PB CONSULT
ENVIRONMENTAL MANAGEMENT SERVICES

BOTANICAL & TERRESTRIAL BIODIVERSITY ASSESSMENT (Updated)

C-N14-08 AKKERBOOM

THE PROPOSED DEVELOPMENT OF AN ELECTRICAL VEHICLE RECHARGE FACILITY AND A RENEWABLE PHOTOVOLTAIC ENERGY GENERATION PLANT AT AKKERBOOM FARM STALL (PORTIONS 19 & 47 OF FARM FRIER'S DALE NO. 466),ALONG THE N14 BETWEEN KAKAMAS AND KEIMOES, KAI! GARIB MUNICIPALITY, NORTHERN CAPE PROVINCE.

PREPARED FOR:

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EXECUTIVE SUMMARY

Zero Carbon Charge (ZCC) is rolling out a network of ultra-fast electric vehicle (EV) charging facilities/stations powered by renewable energy, that will allow South African drivers to travel across the country in the knowledge that there are charging stations located every 150 km along all the mayor roads in South Africa. Charging facilities aim to incorporate existing infrastructure such as farm stalls, shops, and guest houses next to National and Provincial roads across South Africa. A desktop study and field investigation were performed to assess the terrestrial biodiversity within the proposed study area and to identify the ecological characteristics and sensitivity of the site.

The total proposed development footprint will result in a long term or permanent impact on a relatively small area (< 8 ha). The charging station and associated infrastructure will impact on about 0.5 ha of existing vineyards. The proposed solar sites will impact on remaining natural veld within a CBA area (Holness & Oosthuysen, 2016).

VEGETATION TYPE & STATUS	According to the South African vegetation map (2018) (Mucina & Rutherford, 2006), the charging station and Phase 1 of the solar panels will impact on Lower Gariep Alluvial Vegetation (blue in Figure 6), while Phase 2 – 7 of the solar panels will impact on Bushmanland Arid Grassland (Red in Figure 6). Both these vegetation types are considered "Least Threatened", in terms of the "*Revised National list of ecosystems that are threatened and in need of protection*" (GN. No. 2747 of 18 November 2022).
WATER COURSES AND WETLANDS	One episodic watercourse or drainage line was observed (Refer Photo 1, Photo 2 & Heading 7.1.2). A freshwater specialist was appointed to evaluate the significance of this watercourse and the potential impact (as a result it is not discussed in this study).
SPECIAL HABITAT CONDITIONS	The landscape is slightly undulating, relatively homogenous, apart from the deeper sands to the west of the proposed Phase 1 Solar site. It does not contain any rocky outcrop or any other significant biophysical feature that might have resulted in special habitats for fauna or flora.
LAND-USE	The Charging station and its associated infrastructure will impact on (< 0.5 ha) existing vineyards. The proposed solar sites will impact on less than 8 ha of remaining natural land used for game and livestock grazing. Both these properties belong to the landowner of the Akkerboom farm stall, who will benefit from the placement of the charging station and the renewable power plants. The proposed development is likely to lead to job creation, which will reduce the impact on land use significantly.
VEGETATION ENCOUNTERED	The Nama-Karoo is not particularly rich in plant species and does not contain any centre of endemism. Very little of the veld has been transformed. Although the vegetation encountered was in relatively good condition, species diversity was even lower than expected. However, the good cover of grasses suggests recent rains during the autumn season. The lower species diversity is most probably still the result of the recent 7-year drought, which impacted on almost the whole of the Northern Cape and Karoo. In terms of botanical significance, it was only the presence of NFA and NCNCA protected plant species that was of special significance (Refer to Heading 5.5).
CONSERVATION PRIORITY AREAS	According to the 2016, Northern Cape critical biodiversity areas maps (Holness & Oosthuysen, 2016), the charging station (and its associated infrastructure) might impact on a portion of a critical biodiversity area, but this area is in fact existing agricultural land. The proposed Solar facilities, Phase 1 – 7 will all impact on critical biodiversity areas (associated with the conservation corridor along the Orange River (Figure 7). The small episodic watercourse to the west of proposed solar developments is also included in the CBA areas map. According to the **DFFE Environmental Screening Report** the relative Terrestrial Biodiversity theme sensitivity is considered of **Very High Sensitivity** because the site overlaps CBA 1 and CBA 2 areas (Heading 4.3 & 7.2).

CONNECTIVITY

The development of the Charging station (and associated infrastructure) will not lead to any further impact on connectivity, because it overlaps existing vineyards.

Phase 1 Solar site will be in a narrow corridor between the N14 (to the south) and a railway line (to the north). Just north of the railway line vineyards have been established. The location of the Phase 1 solar sites will have a slight impact on the east-west corridor but will not have any significant additional impact on the north-south corridor.

Phase 2 – 7 Solar sites, will be located just north of the existing vineyards mentioned above, with an additional vineyard development slightly away to the north of the proposed solar sites. Again, the proposed solar development will have a slight impact on the east-west migration corridor but will have little additional impact on the north-south migration corridor (.

Overall, the proposed development falls within an area already impacted by long term anthropogenic (human) activity, especially along Orange River. East-west corridors will be slightly impacted but north-south corridors are unlikely to be impacted significantly or at all.

THREATENED AND PROTECTED PLANT SPECIES

No red-listed plant species was observed within the study area,

No NEMBA protected plant species were observed within the proposed footprint.

Two NFA protected species were observed, namely:

- *Adansonia digitata* (Baobab Tree) – 3 trees planted by the owners, on the edge of the garden area of the existing Akkerboom farm stall (Even though this is not its natural distribution area, it should be protected).
- *Vachellia erioloba* (Camelthorn Tree) – several trees within the garden and parking areas of the Akkerboom farm stall and about 7 trees on the edge or just outside of the Phase 1 – Solar site footprint (All of the mature trees larger than 6m MUST be protected).

Two Northern Cape Nature Conservation Act protected species were observed, one of which was outside the footprint. However, several *Boscia foetida* (mostly smaller multi-stemmed individuals) with the area that will be impacted by Phase 2 – 7 Solar extensions.

According to the **DFFE Environmental Screening Tool** report for this site (Appendix 2), the **plant species theme** sensitivity is considered **Medium Sensitive**, which is supported by the findings of this study (presence of protected species). However, if all the large mature (more than 6m high) Camelthorn trees are protected from the development, the sensitivity rating could be reduced to **Low Sensitive**.

FAUNA & AVI-FAUNA

No evidence in the form of tracks, faeces or even burrows of any other indigenous fauna (e.g., small game) were observed within the footprint area, although it is expected that reptile's (like gecko's, agama's, skinks, and snakes) and some of the smaller mammals like rodents might still occur in the larger area.

Three red-listed terrestrial mammals may still occur in the larger surroundings namely the Honey Badger, *Mellivora capensis* (Endangered), the Brown Hyaena, *Hyaena brunnea* (Near Threatened) and the Black-footed cat, *Felis nigripes* (Vulnerable). However, it is highly unlikely that the Brown Hyaena is still present in this area as it had been purposely or inadvertently persecuted over the years. The Honey Badger and the Black-footed cat may still occur in the surrounding areas (although very unlikely so near to human activity), but both have a wide national distribution, and the development footprint will not result in a significant extent of habitat loss for these species.

According to the **DFFE Environmental Screening Tool**, the relative Animal species theme sensitivity is considered of **Medium Sensitivity** because of the potential presence of one bird species namely (*Neotis ludwigii*). Refer to Table 11. The bird may potentially feed and nest in the surrounding area, but it is highly unlikely that the proposed development will have any significant additional impact on its breeding or feeding habitat.

With regards to this project the animal species theme sensitivity rating should be **Low Sensitive**.

MAIN CONCLUSION

According to the **DFFE Environmental Screening Tool** the relative Terrestrial Biodiversity theme sensitivity is considered of **Very High Sensitivity** because:

- The site overlaps CBA 1 and CBA 2 areas
- The site overlaps the distribution range of one IUCN listed bird species (the Ludwig's Bustard).
- Two NFA protected species were observed within the footprint (including *Vachellia erioloba*).
- Two NCNCA protected species were observed within the footprint (including *Boscia foetida*), the other species was only observed outside of the proposed footprint.

The Terrestrial biodiversity assessment aims to take all the discussion under Heading 7.1 into account, including the fact that the fact that the vegetation is not vulnerable or endangered as well as all the other reasons discussed throughout this document. According, Table 12, the main impacts associated with the proposed development will be:

- The potential impact on the CBA area;
- The associated impact on connectivity;
- The potential impact on NFA and NCNCA protected plant species;
- The potential impact on two IUCN listed bird species.

Because of the location and small size of the proposed development even the **Cumulative** impact given in Table 12 is **Medium**.

With mitigation this impact can be reduced to **Medium-Low**

It is considered highly unlikely that the 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 species.
- Loss of ecosystem connectivity.

The findings of this assessment suggests that the relative terrestrial biodiversity theme sensitivity should be **Medium-Low Sensitive** (not Very High Sensitive as suggested in the DFFE screening report).

Based on the data collected and analyzed for the proposed development of the solar charge facility, no fatal flaws or any other obstacles were found with respect to the flora, vegetation, fauna, and terrestrial biodiversity.

WITH THE AVAILABLE INFORMATION IT IS RECOMMENDED THAT THE PROJECT BE APPROVED WITH THE MITIGATION ACTIONS AS DESCRIBED UNDER HEADING 8.

DETAILS OF THE AUTHOR

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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 and environmental legal compliance audits.

During 2010 he joined EnviroAfrica 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.

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:

15 November 2024

Date:

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ABBREVIATIONS

BAR	Basic Assessment Report
CBA	Critical biodiversity area (in terms of the 2017 City of Cape Town Biodiversity Network)
DENC	Department of Environment and Nature Conservation
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
NEMA	National Environmental Management Act, 1998 (Act no. 107 of 1998)
VU	Vulnerable

1. INTRODUCTION

Zero Carbon Charge (ZCC) is rolling out a network of ultra-fast electric vehicle (EV) charging facilities/stations powered by renewable energy, that will allow South African drivers to travel across the country in the knowledge that there are charging stations located every 150 km along all the mayor roads in South Africa. Charging facilities aim to incorporate existing infrastructure such as farm stalls, shops, and guest houses next to National and Provincial roads across South Africa. Where needed, ZCC will erect new farm stalls to complement these charging facilities (https://charge.co.za/about/about-zero-carbon-charge/).

One of the proposed sites for such a charging facility is at the existing Akkerboom farm stall between Kakamas and Keimoes. ZCC proposed to construct an electric vehicle recharge station, next to the existing farm stall (Portion 19 of Farm Frier's Dale no. 466) and a renewable photovoltaic energy generation plant on to the north of the N14 (Portion 47 of Farm Frier's Dale No. 466).

The DFFE screening report for the proposed site, compiled by EnviroAfrica on the 3rd of October 2024, identified various areas of potential environmental sensitivity, of which the following will be discussed in this report:

- The relative Animal species theme sensitivity is considered of **Medium Sensitivity**;
- The relative Plant species theme sensitivity is considered of **Medium Sensitivity**;
- The relative Terrestrial Biodiversity theme sensitivity is considered of **Very High Sensitivity**.

According to the Desktop Assessment (Heading 3.4) and the 2012 Vegetation map of South Africa, two vegetation type might be impacted, namely Bushmanland Arid Grassland, and Lower Gariep Alluvial Vegetation. Both vegetation types are now considered "Least Threatened", in terms of the "*Revised National list of ecosystems that are threatened and in need of protection*" (GN. No. 2747 of 18 November 2022). However, the proposed footprint overlaps critical biodiversity area, as identified in the 2016 Northern Cape critical biodiversity areas maps (Holness & Oosthuysen, 2016).

1.1. LEGISLATION GOVERNING THIS REPORT

EnviroAfrica was appointed as the EAP to facilitate the NEMA EIA application for the proposed project. PB Consult was appointed by EnviroAfrica to conduct a botanical and terrestrial biodiversity assessment of the proposed footprint area.

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

- The National Environmental Management Act, Act. 107 of 1998 (NEMA);
- The "Protocol for the Specialist Assessment and Minimum report content requirements for environmental impacts on terrestrial biodiversity" in terms of Sections 24(5)(a) and (h) and 44 of the NEMA (Government Notice No. 320 of 20 March 2020).

1.2. TERMS OF REFERENCE

The Terms of Reference for this study were to undertake a visit to the study area and compile a specialist report that assesses the potential impacts on *Botanical and Terrestrial Biodiversity* features of the proposed development.

Study should address:

- Habitat sensitivity;
- Threatened ecosystems (including critical biodiversity areas and ecological support areas);
- Flora and fauna species of conservation concern;
- Any significant botanical or other terrestrial biodiversity features that might be impacted because of the proposed development as identified in the DFFE Screening Report for the site.
- Potential direct and cumulative impacts resulting from the proposed development on the receiving environment.

2. STUDY AREA

2.1. LOCATION & LAYOUT

The Akkerboom Farm stall is located just off the N14, about halfway between Kakamas and Keimoes in the Kai !Garib Local Municipality of the Northern Cape province (Figure 1).

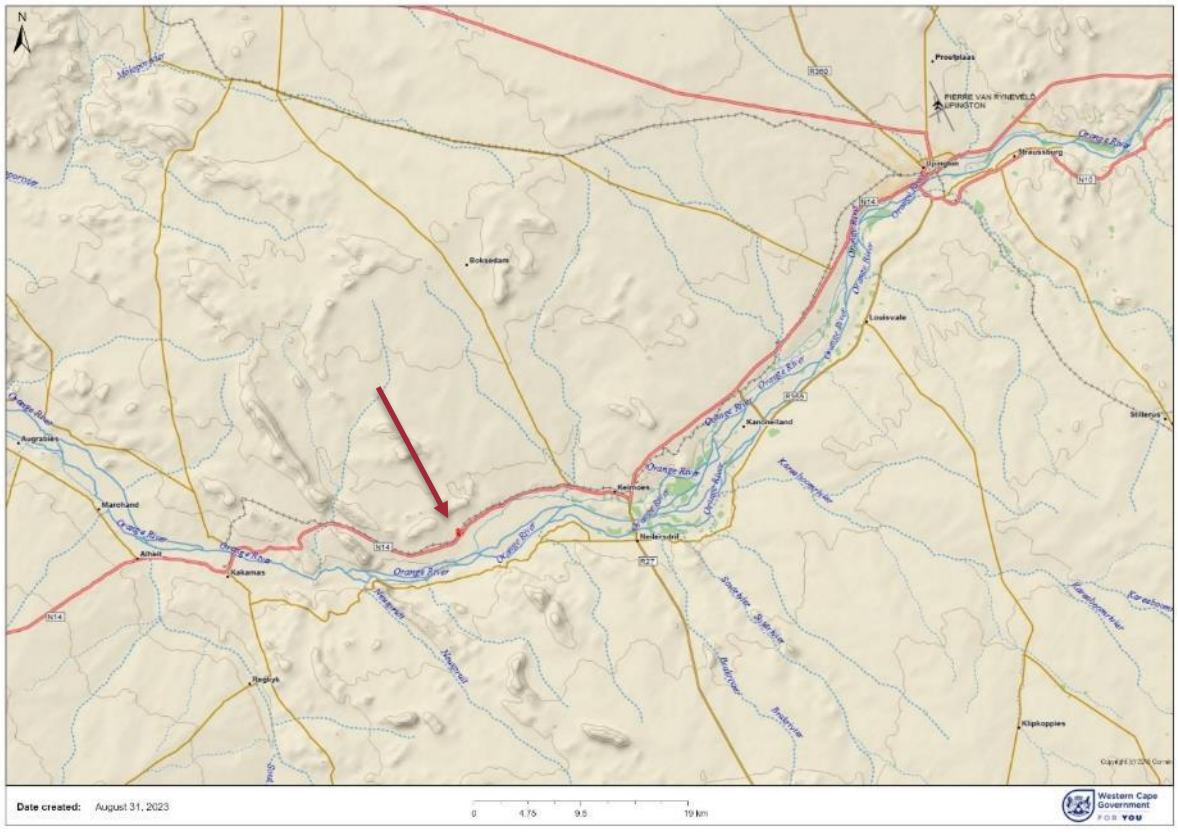

Figure 1: A map showing the location of the Akkerboom Farm stall between Kakamas and Keimoes

The farm stall itself is located on Portion 19 of the farm Frier's Dale No. 466 (about 29.59 ha in size). The proposed charging station will link with the farm stall, placed to the southeast of the existing farm stall on the same property (Figure 2 & Figure 3). It will impact on an area presently planted to vineyards. The proposed charging station, parking areas and potential farm stall additions will cover an area of less than half of a hectare (<500 m^2).

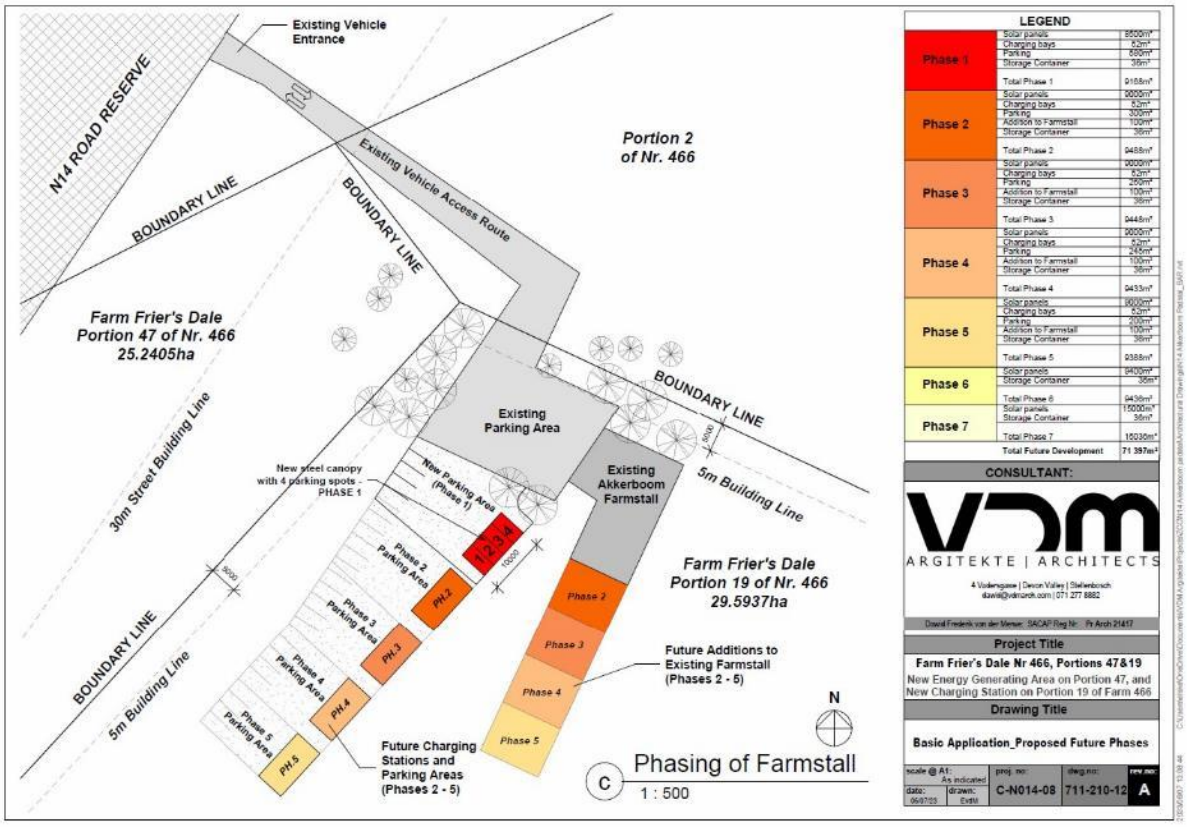

Figure 2: Schematic layout of the proposed locations for the various phases of the charging station and associated parking areas in relation to the existing farm stall and its parking area.

The proposed solar facilities will be placed to the north of the N14 (across the road from the farm stall) on Portion 47 of the farm Frier's Dale No. 466 (about 25.24 ha in size). Phase 1 will be placed to the south of the existing vineyard blocks (between the railway line and the N14), while the subsequent phases (Phase 2 – 7) will be located to the north of the same vineyard blocks. The study area for the solar panels was just under 11 ha in size (the footprint for all the proposed phases of the solar facilities will be <8 ha within this larger site).

Because of the strategic placement of the farm stall no alternatives for the location of the charging station are considered. The placement of the solar facilities was guided by available land and ownership. The solar facilities itself can be placed anywhere within the property boundaries. The final locations are based on recommendations from the EAP after his initial planning site visit with the client.

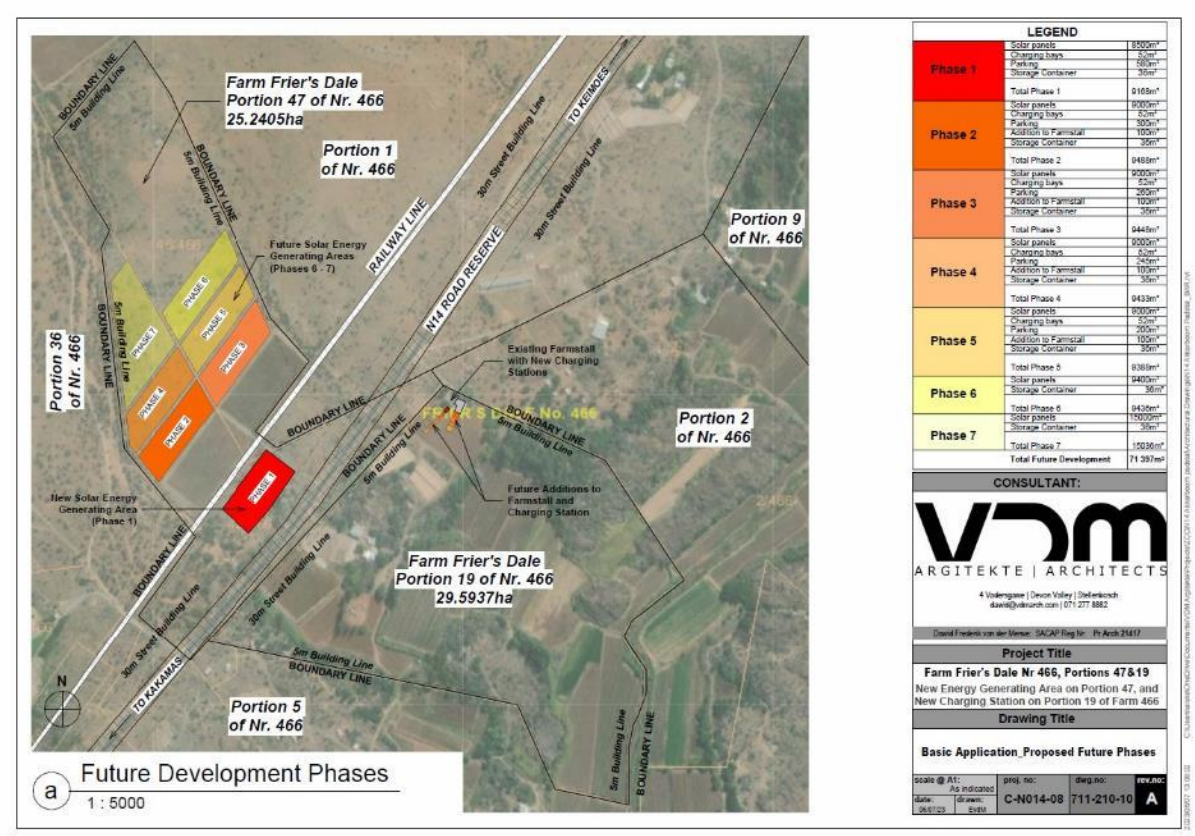

Figure 3: Schematic drawing, showing the proposed layout of the various phases of the charging stations and solar facilities.

Table 1: Co-ordinates of the final layout locations (WGS 84 format)

DESCRIPTION	Latitude	Longitude
Charging station (corner coordinates)		
Corner 1	*28°44'19.54"S*	*20°49'47.09"E*
Corner 2	*28°44'19.79"S*	*20°49'47.58"E*
Corner 3	*28°44'20.31"S*	*20°49'47.19"E*
Corner 4	*28°44'20.00"S*	*20°49'46.72"E*
Solar Pannels: Stage 1 (Corner coordinates)		
Corner 1	*28°44'22.71"S*	*20°49'35.21"E*
Corner 2	*28°44'24.73"S*	*20°49'38.24"E*
Corner 3	*28°44'28.74"S*	*20°49'34.84"E*
Corner 4	*28°44'24.77"S*	*20°49'38.22"E*
Solar Pannels: Stage 2 to 7 (Corner coordinates)		
Corner 1	*28°44'10.92"S*	*20°49'33.49"E*
Corner 2	*28°44'15.76"S*	*20°49'36.02"E*
Corner 3	*28°44'24.17"S*	*20°49'26.99"E*
Corner 4	*28°44'22.58"S*	*20°49'27.06"E*
Corner 5	*28°44'11.93"S*	*20°49'25.55"E*
Corner 6	*28°44'11.31"S*	*20°49'26.22"E*
Corner 7	*28°44'15.16"S*	*20°49'28.93"E*

2.2. TOPOGRAPHY, GEOLOGY AND SOILS

The proposed charging station will be located on an area already leveled for agricultural purposes (existing vineyards). The phase 1 solar site will be in slight depression between the N14 and the railway line. The further solar phases (phase 2 – 7) will be located on a slight elevation with a very gentle slope from the north-east to the southwest (towards a small episodical watercourse, that runs to the west of the property.

According to the Geology map of South Africa (2018 edition) the surface geology of the study area is from the Keimoes Suite (https://maps.geoscience.org.za/portal/apps/sites/) consisting of dark grey to leucocratic, equigranular to porphyritic granite, granodiorite, charnockite and minor diorite (Figure 4).

The national soils map shows that the soils differ to the north (the area where the Phase 2 – 7 solar extensions will be placed) and can described as soils with minimal development, usually shallow, on hard or weathering rock, with or without intermittent diverse soils. Lime is generally present in part or most of the landscape. The soils to the south (associated with the Lower Gariep Alluvial Vegetation) can be described as alluvium soils with minimal development, usually shallow, on hard or weathering rock, with or without intermittent diverse soils. Lime is also generally present in part or most of the landscape.

Figure 4: The surface geology map of South Africa, showing the approximate location of the study area (Council of Geoscience Interactive Web Portal).

2.3. CLIMATE

The site falls within the Nama Karoo, which is an arid biome (all areas with a rainfall of less than 400 mm/year are regarded as arid). Kakamas normally receives about 134 mm of rain per year, with rainfall largely in late summer/early autumn (major peak) and very variable from year to year. It receives the lowest rainfall (3 mm) in June and the highest (27 mm) in March (Refer to **Error! R eference source not found.**).

The climate of Nama-Karoo is essentially continental and is little affected by the ameliorating influences of the oceans. Rainfall is unreliable and droughts are unpredictable and sometimes prolonged (Mucina *et. al.,* 2006). The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Kakamas range from 20°C in July to 35°C in January. The region is the coldest during July with temperatures as low as 3.7°C on average during the night (www.saexplorer.co.za). Table 2 gives a summary of temperatures and rainfall recorded at Kakamas (https://en.climate-data.org/location/911655/).

Table 2: Average rainfall and temperatures at Kakamas (https://en.climate-data.org/location/911655/)

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	27.3	26.4	24.4	21.1	16	13.1	12.2	14.5	17.3	20.9	23.5	26.3
Min. Temperature (°C)	18.9	18.3	16.7	12.8	7.8	4.6	3.7	5.4	8.1	11.6	14.3	17.2
Max. Temperature (°C)	35.7	34.5	32.2	29.5	24.3	21.7	20.8	23.6	26.5	30.3	32.8	35.4
Avg. Temperature (°F)	81.1	79.5	75.9	70.0	60.8	55.6	54.0	58.1	63.1	69.6	74.3	79.3
Min. Temperature (°F)	66.0	64.9	62.1	55.0	46.0	40.3	38.7	41.7	46.6	52.9	57.7	63.0
Max. Temperature (°F)	96.3	94.1	90.0	85.1	75.7	71.1	69.4	74.5	79.7	86.5	91.0	95.7
Precipitation / Rainfall (mm)	17	21	27	17	9	3	4	3	3	7	13	10

3. METHODOLOGY

The protocol for specialist assessment and minimum report content and requirements for environmental impacts on terrestrial biodiversity was published in GN. No. 320 of 20 March 2020. It includes the requirements for a desktop analysis and site verification.

3.1. DESKTOP ANALYSIS

The first step of the study was to conduct a desktop analysis of the study area and its immediate surroundings. Using the DFFE screening tool report as basis, spatial information from online databases such as SANBI BGIS and Google Earth were used to evaluate the site in terms of vegetation, obvious differences in landscape (e.g., variations in soil type, rocky outcrops etc.) or vegetation densities , which might indicate differences in plant community or species composition, critical biodiversity areas and other terrestrial biodiversity features as identified in the screening tool.

This information was used to prepare a study area map, which is used as a reference during the physical site visit. Plant species lists were prepared, and species of special significance were flagged.

3.2. SITE SENSITIVITY VERIFICATION

The fieldwork for project was carried out on the 5th of July 2023. The site survey was conducted over a 4--hour period, by walking the site and sampling the vegetation, using a modified approach, based on the Braun-Blanquet vegetation survey method (Werger, 1974).

Protected or other special plants and any terrestrial feature of significance was, marked by waypoints and/or on the study map, and photographed (Figure 5). A hand-held Garmin GPSMAP 62s was used to track the sampling route and for recording waypoints. During the survey notes, and photographic records were collected. All efforts were made to ensure that any variation in vegetation or soil condition, which might indicate special botanical features (e.g., rocky outcrops, watercourses or heuweltjies), were visited. Efforts was also made to ensure that the plant species list was as complete as possible.

Figure 5: Google overview, showing the study area (red)and the routes walked during the site visit.

3.3. LIMITATIONS, ASSUMPTIONS AND UNCERTAINTIES

The findings are based on a one-day site visit (not long-term repetitive sampling), which means that it is likely that some plant species might have been missed (out of season). The author knows this area and its vegetation well, as a result, the timing of the site visit was reasonable, and it was also clear that the property received recent rains during the autumn rainfall period. Essentially all perennial plants were identifiable and a good understanding of the status of the vegetation and plant species in the study areas were obtained and confidence in the findings are high. There should be no limiting factors which could significantly alter the outcome of this study. It is unlikely that a full botanical assessment will result in any additional findings that would have a significant impact on the outcome.

3.4. 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 status of the veld within the study area to identify special or significant environmental features which might be impacted by the proposed 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.

3.4.1. 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)

3.4.2. 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 3 for categories used).

Likelihood refers to the probability of the specific impact occurring because of the proposed activity (Refer to Table 4, for categories used).

Duration refers to the length in time during which the activity is expected to impact on the environment (Refer to Table 5).

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 6).

Severity refers to the direct physical or biophysical impact of the activity on the surrounding environment should it occur (Refer to Table 7).

Table 3: 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 4: Categories used for evaluating likelihood.

LIKELHOOD	
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 5: 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 6: 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 landowners 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 7: 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.

3.4.3. 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 8. 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 8: 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.

4. DESKTOP ASSESSMENT

The results of the desktop analysis is given underneath.

4.1. BROAD-SCALE VEGETATION EXPECTED

According to the South African vegetation map (2018) (Mucina & Rutherford, 2006), the charging station and Phase 1 of the solar panels will impact on Lower Gariep Alluvial Vegetation (blue in Figure 6), while Phase 2 – 7 of the solar panels will impact on Bushmanland Arid Grassland (Red in Figure 6).

Both these vegetation types are considered "Least Threatened", in terms of the "*Revised National list of ecosystems that are threatened and in need of protection*" (GN. No. 2747 of 18 November 2022).

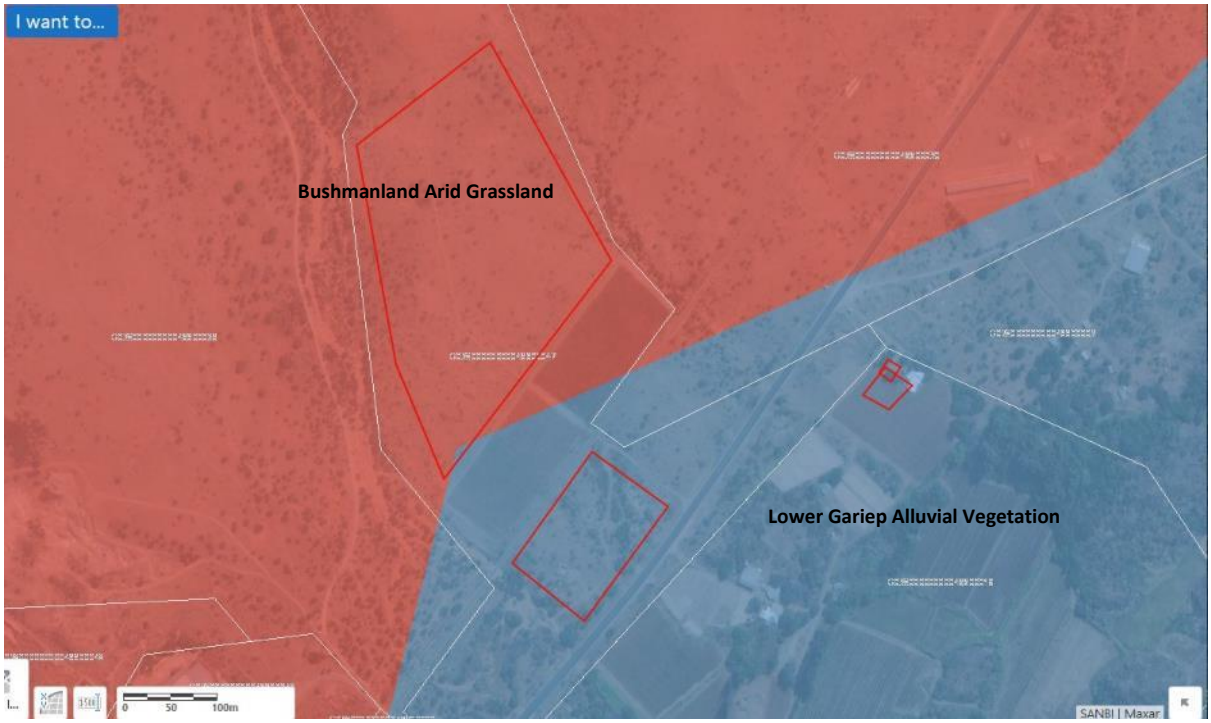

Figure 6: Vegetation map of South Africa (2012), showing the expected vegetation type (SANBI BGIS)

Mucina & Rutherford (2006) describe Bushmanland Arid Grassland as occurring on extensive to irregular plains on a slightly sloping plateau sparsely vegetated by grassland dominated by white grasses (*Stipagrostis* species) giving this vegetation type the character of semidesert 'steppe'. In places low shrubs of *Salsola* change the vegetation structure. In years of abundant rainfall rich displays of annual herbs can be expected.

Lower Gariep Alluvial Vegetation is described as occurring on flat alluvial terraces and riverine islands supporting a complex of riparian thickets (dominated by *Ziziphus mucronata*, *Euclea pseudebenus* and *Tamarix usneoides*), reed beds with *Phragmites australis* as well as flooded grasslands and herblands populating sand banks and terraces within and along the river Mucina & Rutherford (2006).

4.2. ECOLOGICAL DRIVERS & FUNCTIONING

Bushmanland Arid Grassland is part of the Nama-Karoo Biome, which is a large arid landlocked region on the central plateau of the western half of South Africa, extending into Namibia. It is flanked by the Succulent Karoo to the west and south, desert to the northwest, arid Kalahari Savanna to the north, Grassland to the northeast, Albany Thicket to the southeast and small parts of Fynbos to the south. In South Africa, only the Desert Biome has a higher variability in annual rainfall and only the Kalahari Savanna greater extremes in temperature. The Nama-Karoo receives most of its rainfall in summer, especially in late summer (Mucina *et. al*., 2006).

Climate is essentially continental and with almost no effect of the ameliorating influences of the oceans. Rainfall is low and unreliable, peaking in March. Droughts are unpredictable and often prolonged. Summers are hot and winters cold with temperature extremes ranging from -5°C in winter to 43°C in summer. However, rainfall intensity can be high (e.g. episodic thunderstorm and hail storm events). This coupled with the generally low vegetation cover associated with aridity and grazing pressure by domestic stock over the last two centuries, raises the potential for soil erosion. In semi-arid environments such as the Nama-Karoo, nutrients are generally located near the soil surface, making it vulnerable to sheet erosion (Mucina *et. al*., 2006).

Because of its aridity and unpredictable rainfall patterns, the Nama-Karoo region would have favoured free moving herbivores such as gemsbok, 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. During the 19th century the vast herds of migratory ungulates indigenous to this biome have been replaced (almost completely) 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).

In contrast with the Succulent Karoo, the Nama-Karoo is not particularly rich in plant species and does not contain any centre of endemism. Local endemism is very low, which might indicate a relative youthful biome linked to the remarkable geological and environmental homogeneity of the Nama-Karoo. Rainfall seasonality and frequency are too unpredictable and winter temperatures too low to enable leaf succulent dominance (as in the Succulent Karoo). It is also too dry in summer for dominance by perennial grasses alone and the soils generally to shallow and rainfall too low for dominance by trees. But soil type, soil depth and local differences in moisture availability can cause abrupt changes in vegetation structure and composition (e.g. small drainage lines support more plant species than surrounding plains) (Mucina *et. al*., 2006).

In terms of status, very little of the Nama-Karoo has been transformed and the dominant land use is farming with small stock, cattle and game. Farms are fenced, but generally large (because of the low carrying capacity). The biggest threat to this vegetation remains domestic livestock grazing pressure. Grazing by livestock particularly during the summer growing season, reduces the perennial grass component, while prolonged droughts kill a high proportion of perennial plants, rapidly changing vegetation composition in favour of short-lived species with soil stored seed banks. Overgrazing after drought periods can delay vegetation recovery, which will worsen the effect of subsequent droughts.

4.3. CRITICAL BIODIVERSITY AREAS & ECOLOGICAL CORRIDORS

The Northern Cape CBA Map (2016) identifies biodiversity priority areas, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), which, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape (Holness & Oosthuysen, 2016). The 2016 Northern Cape Critical Biodiversity Area (CBA) Map updates, revises and replaces all older systematic biodiversity plans and associated products for the province (including the Namakwa District Biodiversity Sector Plan, 2008). Priorities from existing plans such as the Namakwa District Biodiversity Plan, the Succulent Karoo Ecosystem Plan, National Estuary Priorities, and the National Freshwater Ecosystem Priority Areas were incorporated. Targets for terrestrial ecosystems were based on established national targets, while targets used for other features were aligned with those used in other provincial planning processes.

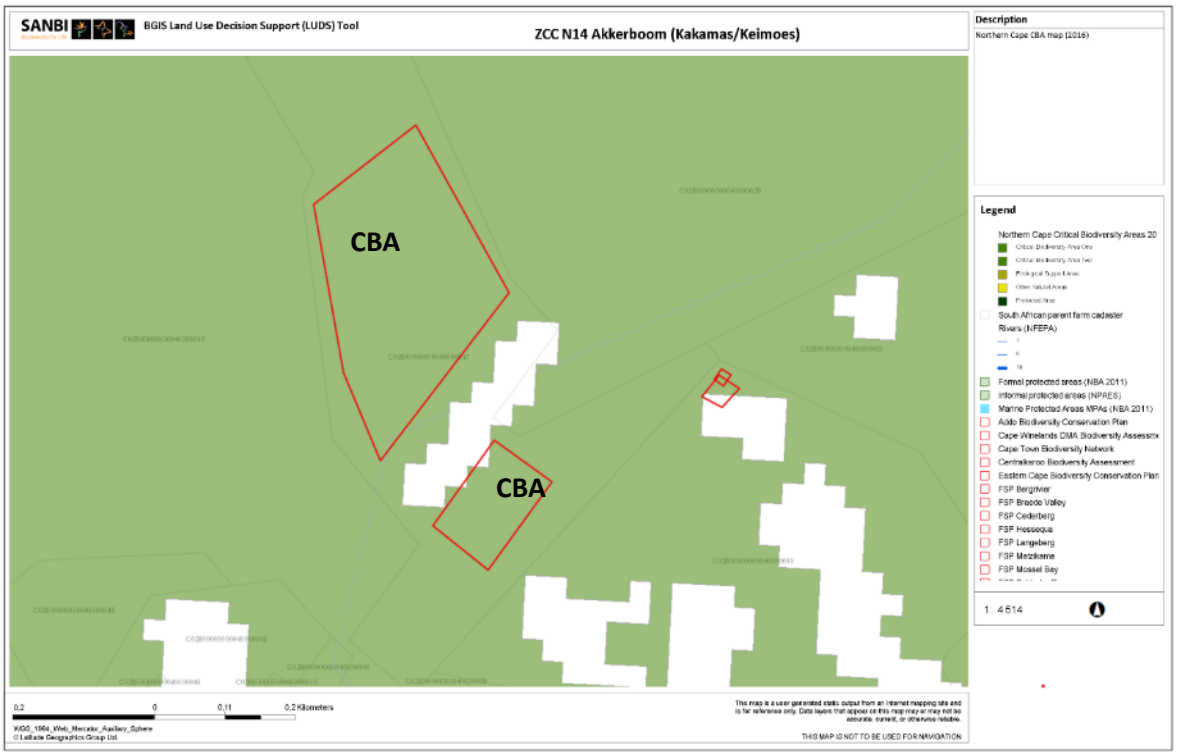

Figure 7: Northern Cape CBA map (2016) showing the study area and associated critical biodiversity areas.

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 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.

- **Critical biodiversity areas (CBA's)** are areas of the landscape that need to be maintained in a natural or near-natural state 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.

According to the 2016, Northern Cape critical biodiversity areas maps, the charging station (and its associated parking) as well as the proposed farm stall enlargement might impact on a portion of a critical biodiversity area, but this area is in fact all existing disturbed- or agricultural land. The proposed solar facilities, Phase 1 – 7 will all impact on critical biodiversity areas (associated with the conservation corridor suggested along the Orange River (Figure 7). The small episodic watercourses to the west of proposed solar developments is also included in the CBA areas map (Holness & Oosthuysen, 2016).

4.4. WATERCOURSES AND WETLANDS

The proposed development is located within the critical biodiversity areas identified along the Orange River (Figure 7). There is also an unnamed small episodic watercourse or drainage line running to the west of the proposed solar site (Photo 1 & Photo 2).

Photo 1: The small episodic watercourse to the west of Solar Site 1. Several young *Vachellia erioloba* trees were observed along this watercourse

Photo 2: Denser stands of *Senegalia mellifera* associated with the small drainage line to the west of Solar sites 2 – 7.

A freshwater assessment has been commissioned to address the importance of this watercourse and

the potential environmental impacts associated with the proposed development. As a result, the watercourses are not discussed in this report (apart from the vegetation associated with the riparian zone). According to the **DFFE Screening** report for the footprint area (Appendix 2), the relative Aquatic biodiversity theme sensitivity is considered of low sensitivity, which is supported by the findings of this study.

4.5. POTENTIAL IMPACT ON CENTERS OF ENDEMISM

According to Van Wyk & Smith (2001) the proposed development will not impact on any recognised centre of endemism. The Gariep Centre is located to the north, north-west, associated with Augrabies, Pella and Onseepkans along the border of South Africa and Namibia, while the Griqualand West Centre of Endemism starts to the east of Upington in the Northern Cape Province.

4.6. LANDUSE AND COVER

According to the 2020 (9-Class) National Land Cover Map of South Africa, the proposed charging station and the farm stall expansions will overlap cultivated areas, while the proposed solar sites will all overlap natural veld (Refer to Figure 8). This is consistent with the findings of the site visit.

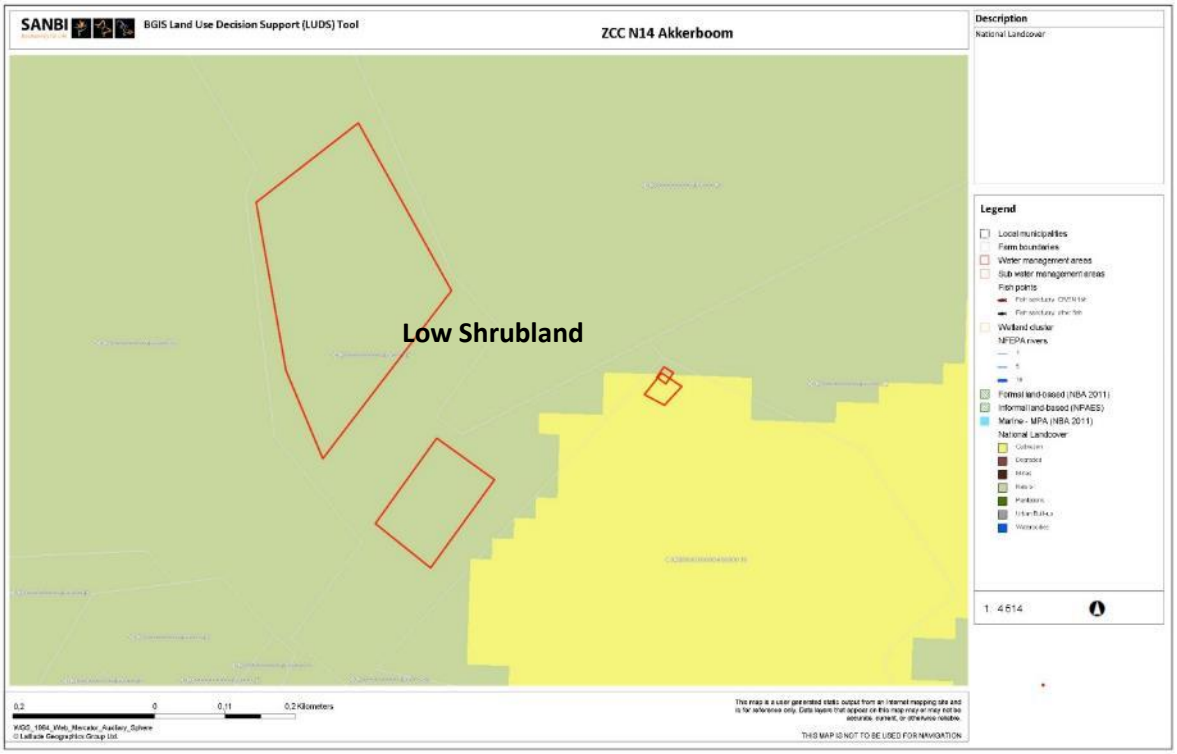

Figure 8: South Africa Land Cover Map (2020, 9 – Class) showing the area expected to be covered by low shrubland (Nama Karoo)

The solar sites overlap areas of natural vegetation which, according to the landowner, are used as grazing by game and domestic stock.

5. THE VEGETATION

The vegetation encountered conformed to the expected vegetation as given in the South African vegetation map (2018) (Mucina & Rutherford, 2006) (Figure 6).

5.1. VEGETATION: CHARGING STATION

The proposed charging station, associated parking infrastructure and the proposed extension of the farm stall will not impact on any remaining natural veld. The existing farmstall footprint will be enlarged to the west, where it will overlap existing agricultural land (vineyards) (Photo 3 to Photo 4).

Photo 3: A photo of the parking area in front of the Akkerboom Farm stall (in the background). Note the beautiful large *Vachellia erioloba* trees in the background and to the top right of the picture. The parking and garden area supports several of these trees in excellent condition.

Photo 4: Looking from the farm stall parking area over the vineyards that will be impacted by the proposed Charging station and its associated parking areas. Note the baobab trees planted on the boundary of the existing parking area (arrows)

The parking and garden area surrounding the existing farm stall supports several large *Vachellia erioloba* (Camel thorn trees) in excellent condition (Photo 3). On the western boundary of the farm stall the owners planted several baobab trees (*Adansonia digitata*) (Photo 4). Both species are protected trees and must be protected during construction and operation. However, there placement should not hinder the proposed development and can be easily incorporated in the proposed development plans.

5.2. VEGETATION: PHASE 1 SOLAR

The proposed, Phase 1 of the solar facility will be located across the road from the Farm stall in a slight depression, between the N14 and the existing railroad. According to the South African vegetation map, the vegetation is expected to be Lower Gariep Alluvial Vegetation (refer to Figure 6).

The site itself was slightly undulating with shallow soils for most of the site, but deeper sandy soils towards the west and southwest. For the most part (apart from the slightly deeper soils to the west) the vegetation encountered represents a slightly denser Bushmanland Arid Grassland rather than Lower Gariep Alluvial Vegetation. It lacks the variety of tree species expected in Lower Gariep Alluvial Vegetation (refer to Photo 5 & Photo 6), but was slightly denser than normal Bushmanland Arid Grassland, but this is probably because most of it is located in slight depression (which would accumulate water more readily. In general, the species composition was very similar to that encountered in the proposed Phase 2 – 7 solar sites, apart from the fact that the shrub overlayer was denser.

Photo 5: Typical vegetation encountered in the Phase 1 solar site. Note the denser stands of *Senegalia mellifera* and the lack of typical tree species expected in Lower Gariep Alluvial Vegetation. To the left of picture in the background one of the *Vachellia erioloba* trees can be seen in the deeper sandy soils (arrow).

Photo 6: Another view of the vegetation with encountered. *Senegalia mellifera* being the dominant shrub, with a *Parkinsonia africana* tree to the back (just right of the middle) and one of the *Tetraena* shrubs in the foreground.

Species diversity was even lower than expected, although a good cover of grasses suggests recent rains during the autumn season. The lower species diversity is most probably still the result of the recent 7-year drought, which impacted on almost the whole of the Northern Cape and Karoo.

The veld can be described as an open to close grassland with an overstory of medium high shrub

stratum (between 1.2 – 1.8m in height) dominated by *Senegalia mellifera*. The shrub layer also include species the occasional *Kleinia longiflora, Parkinsonia africana, Rhigozum trichotomum* and *Phaeoptilum spinosum*. Other shrubs like *Asparagus cooperi* (occasionally in depressions), *Justicia australis*, *J. spartioides* and the ash bush, *Mesembryanthemum coriarium*, *Tetraena decumbens* and the ground cover, *Tetraena simplex*. Mistletoe (*Tapinanthus oleifolius*), a stem parasite was occasionally observed within a *Senegalia* or *Parkinsonia* shrub/tree. *Cyperus margaritaceus* was only observed, near the watercourse to the west of the site, while two patches of *Aloe claviflora* and one *Boscia foetida* was observed on rocky outcrops to the east of the Phase 1 solar site but well away from the footprint area. The occasional alien invasive tree, *Prosopis* species, were occasionally observed, mostly neat the watercourse.

The only plants of any special significance within or near the footprint area, were seven (7) magnificent *Vachellia erioloba* (camel thorn) trees, located to the northwest of the site. A few younger camel thorn trees were located within the watercourse to the west of the proposed site. Two of the 7 full grown falls outside of the footprint (to the west of the site), but 5 may fall within the proposed footprint area. However, they were all located against the fence on the edge of the site (next to the N14) (Refer to the site sensitivity map, Figure 9). There should be no reason why these trees need to be impacted by the proposed development, and they must be protected (no development underneath or within 5m of the canopy width).

5.3. VEGETATION: PHASE 2-7 SOLAR

The vegetation encountered in the proposed Phase 2 – 7 solar sites were very similar to that described above. However, the shrub overlayer was less dense and included several *Boscia foetida* individuals.

In this case the vegetation can be described as an open grassland with a scattered shrub overstory. The shrub layer was also dominated by *Senegalia mellifera*, with *Kleinia longiflora, Boscia foetida, Parkinsonia africana, Rhigozum trichotomum* and *Phaeoptilum spinosum* scattered throughout. The shrub layer was less diverse, but also included *Acanthopsis disperma, Euphorbia gariepina, Justicia austalis* (especially where lime is present), *Mesembryanthemum coriarium (=Psilocaulon), Salsola zeyheri* and *Tetraena microcarpa. Tapinanthus oleifolius* was again observed, within *Phaeoptilum spinosum, Senegalia mellifera* and *Parkinsonia africana.*

Photo 7: Typical vegetation encountered within the proposed Phase 2 – 7 solar sites. Note the open shrubland and sparse shrub overlayer. *Salsola zeyheri* in the foreground, *Senegalia mellifera* in the background.

Photo 8: Looking from south to north over the proposed Phase 2 – 7 solar sites.

The only plants of any special significance encountered within the footprint area were several *Boscia foetida* species. However, most of these plants were small to medium sized multi-stemmed shrubs (one of the larger specimens' portraits in Photo 9).

Photo 9: One of the typical multi-stemmed *Boscia foetida* shrubs scattered throughout the site.

Photo 10: Looking from north to south over the site (from the top of the site). .

Photo 11: A view over the bottom part of the site (looking from east to west). One of the smaller *Boscia foetida* specimen's in the foreground.

According to the **DFFE Screening** report for this site (Appendix 2), the **plant species theme sensitivity is considered Medium Sensitive**, which is supported by the findings of this study. The screening report rates Sensitive Plant Species 144 as of medium sensitivity.

If the mature (larger than 6m in height) Camelthorn trees are protected, the sensitivity rating could be reduced to **Low Sensitive**.

5.4. FLORA ENCOUNTERED

Table 9 gives a list of the plant species encountered during this study. It is important to note that the species list is only based on a one-day site visit. It is likely that some species (especially annuals and geophytes) might have been missed. However, the author is confident that a good understanding of the vegetation was achieved and confidence in the findings is high. No red-listed plant species was observed, but four (2) species protected in terms of the NCNCA was observed.

Table 9: List of plant species observed within the proposed development footprint.

NO.	SPECIES NAME	FAMILY	STATUS	LOCATION
1.	*Acanthopsis disperma*	ACANTHACEAE	LC	Small low growing shrub. Occasionally observed.
2.	*Adansonia digitata*	MALVACEAE	LC NFA protected species.	Planted as garden trees, next to the farm stall parking area.
3.	*Aloe claviflora*	ASPHODELACEAE	LC Protected in terms of schedule 2 of the NCNCA	Only observed outside of the footprint to the east of the Phase 1 solar site.
4.	*Aristida* species	POACEAE		
5.	*Asparagus cooperi*	ASPARAGACEAE	LC	Wiry shrub/climber near watercourses.
6.	*Boscia foetida*	BRASSICACEAE (CAPPARACEAE)	LC All *Boscia* species protected in terms of Schedule 2 of NCNCA	About 16 individuals observed in Phase 2-7 solar area.
7.	*Cyperus margaritaceus*	CYPARACEAE	LC	A medium size cyperoid occasionally observed in watercourses
8.	*Enneapogon* species	POACEAE		

NO.	SPECIES NAME	FAMILY	STATUS	LOCATION
9.	*Euphorbia gariepina*	EUPHORBIACEAE	LC	A dwarf succulent occasionally observed.
10.	*Justicia austalis*	ACANTHACEAE	LC	Common in areas dominated by Lime.
11.	*Justicia spartioides (=Monechma spartioides)*	ACANTHACEAE	LC	Medium large shrub sparse to common throughout.
12.	*Kleinia longiflora*	ASTERACEAE	LC	A medium succulent observed in deeper sandy areas.
13.	*Mesembryanthemum coriarium (=Psilocaulon)*	AIZOACEAE	LC	Common plant, often associated with degraded veld.
14.	*Parkinsonia africana*	FABACEAE	LC	Almost exclusively associated with water courses.
15.	*Phaeoptilum spinosum*	NYCTAGINACEAE	LC	Occasionally observed throughout the remaining natural veld
16.	*Prosopis* species	FABACEAE	**Alien invasive plant species: Must be removed.**	Occasionally observed.
17.	*Rhigozum trichotomum*	BIGNONIACEAE	LC	Occasionally observed in deeper sandy areas.
18.	*Salsola* zeyheri	AMARANTHACEAE	LC	Witkoolganna, occasionally observed.
19.	*Senegalia mellifera*	FABACEAE	LC	The dominant species observed in the remaining natural veld
20.	*Stipagrostis uniplumis*	POACEAE	LC	Medium sized grass – common throughout
21.	*Tapinanthus oleifolius*	LORANTHACEAE	LC	Stem parasite, often growing in *Senegalia* and *Parkinsonia*.
22.	*Tetraena decumbens*	ZYGOPHYLACEAE	LC	A spreading shrub, occasionally observed.
23.	*Tetraena microcarpa*	ZYGOPHYLACEAE	LC	A medium small shrub, occasionally observed (leaves often turned red).
24.	*Tetraena simplex*	ZYGOPHYLACEAE	LC	A mat-forming succulent annual plant, occasionally observed.
25.	*Vachellia erioloba* (=*Acacia*)	FABACEAE	LC NFA protected species.	Observed in the parking areas of the Akkerboom farm stall, as well as to the west of Phase 1 Solar site.

5.5. 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, SANBI uses an amended system of categories to highlight species that may be of low risk of extinction

but are still of conservation concern (SANBI, 2015).

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, 2020).

- No red-listed species was observed during the study.

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.

NFA Protected plant species: The National Forests Act (NFA) of 1998 (Act 84 of 1998) provides for the protection of forests as well as specific tree species (as updated).

- Two species protected in terms of the NFA was observed, namely:
  - ***Adansonia digitata*** (Baobab Tree) – 3 trees planted by the owners, on the edge of the garden area of the existing Akkerboom farm stall (Even though this is not its natural distribution area, it **should be protected**).
  - ***Vachellia erioloba*** (Camelthorn Tree) – several trees within the garden and parking areas of the Akkerboom farm stall and about 7 trees on the edge or just outside of the Phase 1 – Solar site footprint (All of the mature trees larger than 6m **MUST be protected**).

NCNCA Protected plant species: The Northern Cape Nature Conservation Act 9 of 2009 (NCNCA) came into effect on the 12th of December 2011, and provides for the sustainable utilization of wild animals, aquatic biota, and plants. Schedule 1 and 2 of the Act gives extensive lists of specially protected and protected fauna and flora species in accordance with this act. NB. Please note that all indigenous plant species are protected in terms of Schedule 3 of this act (e.g., any work within a road reserve).

- **Two (2) species protected in terms of the NCNCA was observed (Refer to Table 9).** Recommendations on impact minimisation are given in Table 10.

Table 10: Plant species protected in terms of the NCNCA encountered within the study area.

NO.	SPECIES NAME	COMMENTS	I
1.	*Aloe claviflora* **Schedule 2 protected**	Two patches observed in the rocky area to the east of the Phase 1 – Solar site.	**N/a** The plants will not be impacted by the proposed development (outside of the footprint)
2.	*Boscia foetida* **Schedule 2 protected**	Several multi-stemmed shrubs were observed within Phase 2 – 7 Solar facility area.	No search & rescue is proposed. Boscia species seldom transplant successfully, because of their extensive and deep root system. **A NCNCA Permit application must be submitted for the removal of these plant**.

6. FAUNA AND AVI-FAUNA

The Northern Cape is also home to an exceptionally high level of insect and reptile endemism, with new species still being discovered. However, it is important to note that this remarkable diversity is not distributed evenly throughout the region but is concentrated in many local centres of endemism.

Because of its aridity and unpredictable rainfall patterns, the Nama-Karoo region 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, where they would have lingered longer, suggesting the transient nature of herbivores. 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).

In terms of status, very little of the Nama-Karoo has been transformed and the dominant land use is farming with small stock, cattle and game. Farms are fenced, but they need to be large because of the low grazing capacity. The biggest threat to this vegetation remains domestic livestock grazing pressure. Grazing by livestock particularly during the summer growing season, reduces the perennial grass component, while prolonged droughts kill a high proportion of perennial plants, rapidly changing vegetation composition in favour of short-lived species with soil stored seed banks. Overgrazing after drought periods can delay vegetation recovery, which will worsen the effect of subsequent droughts.

No fauna or avi-fauna screening was done as part of this study, but observations were made during the site visit. The proposed footprint area falls on the edge of the agricultural zone associated with the Orange River. It is next to existing vineyards with some vineyard areas to the north and south of the proposed Solar sites. The site solar sites is used for grazing by game and domestic livestock. The vegetation itself is still in relatively good conditions, although species diversity is very low (probably the result of the long 7-year drought period that has just been broken). Apart from insects, reptiles and a few smaller mammal species, the site itself is not expected to support any significant remaining fauna or even avi-fauna (although the episodic watercourse to the west of the proposed sites may still act as a migration corridor).

According to the **DFFE Environmental Screening Report** compiled by EnviroAfrica, the following sensitivity ratings may be applicable:

- The relative Animal species theme sensitivity is considered of **Medium Sensitivity** because of the potential presence of one bird species namely (*Neotis ludwigii*). Refer to Table 11.
- The relative Terrestrial Biodiversity theme sensitivity is considered of **Very High Sensitivity** because the site overlaps CBA 1 and CBA 2 areas (Heading 4.2 & 7.2).

6.1. MAMMALS

The nearby Augrabies Falls National Park still supports an impressive diversity of larger antelope and other mammal species. However, it is highly unlikely that any of this larger game will still frequent or even visit the proposed footprint or its immediate surroundings (because of its location). Smaller game and other mammal species that may still be found in the larger area can include the following (based on the Augrabies Falls National Park species lists): *Orycteropus afer* (Aardvark), *Pedetes capensis* (Springhare), *Phacochoerus africanus* (Common warthog), *Raphicerus campestris* (Steenbok), *Sylvicapra grimmia* (Common duiker) *Suricata suricatta* (Suricate), *Xerus inauris* (Southern African ground squirrel) and *Canis mesomelas* (Black-backed jackal). Three listed terrestrial mammals may occur in the surrounding areas namely the Honey Badger, *Mellivora capensis* (Endangered), the Brown Hyaena, *Hyaena brunnea* (Near Threatened) and the Black-footed cat, *Felis nigripes* (Vulnerable).

Since the site is still actively farmed with frequent human interference, most larger mammals and reptiles would have moved away over time. No evidence in the form of tracks, faeces or even burrows of any other indigenous fauna (e.g., small game) were observed within the footprint area. Of the listed species, it is highly unlikely that the Brown Hyaena is still present in area as it had been purposely or inadvertently persecuted over the years. The Honey Badger and the Black-footed cat may still occur in the surrounding areas (although very unlikely so near to human activity), but both have a wide national distribution, and the development footprint will not result in a significant extent of habitat loss for these species (especially if the riparian zone associated with the episodical watercourse to the west of the sites are protected).

6.2. REPTILES

According to the SARCA (South African Reptile Conservation Assessment) database, 39 reptile species are known from the larger area, which suggests that reptile diversity is likely to be moderate to low. As there are no significant rocky outcrops or larger trees on the site (apart from the Camel thorn trees in or near the edge of Phase 1 Solar site – which will be protected). No RDB-listed reptile species are known from the area and there do not appear to be any broad habitats at the site which would be of high significance for reptiles.

Because of the proximity and constant human interference, it is highly unlikely that the proposed development will result in any significant additional impact in terms of habitat loss (especially since there are no listed or range-restricted reptiles expected in this area).

6.3. AMPHIBIANS

The site lies within the distribution range of 10 amphibian species. The only listed species which may occur at the site is the Giant Bullfrog, *Pyxicephalus adspersus*, which is listed as Near Threatened. This species is however associated with pans or wetland areas. The aridity of the site and the lack of natural pans or other water sources reduces and almost eliminates any natural habitat for most amphibian species. As a result, impacts on amphibians are likely to be local in extent and of low significance.

6.4. AVI-FAUNA

This larger area can potentially attract a great number of bird species like Cape Buntings Cape Wagtail, Cape Southern Masked Weaver, Cinnamon-Breasted Buntings Common Waxbill, Karoo Robin-Chats, Pale Winged Starlings, Pied Wagtail, Red Eyed Bulbuls, Rock Hyraxes, Swallow-Tailed Bee Eaters and White Throated Canaries. Near permanent rivers Alpine Swifts, Bradfield's Swifts, Brown-Throated Martins, Cape Robin-Chats, Common Moorhen Orange-River White-eyes, Rock Martins, Red-Eyed Bulbuls, White-Backed Mousebirds, and Lesser Swamp-Warblers may be observed.

According to the Southern Africa Bird Atlas Project (SABAP 2) data sets, 140 bird species are known from the broad area surrounding the site (https://sabap2.birdmap.africa/). This includes 1 IUCN listed species, the Lanner Falcon, (*Falco biarmicus*). The animal species theme sensitivity is considered medium sensitive because the site falls within the potential distribution range of **Ludwig's Bustard** (*Neotis ludwigii*), however, according to distribution data of SABAP 2 Ludwig's Bustard had not been observed in this area.

Table 11: Animal species theme according to the NEMA EIA Sensitivity Scan results.

SENSITIVITY	FEATURES	MOTIVATION
Medium	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 its distribution is believed to have extended to the eastern and 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 & Smallie 2009) The bird may potentially feed and nest in the surrounding area, but it is highly unlikely that the proposed development will have any significant additional impact on its breeding or feeding habitat. With regards to the is project the sensitivity rating is considered to be **low sensitive**.

However, since the proposed footprints are relatively small and will not impact significantly on watercourses or large trees the impact is not likely to be of any significance.

7. IMPACT ASSESSMENT

7.1. SITE SENSITIVITY DISCUSSION

The total proposed development footprint will result in a long term or permanent impact on a relatively small area (< 8 ha). The charging station and associated infrastructure will impact on about 0.5 ha of existing vineyards. The proposed solar sites (< 8 ha) will impact on remaining natural veld within a CBA area (Holness & Oosthuysen, 2016).

7.1.1. IMPACT ON SPECIAL HABITATS

- The landscape is slightly undulating, relatively homogenous, apart from the deeper sands to the west of the proposed Phase 1 Solar site.
- It does not contain any rocky outcrop or any other significant biophysical feature that might have resulted in special habitats for fauna or flora.
- A small episodic drainage line was observed to the west and outside of the proposed footprint area (refer to watercourses and wetlands, underneath).

7.1.2. IMPACT ON WATERCOURSES & WETLANDS

- One episodic watercourse or drainage line was observed (Refer Photo 1 and Photo 2).
- The drainage line supported a denser shrub vegetation (dominated by *Senegalia mellifera*) to the north but also supported several youngish *Vachellia erioloba* trees in the deeper sands to the south (west of the Phase 1 Solar site).
- However, this drainage line is outside of the footprint area and should not be impacted by the proposed development. A freshwater specialist was appointed to evaluate the significance of this watercourse and the potential impact (as a result it is not discussed in this study).

7.1.3. IMPACT ON LAND USE

- The Charging station site with its associated infrastructure and the potential enlargement of the farm stall itself will impact on a small portion (< 0.5 ha) of existing agricultural area (vineyards).
- The proposed solar sites will impact on less than 8 ha of natural land used for game and livestock grazing.
- Both these properties belong to the landowner of the Akkerboom farm stall, who will benefit from the placement of the charging station and the renewable power plants. The proposed development is likely to lead to job creation, which will reduce the impact on land use significantly.

7.1.4. IMPACT ON VEGETATION

- The proposed development might impact on two vegetation types, namely Lower Gariep Alluvial Vegetation and Bushmanland Arid Grassland (Figure 6). The vegetation study showed that it will impact mostly on Bushmanland Arid Grassland (Heading 5).
- Both these vegetation types are considered "Least Threatened", in terms of the "*Revised National list of ecosystems that are threatened and in need of protection*" (GN. No. 2747 of 18 November

2022).

- The Nama-Karoo is not particularly rich in plant species and does not contain any centre of endemism.
- In terms of status, very little of the Nama-Karoo has been transformed and the dominant land use is farming with small stock, cattle and game. Farms are fenced, but generally large (because of the low carrying capacity). The biggest threat to this vegetation remains domestic livestock grazing pressure.
- Species diversity was even lower than expected, although a good cover of grasses suggests recent rains during the autumn season. The lower species diversity is most probably still the result of the recent 7-year drought, which impacted on almost the whole of the Northern Cape and Karoo.

7.1.5. IMPACT ON CONSERVATION PRIORITY AREAS

- According to the 2016, Northern Cape critical biodiversity areas maps (Holness & Oosthuysen, 2016), the charging station (and its associated parking) as well as the proposed farm stall enlargement might impact on a portion of a critical biodiversity area, but this area is in fact all existing disturbed- or agricultural land.
- The proposed solar facilities, Phase 1 – 7 will all impact on critical biodiversity areas (associated with the conservation corridor suggested along the Orange River (Figure 7)**.**
- The small episodic watercourse to the west of proposed solar developments is also included in the CBA areas map.

According to the **DFFE Environmental Screening Report** the relative Terrestrial Biodiversity theme sensitivity is considered of **Very High Sensitivity** because the site overlaps CBA 1 and CBA 2 areas (Heading 4.3 & 7.2).

- However, the proposed development footprint is relatively small and located within an area already subject to development.
- The impact on the specific vegetation type will be negligible.
- The impact on connectivity is described under Heading 7.1.6 (underneath)
- The impact on threatened and protected plant species is described under Heading 7.1.7.
- The impact on fauna & avi-fauna is described under Heading 7.1.8.
- The indirect impact is described under Heading 7.1.9.
- The cumulative impact is described under Heading 7.1.10.

The overall impact on terrestrial biodiversity is described discussed at the end of Heading 7.2.

7.1.6. IMPACT ON CONNECTIVITY

- The development of the Charging station (and associated infrastructure) and the enlargement of the farm stall itself will not lead to any further impact on connectivity, because it will be located within an area already developed (existing vineyards).
- Phase 1 Solar site will be in a narrow corridor between the N14 (to the south) and a railway line (to the north). Just north of the railway line vineyards have been established. The location of the Phase 1 solar sites will have a slight impact on the east-west corridor but will not have any significant additional impact on the north-south corridor.

- Phase 2 – 7 Solar sites, will be located just north of the existing vineyards mentioned above, with an additional vineyard development slightly away to the north of the proposed solar sites. Again, the proposed solar development will have a slight impact on the east-west migration corridor but will have little additional impact on the north-south migration corridor (.
- Overall, the proposed development falls within an area already impacted because of long term anthropogenic (human) activity, especially within agricultural corridor along Orange River. East-west corridors will be slightly impacted but north-south corridors are unlikely to be impacted significantly or at all.

7.1.7. IMPACT ON THREATENED AND PROTECTED PLANT SPECIES

- No red-listed plant species was observed within the study area,
- No NEMBA protected plant species were observed within the proposed footprint.
- Two NFA protected species were observed, namely:
    - *Adansonia digitata* (Baobab Tree) – 3 trees planted by the owners, on the edge of the garden area of the existing Akkerboom farm stall (Even though this is not its natural distribution area, it should be protected).
    - *Vachellia erioloba* (Camelthorn Tree) – several trees within the garden and parking areas of the Akkerboom farm stall and about 7 trees on the edge or just outside of the Phase 1 – Solar site footprint (All of the mature trees larger than 6m MUST be protected).
- Two Northern Cape Nature Conservation Act protected species were also observed, one of which was outside the footprint. However, several *Boscia foetida* (mostly smaller multi-stemmed individuals) with the area that will be impacted by Phase 2 – 7 Solar extensions.

According to the **DFFE Environmental Screening** report for this site (Appendix 2), the **plant species theme sensitivity is considered Medium Sensitive**, which is supported by the findings of this study (presence of protected species). However, if all the large mature (more than 6m high) Camelthorn trees are protected from the development, the sensitivity rating could be reduced to **Low Sensitive**.

7.1.8. IMPACT ON PROTECTED FAUNA & AVI-FAUNA

- Three red-listed terrestrial mammals may still occur in the larger surroundings namely the Honey Badger, *Mellivora capensis* (Endangered), the Brown Hyaena, *Hyaena brunnea* (Near Threatened) and the Black-footed cat, *Felis nigripes* (Vulnerable). However, it is highly unlikely that the Brown Hyaena is still present in this area as it had been purposely or inadvertently persecuted over the years. The Honey Badger and the Black-footed cat may still occur in the surrounding areas (although very unlikely so near to human activity), but both have a wide national distribution, and the development footprint will not result in a significant extent of habitat loss for these species.
- No evidence in the form of tracks, faeces or even burrows of any other indigenous fauna (e.g., small game) were observed within the footprint area.
- According to the **DFFE Environmental Screening Report**, the relative Animal species theme sensitivity is considered of **Medium Sensitivity** because of the potential presence of one bird

species namely (*Neotis ludwigii*). Refer to Table 11. The bird may potentially feed and nest in the surrounding area, but it is highly unlikely that the proposed development will have any significant additional impact on its breeding or feeding habitat. With regards to the is project the sensitivity rating is considered low sensitive.

7.1.9. INDIRECT IMPACTS

Indirect impacts occur away from the 'action source' i.e., away from the development site. The impact assessed here is specifically how the proposed development would have an indirect impact on vegetation, flora, mammals, birds, reptiles, and invertebrates away from the development site.

The indirect impact in this case will be loss of connectivity. Because of the relatively small size of the development footprint and its location (within existing agricultural development), the indirect impact would be Low Significant.

7.1.10. CUMULATIVE IMPACTS

Refer to Table 12. In this impact assessment method, cumulative impacts are calculated by using the worst scenarios for each aspect as input into the impact assessment table.

7.1.11. THE "NO-GO" ALTERNATIVE

The **"No Go" alternative** means there would be no change to the *status quo*. The site will continue to be used as grazing. The No-Go alternative will mean no loss of vegetation or connectivity. The impact on the National and Provincial protected plant species will not occur. The land would remain in its natural state and any changes that would occur would only be attributable to agriculture and external factors such as climate change.

The 'No Go' alternative is included in the impact table below (Table 12).

7.2. TERRESTRIAL BIODIVERSITY 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 12: Terrestrial biodiversity impact associated with the proposed development.

Impact assessment								
Aspect	**Mitigation**	**CV**	**Lik**	**Dur**	**Ext**	**Sev**	**Significance**	Short discussion
Special habitats: Potential impact on special habitats (e.g. true quartz or "heuweltjies")	Without mitigation	2	1	4	1	1	14	Refer to Heading 7.1.1 (No special habitats, apart from a small episodical watercourse to the west of the property)
	With mitigation	2	1	4	1	1	14	Ensure that the watercourse is protected and could maintain its function as a migration corridor.

Impact assessment								
Aspect	**Mitigation**	**CV**	**Lik**	**Dur**	**Ext**	**Sev**	**Significance**	Short discussion
Watercourses & Wetlands: Potential impact on natural water resources and it's ecological support areas.	Without mitigation						0	Refer to Heading 7.1.2 (A freshwater specialist was appointed)
	With mitigation						0	Ensure that the watercourse is protected and could maintain its function as a migration corridor.
Landuse and cover: Potential impact on socio-economic activities.	Without mitigation	2	4	4	1	1	20	Refer to Heading 7.1.3
	With mitigation	2	4	4	1	1	20	The impact is expected to have a positive impact on job creation.
Vegetation status: Loss of vulnerable or endangered vegetation and associated habitat.	Without mitigation	2	4	4	1	1	20	Refer to Heading 7.1.4
	With mitigation	2	4	4	1	1	20	Loss of vegetation is expected to be negligible.
Conservation priority: Potential impact on protected areas, CBA's, ESA's or Centre's of Endemism.	Without mitigation	4	4	4	1	3	48	Refer to Heading 7.1.5
	With mitigation	4	3	4	1	2	40	Ensure that the watercourse is protected and that the impact on *Vachellia erioloba* trees larger than 6m are protected.
Connectivity: Potential loss of ecological migration corridors.	Without mitigation	4	4	4	1	2	44	Refer to Heading 7.1.6
	With mitigation	4	3	4	1	1	36	Ensure that the watercourse is protected and could maintain its function as a migration corridor.
Protected & endangered plant species: Potential impact on threatened or protected plant species.	Without mitigation	4	3	4	1	3	44	Refer to Heading 7.1.7
	With mitigation	4	1	1	1	1	16	Ensure that all mature *Vachellia erioloba* trees, larger than 6m are protected.
Fauna & Avi-fauna Potential impact on mammals, reptiles, amphibians & birds.	Without mitigation	4	2	3	1	2	32	Refer to Heading 7.1.8
	With mitigation	4	1	2	1	1	20	Ensure that all mature *Vachellia erioloba* trees, larger than 6m are protected.
Cumulative impacts: Cumulative impact associated with proposed activity.	Without mitigation	4	4	4	1	3	48	The transformation of under 8ha of natural veld (Least Concern) and potential impact on protected tree species red-listed fauna.
	With mitigation	4	4	4	1	2	44	Ensure that the watercourse is protected and that the impact on Vachellia erioloba trees larger than 6m are protected.
The "No-Go" option: Potential impact associated with the No-Go alternative.	Without mitigation	4	2	2	1	1	24	Refer to Heading 7.1.11

According to the **DFFE Environmental Screening Report** the relative Terrestrial Biodiversity theme sensitivity is considered of **Very High Sensitivity** because:

- The site overlaps CBA 1 and CBA 2 areas associated with the protection of:
  - The remaining natural vegetation along the Orange River corridor.
  - Corridor connectivity.
- The site overlaps the distribution range of one IUCN listed bird species (the Ludwig's Bustard).
- Two NFA protected species were observed within the footprint (including *Vachellia erioloba*).
- Two NCNCA protected species were observed within the footprint (including *Boscia foetida*), the other species was only observed outside of the proposed footprint.

The Terrestrial biodiversity assessment aims to take all the discussion under Heading 7.1 into account, including the fact that the fact that the vegetation is not vulnerable or endangered as well as all the other reasons discussed throughout this document. According, Table 12, the main impacts associated with the proposed development will be:

- The potential impact on the CBA area;
- The associated impact on connectivity;
- The potential impact on NFA and NCNCA protected plant species;
- The potential impact on two IUCN listed bird species.

Because of the location and small size of the proposed development even the cumulative impact given is **Medium**. With mitigation this impact can be reduced to **Medium-Low**

No fatal flaws or any other obstacles were found with respect to the flora, vegetation, fauna, and terrestrial biodiversity and it is considered highly unlikely that the 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 species.
- Loss of ecosystem connectivity.

The findings of this assessment suggests that the relative terrestrial biodiversity theme sensitivity should be **Medium-Low Sensitive** (not Very High Sensitive as suggested in the DFFE screening report).

7.3. TERRESTRIAL BIODIVERSITY SENSITIVITY MAP

The proposed mitigation recommendations focus on the protection of the small episodic watercourse to the west of the proposed solar facilities and the protection of NFA protected tree species (Refer to Figure 9, underneath.

Figure 9: Site sensitivity map – focusing on the protection of the small watercourse to the west of the site and the protection of mature *Vachellia erioloba* trees larger than 6m.

8. MITIGATION RECOMMENDATIONS

The proposed development site is considered of Medium-Low sensitivity in terms of terrestrial biodiversity. Impact minimisation should focus on the protection of the watercourse to the west of the solar site's footprint, the protection of mature *Vachellia erioloba* trees and 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 efforts must be made to protect the small watercourse to the west of the proposed solar facilities (as demarcated in the site sensitivity map - Figure 9).
- All mature *Vachellia erioloba* trees, larger than 6 m, must be protected during development and operation. No development should be considered underneath the canopy of any of the trees remaining on Portion 47 of the Farm Frier's Dale No. 466.
- The *Vachellia erioloba* and *Adansonia digitata* trees remaining and planted within the parking and garden area of the Akkerboom farm stall (on Portion 19 of the Farm Frier's Dale no. 466) must be protected.
- A National Forest Act licence application must be submitted if any of the identified ***Vachellia erioloba*** or ***Adansonia digitata*** trees will be impacted.
- A Northern Cape Nature Conservation Act permit must be **obtained for impact on the protected species listed** in Table 10 species.
- All alien invasive species within the footprint and its immediate surroundings 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.
- Indiscriminate clearing of any area outside of these footprints may not be allowed.
- 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.

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APPENDIX 1: REQUIREMENTS FOR SPECIALIST REPORTS

Minimum Content Requirements for Botanical and Terrestrial Biodiversity Specialist Reports as per Protocol for the Specialist Assessment of Environmental Impacts on Terrestrial Biodiversity (GN 320 of 20 March 2020).

Protocol Ref	**Botanical and Terrestrial Biodiversity Specialist Assessment Report Content**	**Section / Page**
3.1.1.	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	Page iv - v
3.1.2.	a signed statement of independence by the specialist;	Page v
3.1.3.	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	Heading 3.2
3.1.4.	a description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant;	Heading 3.1, 3.2 & 3.3.
3.1.5.	a description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;	Heading 3.3
3.1.6.	a location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	Heading 7.3
3.1.7.	additional environmental impacts expected from the proposed development;	Heading 7.1
3.1.8.	any direct, indirect and cumulative impacts of the proposed development;	Heading 7.1
3.1.9.	the degree to which impacts and risks can be mitigated;	Heading 8
3.1.10.	the degree to which the impacts and risks can be reversed;	Heading 7.1
3.1.11.	the degree to which the impacts and risks can cause loss of irreplaceable resources;	Heading 7 & 7.2
3.1.12.	proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	Heading 8
3.1.13.	a motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a "low" terrestrial biodiversity sensitivity and that were not considered appropriate;	NA
3.1.14.	a substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not; and	Page iii
3.1.15.	any conditions to which this statement is subjected.	N/A

APPENDIX 2: DFFE SCREENING REPORT

APPENDIX 3: 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): Paballelo 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 Wastewater 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.