type considered least threatened. There are no special habitats within or near the proposed footprint that will be impacted by the development (even though it falls within the Knersvlakte Centre of Endemism). It is highly unlikely that the proposed development will have any significant impact on protected or endangered fauna or flora.

According to the impact assessment given in Table 15, the proposed development is unlikely to result in any significant impact and with good environmental control, the development is likely to result in a Low impact on the environment.

With the correct mitigation it is considered highly unlikely that the proposed development will contribute significantly to any of the following:

- Significant loss of vegetation type and associated habitat.
- Loss of ecological processes (e.g., migration patterns, pollinators, river function etc.) due to construction and operational activities.
- Loss of local biodiversity and threatened plant species.
- Loss of ecosystem connectivity.

8.1. MITIGATION MEASURES

The proposed development site is not considered sensitive in terms of terrestrial biodiversity. As a result, impact minimisation should focus on mitigation measures during construction (and operational) phases, of which the overriding goal should be to clearly define the final layout and to minimise the disturbance footprint.

- All construction must be done in accordance with an approved construction and operational phase Environmental Management Plan (EMP), which must be developed by a suitably experienced Environmental Assessment Practitioner.
- A suitably qualified Environmental Control Officer must be appointed to monitor the construction phase in terms of the EMP and any other conditions pertaining to specialist studies.
- Before any work is done the footprint must be clearly demarcated. The demarcation must aim at minimum footprint and minimisation of disturbance.
- All alien invasive species within the footprint and or within 10 m of the footprint must be removed responsibly.
    - Care must be taken with the eradication method to ensure that the removal does not impact or lead to additional impacts (e.g., spreading of the AIP due to incorrect eradication methods);
    - Care must be taken to dispose of alien plant material responsibly.
- Topsoil (the top 15-20 cm) must be removed and protected and re-used for rehabilitation purposes of suitable areas on site or within the immediate surroundings (Seedbed protection).
- Lay-down areas or construction camp sites must be located within areas already disturbed or areas of low ecological value and must be pre-approved by the ECO.
- Indiscriminate clearing of any area outside of these footprints may not be allowed.
- All construction areas must be suitably rehabilitated on completion of the project.

  - This includes the removal of all excavated material, spoil and rocks, all construction related material and all waste material.
  - This must include re-using the protected topsoil as well as shaping the area to represent the original shape of the environment.

- An integrated waste management approach must be implemented during construction.
  - Construction related general and hazardous waste may only be disposed of at approved waste disposal sites.
  - All rubble and rubbish should be collected and removed from the site to a Municipal approved waste disposal site.

9. REFERENCES

Acocks, J.P.H. 1953. Veld types of South Africa. *Mem. Bot. Surv. .S. Afr*. No. 28: 1-192.

Anderson, M. D. 2000. Ludwig's Bustard. In: Barnes, K. N. (ed.), *The Eskom Red Data Book of birds of South Africa, , Lesotho and Swaziland*, pp. 105-107. BirdLife South Africa, Johannesburg. In BirdLife International (2022) Species factsheet: *Neotis ludwigii*. Downloaded from http://www.birdlife.org on 07/09/2022.

Anon, 2008. Guideline regarding the determination of bioregions and the preparation and publication of Bioregional Plans. April 2008. Government Notice No. 291 of 16 March 2009.

Birss C. 2017. Chapter 9: Mammals. In: Turner A.A., editor. Western Cape Province State of Biodiversity 2017. CapeNature Scientific Services, Stellenbosch. ISBN: 978-0-621-45962-3. In CapeNature. 2020.

Botes, P.J.J. 2012. Vanrhynsdorp Keren Energy Holdings. Biodiversity assessment & Botanical Scan for the proposed establishment of a 10 MW concentrated photovoltaic solar energy facility on the remaining extent Duinen Rdr, Farm 258, Vanrhynsdorp. Specialist report submitted as part of a NEMA EIA application. 13 April 2012.

Botes, P.J.J. 2017. Vanrhynsdorp Solar Project. Addendum to the Biodiversity assessment & Botanical Scan for the proposed establishment of a 10 MW concentrated photovoltaic solar energy facility on the remaining extent Duinen Rdr, Farm 258, Vanrhynsdorp. Updated specialist report submitted as part of a NEMA EIA application. 20 June 2017.

Brooke R K. 1984. *South African Red Data Book–Birds*, Foundation for Research Development: CSIR, 1984.

CapeNature, 2020. Knersvlakte Nature Reserve: Protected Area Management Plan 2020-2030. Internal Report, CapeNature, Cape Town.

De Villiers C.C., Driver, A., Brownlie, S., Clark, B., Day, E.G., Euston-Brown, D.I.W., Helme, N.A., Holmes, P.M., Job, N. & Rebelo, A.B. 2005. Fynbos Forum Ecosystem Guidelines for Environmental Assessment in the Western Cape. Fynbos Forum, c/o Botanical Society of South Africa: Conservation Unit, Kirstenbosch, Cape Town.

DEAT, 2002. Impact significance. Integrated Environmental Management, Information series 5. Department of Environmental Affairs and Tourism (DEAT). Pretoria.

Del Hoyo, J.; Elliott, A.; Sargatal, J. 1996. *Handbook of the Birds of the World, vol. 3: Hoatzin to Auks*. Lynx Editions, Barcelona, Spain. In BirdLife International (2022) Species factsheet: *Neotis ludwigii*. Downloaded from http://www.birdlife.org on 07/09/2022.

Dippenaar-Schoeman A.S., Haddad C.R., Foord S.H., Lyle R., Lotz L.N. & Marais P. 2015. South African National Survey of Arachnida (SANSA): Review of current knowledge, constraints and future needs for documenting spider diversity (Arachnida: Araneae). Transactions of the Royal Society of South Africa 70: 245-275. In CapeNature. 2020

Driver A., Sink, K.J., Nel, J.N., Holness, S., Van Niekerk, L., Daniels, F., Jonas, Z., Majiedt, P.A., Harris, L. & Maze, K. 2012. National Biodiversity Assessment 2011: An assessment of South Africa's biodiversity and ecosystems. Synthesis Report. South African National Biodiversity Institute and Department of Environmental Affairs, Pretoria

Driver, A., Maze, K., Rouget, M., Lombard, A.T., Nel, J.L., Turpie, J.K., Cowling, R.M., Desmet, P., Goodman, P., Harris, J., Jonas, Z., Reyers, B., Sink, K. & Strauss, T. 2005. National spatial biodiversity assessment 2004: priorities for biodiversity conservation in South Africa. Strelitzia, 17. South African National Biodiversity Institute, Pretoria.

Edwards, R. 2011. Environmental impact assessment method. Unpublished report for SiVest (Pty) Ltd. Environmental division. 9 May 2011.

Forsyth, G.G., FJ Kruger, F.J., & Le Maitre, D.C. 2010. National veldfire risk assessment: analysis of exposure of social, economic and environmental assets to veldfire hazards in South Africa. CSIR Report No: CSIR/NRE/ECO/ER/2010/0023/C. March 2010.

Herholdt J J. 1988. The distribution of Stanley's and Ludwig's Bustards in southern Africa: A review. *Ostrich*, 59(1): 8-13. In BirdLife International (2022) Species factsheet: *Neotis ludwigii*. Downloaded from http://www.birdlife.org on 07/09/2022.

Hilton-Taylor, C. 2000. The IUCN red list of threatened species. IUCN, Gland, Switzerland and Cambridge, United Kingdom.

Hofmeyr M.D., Loehr V.J.T. & Baard E.H.W. 2018. Chersobius signatus. The IUCN Red List of Threatened Species 2018: e.T10241A115650943. URL: https://www.iucnredlist.org/species/10241/115650943. In CapeNature. 2020.

Jenkins, A.; Smallie, J. 2009. Terminal velocity: end of the line for Ludwig's Bustard? *Africa – Birds & Birding* 14(2): 34-39. In BirdLife International (2022) Species factsheet: *Neotis ludwigii*. Downloaded from http://www.birdlife.org on 07/09/2022.

Le Roux, A. 2015. Wild flowers of Namaqualand. A botanical society guide. Fourth revised edition. Struik Nature. Cape Town.

Low, A.B. & Rebelo, A.(T.)G. (eds.) 1996. *Vegetation of South Africa, Lesotho and Swaziland*. Department of Environmental Affairs and Tourism, Pretoria.

Manning, J. 2008. Namaqualand Eco Guide. Briza Publications. Pretoria

McGeoch M.A. 2002. Insect conservation in South Africa: An overview. African Entomology 10: 1-10. In CapeNature. 2020).

Mucina, L., Jürgens, N., Le Roux, A., Rutherford, M.C., Schmiedel, U., Esler, K.J., Powrie, L.W., Desmet, P.G., and Milton, S.J. 2006. Succulent Karoo Biome. In Mucina, L. & Rutherford, M.C. 2006. (eds.) The Vegetation of South Africa. Lesotho & Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria. Pp. 221 – 299.

Naskrecki, P., & Bazelet, C.S. 2009. A species radiation among South African flightless spring katydids. (Orthoptera: Tettigoniidae: Phaneropterinae: Brinckiella Chopard). Zootaxa 2056. PP 46 – 62.

Penrith M.L. & Endrödy-Younga S. 1994. Revision of the subtribe Cryptochilina (Coleoptera: Tenebrionidae: Cryptochilini). Transvaal Museum Monograph 9: 1-144. In CapeNature. 2020.

Penrith M.L. 1986a. Relationships in the tribe Adesmiini (Coleoptera: Tenebrionidae) and a revision of the genus Stenodesia Reitter. Annals of the Transvaal Museum 34: 275-302. In CapeNature. 2020.

Picker, M.D., Colville, J.F. & Van Noort, S. 2002. Mantophasmatodea now in South Africa. Science, 297,1475**.**

Rouget, M., Reyers, B., Jonas, Z., Desmet, P., Driver, A., Maze, K., Egoh, B. & Cowling, R.M. 2004. South Africa National Spatial Biodiversity Assessment 2004: Technical report. Volume 1: Terrestrial Component. Pretoria: South African National Biodiversity Institute.

Samways M.J., Bazelet C.S. & Pryke J.S. 2010. Provision of ecosystem services by large-scale corridors and ecological networks. Biodiversity Conservation 19: 2949-2962. In CapeNature. 2020.

Samways M.J., Hamer M. & Veldtman R. 2012. Development and future of insect conservation in South Africa. In: New T.R., editor. Insect Conservation: Past, Present and Prospects. Springer Publishing, Dordrecht. In CapeNature. 2020.

SANBI. 2020. Statistics: Red List of South African Plants version 2020.1. Downloaded from Redlist.sanbi.org on 2023/02/01.

Scholtz C.H. & Holm E. 1985. Insects of southern Africa. University of Pretoria Press, Pretoria. In CapeNature. 2020

Shearing, D. 1994. Karoo. South African Wild Flower Guide 6. Botanical Society of South Africa. Kirstenbosch.

Skowno, A.L., Matlata, M., Slingsby, J.,Kirkwood,D., Raimondo, D.C., Von Staden, L., Holness, S.D., Lotter, M., Pence, G Daniels, F., Driver, A., Desmet, P.G., Dayaram, A. 2019b. Terrestrial ecosystem threat status assessment 2018 – comparison with 2011 assessment for provincial agencies. National Biodiversity Assessment 2018 Technical Report. South African National Biodiversity Institute, Pretoria.

Skowno, A.L., Raimondo, D.C., Poole, C.J., Fizzotti, B. & Slingsby, J.A. (eds.). 2019a. South African National Biodiversity Assessment 2018 Technical Report Volume 1: Terrestrial Realm. South African National Biodiversity Institute, Pretoria. http://hdl.handle.net/20.500.12143/6370

South African National Biodiversity Institute. 2012. Vegetation map of South Africa, Lesotho and Swaziland [vector geospatial dataset] 2012.

Struck M. 1995. Land of blooming pebbles: flowers and their pollinators in the Knersvlakte. Aloe 32: 56-64. In CapeNature. 2020

Stuart C. & Stuart T. 1988. Veldgids tot die soogdiere van Suid-Afrika. Struik Publishers, Cape Town. In CapeNature, 2020.

Taylor, M.R. 2015. Martial Egale Polemaetus bellicosus. In: Taylor, M. R.; Peacock, F.; Wanless, R. M. (ed.), *The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland*, pp. 113-115. BirdLife South Africa, Johannesburg, South Africa. In BirdLife International (2022) Species factsheet: *Neotis ludwigii*. Downloaded from http://www.birdlife.org on 07/09/2022.

The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. Taylor, MR, Peacock F, Wanless RW (eds). 2015. BirdLife South Africa, Johannesburg, South Africa. In BirdLife International (2022) Species factsheet: *Neotis ludwigii*. Downloaded from http://www.birdlife.org on 07/09/2022.

Van Wyk, A.E., & Smith, G.F. 2001. Regions of floristic endemism in South Africa. A review with emphasis on succulents. Umdaus press. Hatfield.

Veldtman A., Dippenaar-Schoeman A.S., Samways M.J., Veldtman R. & Du Plessis D. 2017. Chapter 10: Arthropods. In: Turner A.A., editor. Western Cape Province State of Biodiversity 2017. CapeNature Scientific Services, Stellenbosch. ISBN: 978-0-621-45962-3. In CapeNature. 2020.

Werger, M.J.A. 1974. On concepts and techniques applied in the Zürich-Montpellier method of vegetation survey. Bothalia 11, 3: 309-323.

Whitehead V.B. 1984. Distribution, biology and flower relationships of fideliid bees of southern Africa (Hymenoptera: Apoidea, Fideliidae). African journal of Zoology 19: 87-90. In CapeNature. 2020.

Yarnell R.W., Richmond-Coggan L., Bussière E., Williams K., Bissett C., Welch R. & Wiesel I. 2016. A conservation assessment of Parahyaena brunnea. In: Child M.F., Roxburgh L., Do Linh San E., Raimondo D. & Davies-Mostert H.T., editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa. In CapeNature. 2020.

APPENDIX 1: CURRICULUM VITAE – P.J.J. BOTES

Curriculum Vitae: Peet JJ Botes

Address: 22 Buitekant Street, Bredasdorp, 7280; **Cell**: 082 921 5949

Nationality:	South African
ID No.:	670329 5028 081
Language:	Afrikaans / English
Profession:	Environmental Consultant & Auditing
Specializations:	Botanical & Biodiversity Impact Assessments
	Environmental Compliance Audits
	Environmental Impact Assessment
	Environmental Management Systems
Qualifications:	**BSc** (Botany & Zoology), with Nature Conservation III & IV as extra subjects; Dept. of Natural Sciences, Stellenbosch University 1989.
	Hons. BSc (Plant Ecology), Stellenbosch University, 1989
	More than 20 years of experience in the Environmental Management Field (Since 1997 to present).
Professional affiliation:	Registered Professional Botanical, Environmental and Ecological Scientist at SACNASP (South African Council for Natural Scientific Professions) since 2005.
SACNAP Reg. No.:	400184/05

BRIEF RESUME OF RELEVANT EXPERIENCE

1997-2005: Employed by the Overberg Test Range (a Division of Denel), responsible for managing the environmental department of OTB, developing and implementing an ISO14001 environmental management system, ensuring environmental compliance, performing environmental risk assessments with regards to missile tests and planning the management of the 26 000 ha of natural veld, working closely with CapeNature (De Hoop Nature Reserve).

2005-2010: Joined Enviroscientific, as an independent environmental consultant specializing in wastewater management, botanical and biodiversity assessments, developing environmental management plans and strategies, environmental control work as well as doing environmental compliance audits and was also responsible for helping develop the biodiversity part of the Farming for the Future audit system implemented by Woolworths. During his time with Enviroscientific he performed more than 400 biodiversity and environmental legal compliance audits.

2010-2017: Joined EnviroAfrica, as an independent Environmental Assessment Practitioner and Biodiversity Specialist, responsible for Environmental Impact Assessments, Biodiversity & Botanical specialist reports and Environmental Compliance Audits. During this time Mr Botes compiled more than 70 specialist Biodiversity & Botanical impact assessment reports ranging from agricultural-, infrastructure pipelines- and solar developments.

2017-Present: Establish a small independent consultancy (PB Consult) specialising in Environmental Audits, Biodiversity and Botanical specialist studies as well as Environmental Impact Assessment.

LIST OF MOST RELEVANT BOTANICAL & BIODIVERSITY STUDIES

Botes. P. 2007: Botanical assessment. Schaapkraal, Erf 644, Mitchell's Plain. A preliminary assessment of the vegetation in terms of the Fynbos Forum: Ecosystem guidelines. 13 November 2007.

Botes. P. 2008: Botanical assessment. Schaapkraal Erf 1129, Cape Town. A preliminary assessment of the vegetation using the Fynbos Forum Terms of Reference: Ecosystem guidelines for environmental Assessment in the Northern Cape. 20 July 2008.

Botes, P. 2010(a): Botanical assessment. Proposed subdivision of Erf 902, 34 Eskom Street, Napier. A Botanical scan and an assessment of the natural vegetation of the site to assess to what degree the site contributes towards conservation targets for the ecosystem. 15 September 2010.

Botes, P. 2010(b): Botanical assessment. Proposed Loeriesfontein low cost housing project. A preliminary Botanical Assessment of the natural veld with regards to the proposed low cost housing project in/adjacent to Loeriesfontein, taking into consideration the National Spatial Biodiversity Assessment of South Africa. 10 August 2010.

Botes, P. 2010(c): Botanical assessment: Proposed Sparrenberg dam, on Sparrenberg Farm, Ceres. . A Botanical scan and an assessment of the natural vegetation of the site. 15 September 2010.

Botes, P. 2011: Botanical scan. Proposed Cathbert development on the Farm Wolfe Kloof, Paarl (Revised). A botanical scan of Portion 2 of the Farm Wolfe Kloof No. 966 (Cathbert) with regards to the proposed Cathbert Development, taking into consideration the National Spatial Biodiversity Assessment of South Africa. 28 September 2011.

Botes, P. 2012(a): Proposed Danielskuil Keren Energy Holdings Solar Facility on Erf 753, Danielskuil. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 17 March 2012.

Botes, P. 2012(b): Proposed Disselfontein Keren Energy Holdings Solar Facility on Farm Disselfontein no. 77, Hopetown. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 28 March 2012.

Botes, P. 2012(c): Proposed Kakamas Keren Energy Holdings Solar Facility on Remainder of the Farm 666, Kakamas. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 13 March 2012.

Botes, P. 2012(d): Proposed Keimoes Keren Energy Holdings Solar Facility at Keimoes. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 9 March 2012.

Botes, P. 2012(e): Proposed Leeu-Gamka Keren Energy Holdings Solar Facility on Portion 40 of the Farm Kruidfontein no. 33, Prince Albert. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 27 March 2012.

Botes, P. 2012(f): Proposed Mount Roper Keren Energy Holdings Solar Facility on Farm 321, Kuruman. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 28 March 2012.

Botes, P. 2012(g): Proposed Whitebank Keren Energy Holdings Solar Facility on Farm no. 379, Kuruman. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 27 March 2012.

Botes, P. 2012(h): Proposed Vanrhynsdorp Keren Energy Holdings Solar Facility on Farm Duinen Farm no. 258, Vanrhynsdorp. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 13 April 2012.

Botes, P. 2012(i): Askham (Kameelduin) proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required. 1 November 2012.

Botes, P. 2013(a): Groot Mier proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required. January 2013.

Botes, P. 2013(b): Loubos proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required. January 2013.

Botes, P. 2013(c): Noenieput proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required. January 2013.

Botes, P. 2013(d): Rietfontein proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required. January 2013.

Botes, P. 2013(e): Welkom proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required. January 2013.

Botes, P. 2013(f): Zypherfontein Dam Biodiversity & Botanical Scan. Proposed construction of a new irrigation dam on Portions 1, 3, 5 & 6 of the Farm Zypherfontein No. 66, Vanrhynsdorp (Northern Cape) and a scan of the proposed associated agricultural enlargement. September 2013.

Botes, P. 2013(g): Onseepkans Canal: Repair and upgrade of the Onseepkans Water Supply and Flood Protection Infrastructure, Northern Cape. A Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required). August 2013.

Botes, P. 2013(h): Biodiversity scoping assessment with regards to a Jetty Construction On Erf 327, Malagas (Matjiespoort). 24 October 2013.

Botes, P. 2013(i): Jacobsbaai pump station and rising main (Saldanha Bay Municipality). A Botanical Scan of the area that will be impacted by the proposed Jacobsbaai pump station and rising main. 30 October 2013.

Botes, P. 2014(a): Brandvlei Bulk Water Supply: Proposed construction of a 51 km new bulk water supply pipeline (replacing the existing pipeline) from Romanskolk Reservoir to the Brandvlei Reservoir, Brandvlei (Northern Cape Province). A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required). 24 February 2014.

Botes, P. & McDonald Dr. D. 2014: Loeriesfontein Bulk Water Supply: Proposed construction of a new bulk water supply pipeline and associated infrastructure from the farm Rheeboksfontein to Loeriesfontein Reservoir, Loeriesfontein. Botanical scan of the proposed route to determine the possible impact on vegetation and plant species. 30 May 2014.

Botes, P. 2014(b): Kalahari-East Water Supply Scheme Extension: Phase 1. Proposed extension of the Kalahari-East Water Supply Scheme and associated infrastructure to the Mier Municipality, ZF Mgcawu District Municipality, Mier Local Municipality (Northern Cape Province). Biodiversity & Botanical scan of the proposed route to determine the possible impact on biodiversity with emphasis on vegetation and plant species. 1 July 2014.

Botes, P. 2014(c): The proposed Freudenberg Farm Homestead, Farm no. 419/0, Tulbagh (Wolseley Area). A Botanical scan of possible remaining natural veld on the property. 26 August 2014.

Botes, P. 2014(d): Postmasburg WWTW: Proposed relocation of the Postmasburg wastewater treatment works and associated infrastructure, ZF Mgcawu District Municipality, Tsantsabane Local Municipality (Northern Cape Province). Biodiversity and botanical scan of the proposed pipeline route and WWTW site. 30 October 2014.

Botes, P. 2015(a): Jacobsbaai pump station and rising main (Saldanha Bay Municipality) (Revision). A Botanical Scan of the area that will be impacted by the proposed Jacobsbaai pump station and rising main. 21 January 2015.

Botes, P. 2015(b): Steenkampspan proving ground. Proposed establishment of a high speed proving (& associated infrastructure) on the farm Steenkampspan (No. 419/6), Upington, ZF Mgcawu (Siyanda) District

Municipality, Northern Cape Province. Biodiversity and Botanical Scan of the proposed footprint. 20 February 2015.

Botes, P 2015(c): Proposed Bredasdorp Feedlot, Portion 10 of Farm 159, Bredasdorp, Cape Agulhas Municipality, Northern Cape Province. A Botanical scan of the area that will be impacted. 28 July 2015.

Botes, P. 2016(a): OWK Raisin processing facility, Upington, Erf 151, Kenhardt, Northern Cape Province. A Botanical scan of the proposed footprint. 26 May 2016.

Botes, P. 2016(b): Onseepkans Agricultural development. The proposed development of ±250 ha of new agricultural land at Onseepkans, Northern Cape Province. Biodiversity and Botanical Scan. January 2016.

Botes, P. 2016(c): Henkries Mega-Agripark development. The proposed development of ±150 ha of high potential agricultural land at Henkries, Northern Cape Province. Biodiversity and Botanical Scan of the proposed footprint. 28 February 2016.

Botes, P. 2016(d): Proposed Namaqualand Regional Water Supply Scheme high priority bulk water supply infrastructure upgrades from Okiep to Concordia and Corolusberg. Biodiversity Assessment of the proposed footprint. March 2016.

Botes, P. 2017: The proposed new Namaqua N7 Truck Stop on Portion 62 of the Farm Biesjesfontein No. 218, Springbok, Northern Cape Province. Botanical scan of the proposed footprint. 10 July 2017.

Botes, P. 2018(a): Kamiesberg Bulk Water Supply – Ground water desalination, borehole- and reservoir development, Kamiesberg, Northern Cape Province. Botanical scan of the proposed footprint. 20 February 2018

Botes, P. 2018(b): Rooifontein Bulk Water Supply – Ground water desalination, borehole- and reservoir development, Rooifontein, Northern Cape Province. Botanical scan of the proposed footprint. 23 February 2018

Botes, P. 2018(c): Paulshoek Bulk Water Supply – Ground water desalination, borehole- and reservoir development, Paulshoek, Northern Cape Province. Botanical scan of the proposed footprint. 27 March 2018.

Botes, P. 2018(d): Kakamas Waste Water Treatment Works Upgrade – Construction of a new WWTW and rising main, Khai !Garib Local Municipality, Northern Cape Province. Botanical assessment of the proposed footprint. 1 August 2018.

Botes, P. 2018(e): Kakamas Bulk Water Supply – New bulk water supply line for Kakamas, Lutzburg & Cillie, Khai !Garib Local Municipality, Northern Cape Province. Botanical assessment of the proposed footprint. 4 August 2018.

Botes, P. 2018(f): Wagenboom Weir & Pipeline – Construction of a new pipeline and weir with the Snel River, Breede River Local Municipality, Northern Cape Province. Botanical assessment of the proposed footprint. 7 August 2018.

Botes, P. 2018(g): Steynville (Hopetown) outfall sewer pipeline – Proposed development of a new sewer outfall pipeline, Hopetown, Northern Cape Province. Botanical assessment of the proposed footprint. 8 October 2018.

Botes, P. 2018(h): Tripple D farm agricultural development – Development of a further 60 ha of vineyards, Erf 1178, Kakamas, Northern Cape Province. Botanical assessment of the proposed footprint. 8 October 2018.

Botes, P. 2018(i): Steynville (Hopetown) outfall sewer pipeline – Proposed development of a new sewer outfall pipeline, Hopetown, Northern Cape Province. Botanical assessment of the proposed footprint. 8 October 2018.

Botes, P. 2019(a): Lethabo Park Extension – Proposed extension of Lethabo Park (Housing Development) on the remainder of the Farm Roodepan No. 70, Erf 17725 and Erf 15089, Roodepan Kimberley. Sol Plaaitje Local Municipality, Northern Cape Province. Botanical assessment of the proposed footprint (with biodiversity inputs). 15 May 2019.

Botes, P. 2019(b): Verneujkpan Trust agricultural development – The proposed development of an additional ±250 ha of agricultural land on Farms 1763, 2372 & 2363, Kakamas, Northern Cape Province. 27 June 2019.

Botes, P. 2020(a): Gamakor & Noodkamp Low cost housing – Botanical Assessment of the proposed formalization of the Gamakor and Noodkamp housing development on the remainder and portion 128 of the Farm Kousas No. 459 and Ervin 1470, 1474 and 1480, Gordonia road, Keimoes. Kai !Gariep Local Municipality, Northern Cape Province. 6 February 2020.

Botes, P. 2020(b): Feldspar Prospecting & Mining, Farm Rozynen Bosch 104, Kakamas. Botanical assessment of the proposed prospecting and mining activities on Portion 5 of The Farm Rozynen Bosch No. 104, Kakamas, Khai !Garib Local Municipality, Northern Cape Province. 12 February 2020.

Botes, P. 2020(c): Boegoeberg housing project – Botanical assessment of the proposed formalization and development of 550 new erven on the remainders of farms 142 & 144 and Plot 1890, Boegoeberg settlement, !Kheis Local Municipality, Northern Cape Province. 1 July 2020.

Botes, P. 2020(d): Komaggas Bulk Water supply upgrade – Botanical assessment of the proposed upgrade of the existing Buffelsrivier to Komaggas BWS system, Rem. of Farm 200, Nama Khoi Local Municipality, Northern Cape Province. 8 July 2020.

Botes, P. 2020(e): Grootdrink housing project – Botanical assessment of the proposed formalization and development of 370 new erven on Erf 131, Grootdrink and Plot 2627, Boegoeberg Settlement, next to Grootdrink, !Kheis Local Municipality, Northern Cape Province. 14 July 2020.

Botes, P. 2020(f): Opwag housing project – Botanical assessment of the proposed formalization and development of 730 new erven on Plot 2642, Boegoeberg Settlement and Farm Boegoeberg Settlement NO.48/16, Opwag, !Kheis Local Municipality, Northern Cape Province. 16 July 2020.

Botes, P. 2020(g): Wegdraai housing project – Botanical assessment of the Proposed formalization and development of 360 new erven on Erven 1, 45 & 47, Wegdraai, !Kheis Local Municipality, Northern Cape Province. 17 July 2020.

Botes, P. 2020(h): Topline (Saalskop) housing project – Botanical assessment of the pproposed formalization and development of 248 new erven on Erven 1, 16, 87, Saalskop & Plot 2777, Boegoeberg Settlement, Topline, !Kheis Local Municipality, Northern Cape Province. 18 July 2020.

Botes, P. 2020(i): Gariep housing project – Botanical assessment of the proposed formalization and development of 135 new erven on Plot 113, Gariep Settlement, !Kheis Local Municipality, Northern Cape Province. 20 July 2020.

APPENDIX 2: VANRHYNSDORP ROMA ENERGY – NEMA EIA SCREENING REPORT