PB CONSULT
ENVIRONMENTAL MANAGEMENT SERVICES

BOTANICAL & TERRESTRIAL BIODIVERSITY SCAN

AGRI-DEVELOPMENT ERVEN 1372 & 1375

THE PROPOSED 14HA AGRICULTURAL DEVELOPMENT ON ERVEN 1372 & 1375 BOEGOEBERG SETTLEMENT (IN KENHARDT), NEAR GROBLERSHOOP, !KHEIS MUNICIPALITY, NORTHERN CAPE PROVINCE.

PREPARED FOR:

ENVIROAFRICA.

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30 September 2023

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EXECUTIVE SUMMARY

The landowner would like to extend his agricultural activities by the development of the adjacent Erven 1372 & 1375 (**The study area**), approximately 14 ha in size. The Erven is in the Boegoeberg Settlement area (just north of Groblershoop), within the irrigation zone of agriculture along the Orange River. The study area is surrounded by intensive agriculture but is still covered by natural vegetation.

The proposed development footprint will result in the transformation of 14 ha of natural veld for agricultural.

VEGETATION TYPE & STATUS	According to the South African vegetation map (2018) (Mucina & Rutherford, 2006), the study area will impact on Lower Gariep Alluvial Vegetation (blue in Figure 5), a vegetation type that has NOW been classified as "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	There are no rivers or watercourses on the property itself (apart from the manmade concrete irrigation canal that runs on or just east of the property boundary). The Orange River is located more than 170 m to the east of the study area.
SPECIAL HABITATS	The landscape is relatively homogenous and 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	Both these properties belong to the applicant. Only a small portion of the property was used for agriculture in the past. The site itself is probably only used for occasional livestock grazing.
VEGETATION ENCOUNTERED	The development will impact on 14 ha of Lower Gariep Alluvial Vegetation (Figure 5), which is considered "Least Threatened" (GN. No. 2747 of 18 November 2022). The study area is not particularly rich in plant species and were absolutely dominated by *Senegalia mellifera* and *Rhigozum trichotomum* (which is often seen as an indicator of poor veld management). In addition, the alien invasive plant, Prosopis species, is slowly but surely busy spreading through the site. *Opuntia ficus-indica* was also common (especially in the southern parts of the study area). Overall, the veld can be described as in fair condition, but slowly succumbing to alien infestation. The only plant species of significance observed were several shepherd's trees (*Boscia albitrunca*), scattered throughout the site, two small stink-bush (*Boscia foetida*) shrubs and several individuals of *Aloe hereroensis*.
CONSERVATION PRIORITY AREAS	According to the 2016, Northern Cape critical biodiversity areas maps (Holness & Oosthuysen, 2016), the study area will impact on a critical biodiversity area (Lower Gariep Alluvial Vegetation used to be classified as endangered). According to the **DFFE National Web Based Environmental Screening Tool** the relative Terrestrial Biodiversity theme sensitivity is considered of **Very High Sensitivity** because the site overlap a CBA 1 and falls within an endangered ecosystem and a protected areas expansion strategy area. However: • However, the proposed development footprint is relatively small, and surrounded by intensive agriculture (no connectivity remaining). • The vegetation type has now been reclassified as "Least threatened".
CONNECTIVITY	The proposed site is surrounded by intensive agriculture, with no direct connectivity with any other area of natural veld. The nearest natural veld is about 650 – 700m to the west or across the Orange River. The study area falls within an area already impacted because of long term anthropogenic (human) activity (agricultural corridor along Orange River). The additional impact on connectivity will be negligible.
THREATENED AND PROTECTED PLANT SPECIES	Table 8 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 eight (8) species

protected in terms of the NCNCA, and one (1) species protected in terms of the NFA were observed. The only plant species of significance observed were several shepherd's trees (*Boscia albitrunca*), scattered throughout the site, two small stink-bush (*Boscia foetida*) shrubs and several individuals of *Aloe hereroensis*.

According to the **DFFE Environmental Screening Tool** report for this site (Appendix 2), the **plant species theme sensitivity is considered Low Sensitive**, which is supported by the findings of this study (if the mitigation recommendations given in Table 9 & Table 10 are implemented).

FAUNA & AVI-FAUNA

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 surrounded by existing agriculture. The vegetation itself is in fair good conditions, but species diversity is very low and slowly succumbing to alien infestation. 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.

According to the **DFFE Environmental Screening Tool** report for this site (Appendix 2), the **animal species theme sensitivity is considered Low Sensitive**, which is supported by the findings of this study.

MAIN CONCLUSION

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

- The site overlaps CBA 1
- It falls within a Protected Areas Expansion Strategy Area.
- It overlaps an endangered ecosystem.

According, Table 11, the main impacts associated with the proposed development will be:

- A **medium/low** potential impact on NFA and NCNCA protected plant species;
- A low potential impact on a CBA;
- A low impact on connectivity;

It is thus 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 **Low Sensitive** (not Very High Sensitive as suggested in the DFFE screening report).

Based on the data collected and analyzed for the proposed development, 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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SACNASP REG. NO.: **400184/05** *(Registered Professional Botanical, Environmental and Ecological Scientists with SACNASP as required in terms of Section 18(1)(a) of the Natural Scientific Professions Act, 2003, since 2005).*

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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:

30 September 2023

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

The landowner would like to extend his agricultural activities by the development of the adjacent Erven 1372 & 1375 (**The study area**), approximately 14 ha in size. The Erven is in the Boegoeberg Settlement area, just north of Groblershoop, next to the Orange River, within the irrigation zone of agriculture along the Orange River and is almost the only remaining undeveloped land in this area.

The study area (Erven 1372 & 1375) is surrounded by intensive agriculture but is still covered by natural vegetation. According to 2018 Vegetation map of South Africa, the vegetation is expected to be **Lower Gariep Alluvial Vegetation**, a vegetation type that has now been classified as "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) (it used to be considered endangered).

The proposed site (or the study area) overlaps an area identified as a critical biodiversity area, in the 2016 Northern Cape critical biodiversity areas maps (Holness & Oosthuysen, 2016).

The DFFE screening report for the proposed site, compiled by Mr. Bernard de Witt of EnviroAfrica on the 7th of September 2022, 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 **Low Sensitivity**;
- The relative Plant species theme sensitivity is considered of **Low Sensitivity**;
- The relative Terrestrial Biodiversity theme sensitivity is considered of **Very High Sensitivity**.

1.1. LEGISLATION GOVERNING THIS REPORT

EnviroAfrica was appointed as the applicant 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

Erven 1372 & 1375 (Kenhardt) is located about 170 m west of the Orange River in the Boegoeberg Settlement Area, about 24 km to the north of Groblershoop . The properties borders on each other and is located within the !Kheis Local Municipality of the Northern Cape province (Figure 1). Erf 1372 is about 6.1996 ha in size, while Erf 1375 is about 8.6541ha in size (about 14 ha in total) (Figure 2).

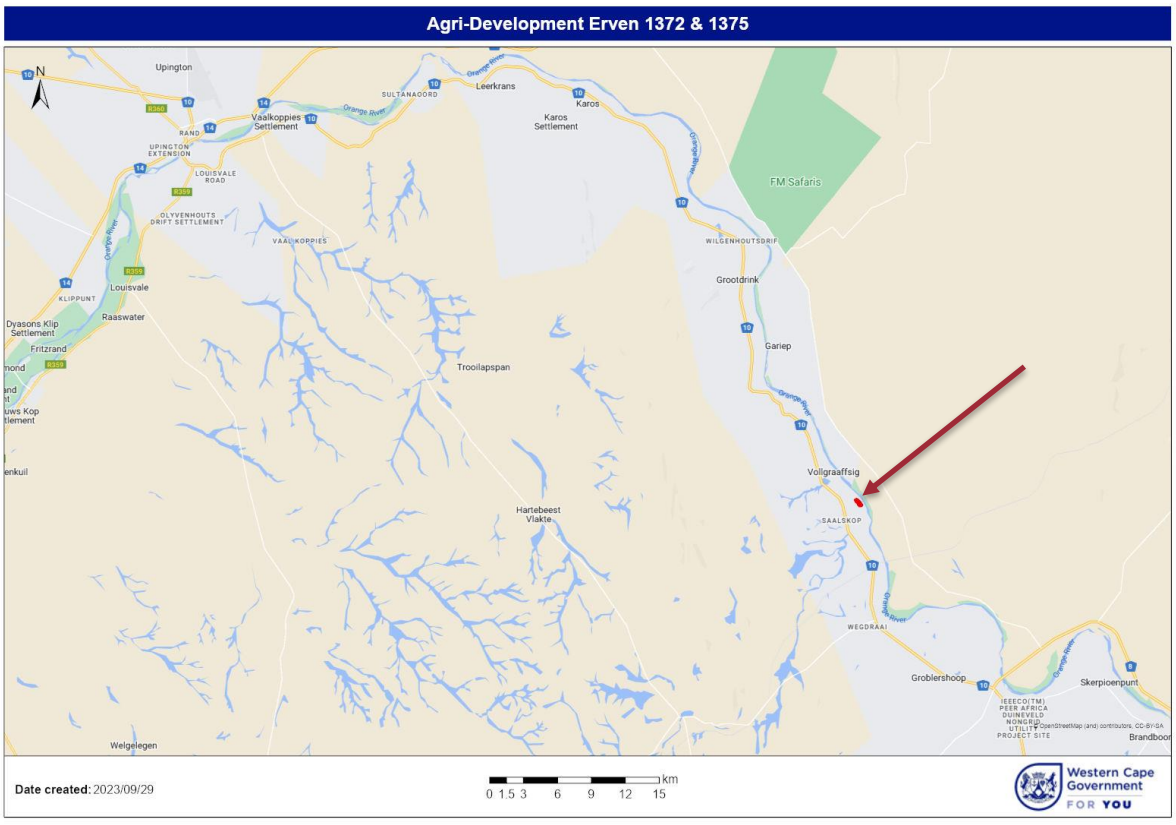

Figure 1: A map showing the location of the study area just north of Groblershoop.

Table 1: Co-ordinates of the two properties (approximately midpoint) (WGS 84 format)

DESCRIPTION	CO-ORDINATE
Erf 1372 Boegoeberg Settlement (in Kenhardt)	S28° 44' 23.1" E21° 51' 18.6"
Erf 1375 Boegoeberg Settlement (in Kenhardt)	S28° 44' 31.0" E20° 51' 25.4"

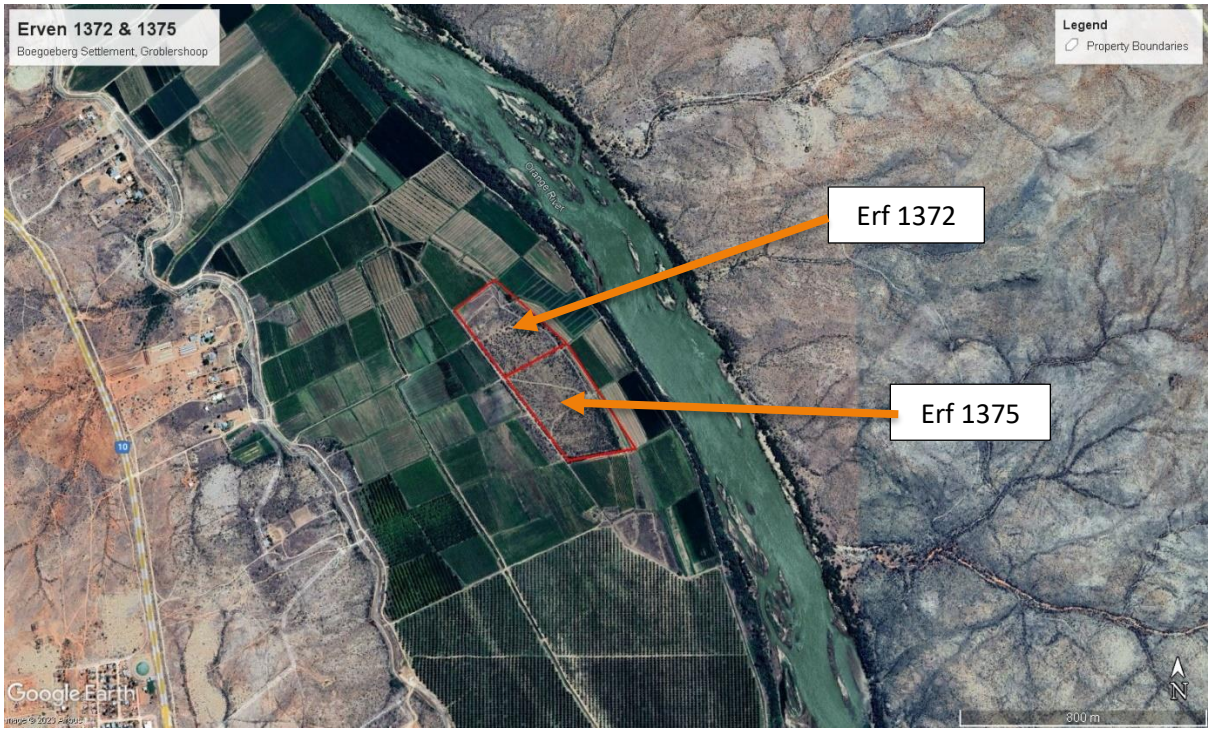

Figure 2: Google Image showing the study area in relation to the Orange River.

2.2. 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). 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 nearby Topline (Saalskop) receives less than a 100 mm of rain per year, mainly in mid-summer December to March the highest (40 mm) in February/March, with its lowest rainfall (0 mm)during winter (June to August). It is also important to note that rainfall can be highly erratic and can vary significantly per annum on any specific location. Daily temperatures vary from 23°C – 37°C during the hot summer months (December / January) and drops down to between 8°C - 17°C during the colder winter months (June – July) (www.worldweatheronline.com).

2.3. TOPOGRAPHY, GEOLOGY AND SOILS

The study area is surrounded by intensive agriculture on almost level terrain that was originally part of the Orange River floodplain area. Topography will not play any important role in plant species diversity.

According to Mucina & Rutherford (2006) the soils associated within the study area can be described as imperfectly drained sandy soils, with negligible to weak profile development, usually occurring on deep alluvial deposits (Figure 3).

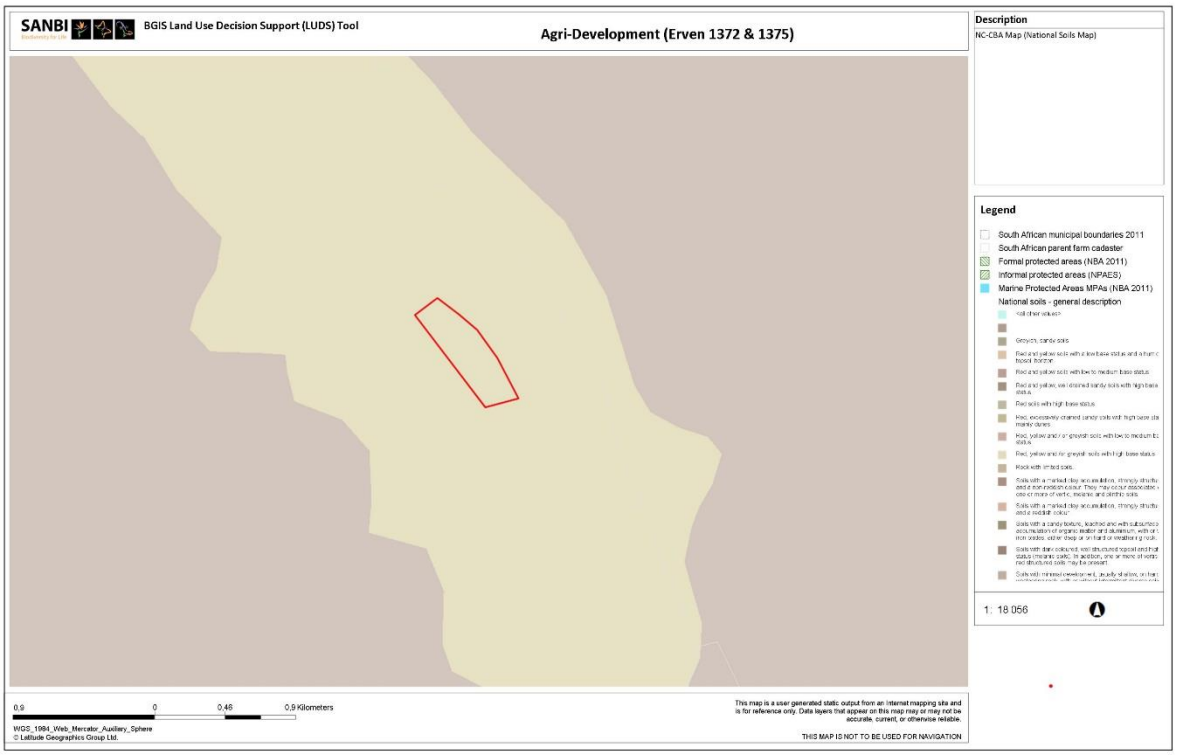

Figure 3: The national soils map, showing the proposed development footprint (study area)

3. METHODS

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 3rd of April 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 4). 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 4: 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. However, the author knows this area and expected vegetation type well, as a result, the timing of the site visit was reasonable. The relatively dense stands of white grasses, shows that the site had received rains during the summer 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 2 for categories used).

Likelihood refers to the probability of the specific impact occurring because of the proposed activity (Refer to Table 3, for categories used).

Duration refers to the length in time during which the activity is expected to impact on the environment (Refer to Table 4).

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 5).

Severity refers to the direct physical or biophysical impact of the activity on the surrounding environment should it occur (Refer to Table 6).

Table 2: 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 3: 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 4: 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 5: 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 6: 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 7. 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 7: 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 study area will impact on Lower Gariep Alluvial Vegetation (blue in Figure 5), a vegetation type that has been classified as "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).

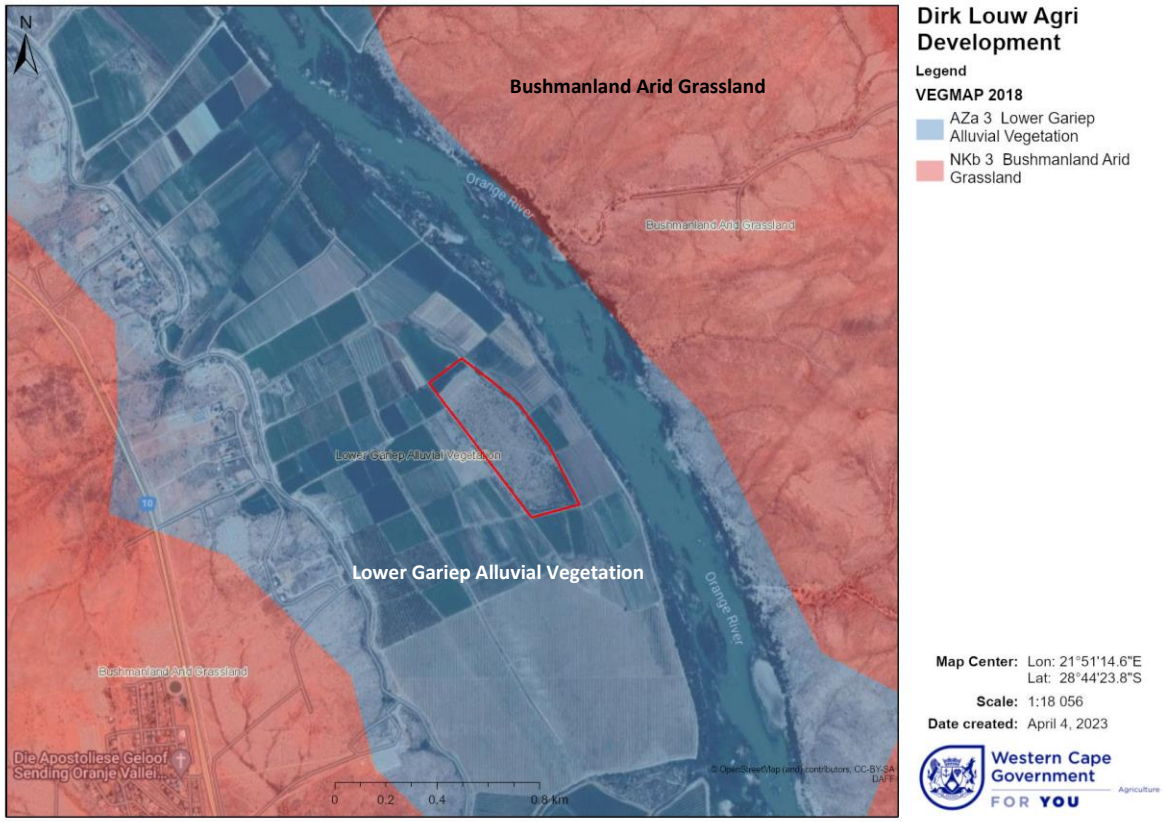

Figure 5: Vegetation map of South Africa (2012), showing the expected vegetation type (SANBI BGIS)

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

The study area falls within 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.

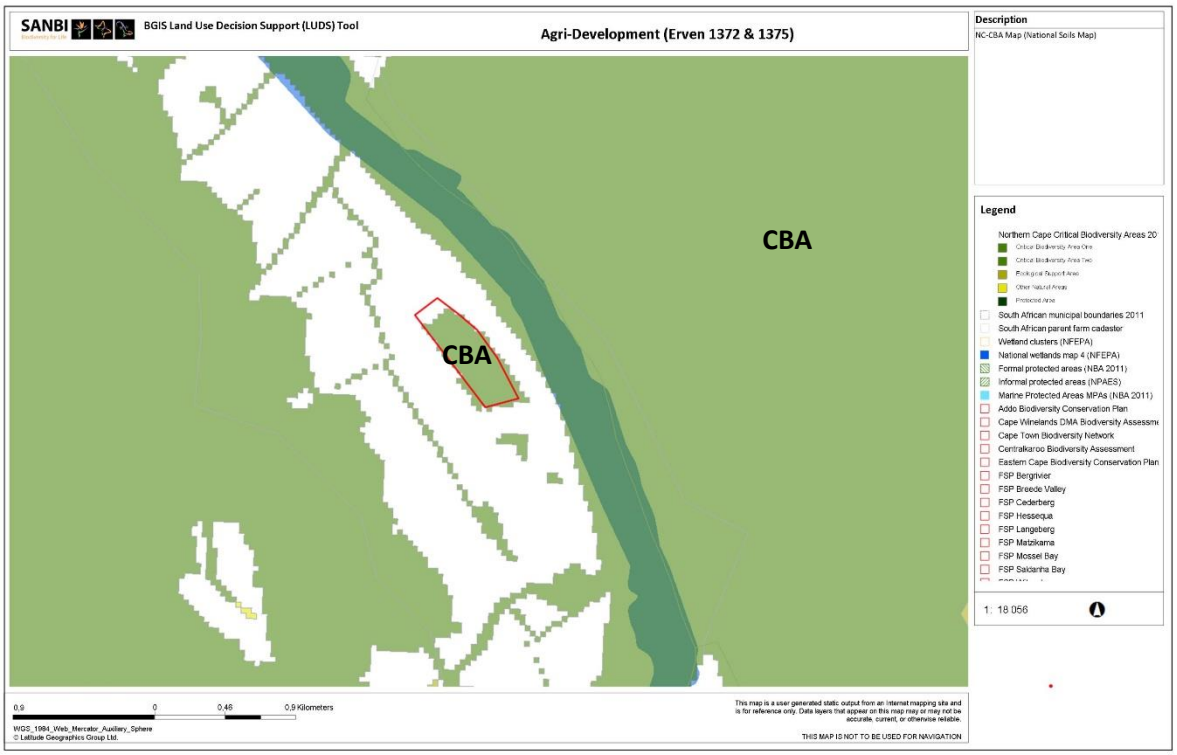

Figure 6: Northern Cape CBA map (2016) showing the study area and associated critical biodiversity areas.

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 study area will impact on a critical biodiversity area, associated with the conservation corridor suggested along the Orange River (Figure 6) (Holness & Oosthuysen, 2016).

4.4. WATERCOURSES AND WETLANDS

The proposed development is located further than 170 m of the Orange River (but fall within the critical biodiversity areas identified with this river system) (Figure 6). There are no rivers or watercourses on the property itself (apart from the manmade concrete irrigation canal that runs on or just east of the property boundary).

According to the **DFFE Screening Tool** 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 study area falls within the larger boundaries of the Griqualand West Centre of Endemism, but it does not overlap any of the geological features required, which is centred on the surface outcrops of the Ghaap Group (notably limestone and dolomite) and the Olifantshoek Supergroup (notably quartzite).

The proposed development is not expected to have any impact on the Griqualand West Centre of Endemism.

5. VEGETATION

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) (Figure 5).

5.1. THE VEGETATION ENCOUNTERED

In species composition, the vegetation encountered represents a slightly denser Bushmanland Arid Grassland rather than Lower Gariep Alluvial Vegetation. Two vegetation strata was usually observed, namely a bottom and middle stratum. Species diversity was relatively low, but the effects of recent rains were visible in the grassy bottom layer. The middle stratum was between 1 to 2 m in height and absolutely dominated by a medium dense to dense stands of *Senegalia mellifera* (swarthaak), in combination with other larger shrubs such as *Phaeoptilum spinosum* and *Rhigozum trichotomum* (Photo 1 to Photo 2). The parasite *Tapinanthus oleifolius* was often observed within larger *Senegalia mellifera* shrubs. Other shrubs observed in the middle stratum included larger shrubs such as *Justicia incana*, *Mesembryanthemum leptarthron* (= *Psilocaulon*), *Salsola zeyheri* and *Ziziphus mucronata* ("blinkblaar wag-'n-bietjie" tree).

Photo 1: Looking from north to south over the terrain. The photo depicts the typical vegetation encountered throughout the site. Note the dense stands of *Senegalia mellifera* dominating the top stratum of the vegetation.

Photo 2: Looking from east to west over the middle of the site. Again, the dominance by *Senegalia mellifera* can be observed with driedoring (*Rhigozum trichotomum*) in the foreground.

Photo 3: One of the shepherd's trees (*Boscia albitrunca*) observed within the site (within a patch of driedoring – *Rhigozum trichotomum*). Almost all the individuals were multi-stemmed shrubs, between 0.5 to 2m in height.

Photo 4: One of the *Euphorbia gariepina* individuals that were occasionally observed, near the northwestern corner of the site.

The lower stratum was sometimes covered with dense stands of whit grasses (Photo 5) or was more open (Photo 4). Apart from the grass species the following shrubs or herbs were observed: *Adenium oleifolium*, *Aloe hereroensis*, *Aptosimum indivisum*, *Dicoma capensis*, *Euphorbia gariepina*, *Geigeria pectidea*, *Kleinia longiflora*, *Mesembryanthemum guerichianum*, *Mesembryanthemum* cf. *pallens* (Springbokslaai), *Senna italica* (in deeper sands), *Tetraena retrofracta*, *T. decumbens* and the weed *Tribulus zeyheri*.

In the southeastern corner a patch of larger trees, dominated by *Searsia pendulina* (wit karee), growing upwards of 6 ,m was observed. The large *Boscia albitrunca* was also associated with this patch, as were several larger *Senegalia mellifera*. This patch is located right next to an open concrete irrigation canal, and most likely benefited from water leaked into soils by the canal.

The alien invasive *Prosopis* tree, was commonly observed throughout the site, while single *Eucalyptus* trees were also observed along the boundaries of the site (probably planted as shade trees). Quite a few of the invasive prickly pear (*Opuntia ficus-indica*) was also observed, especially in the southern part of the site (Photo 6).

Photo 5: One of the open areas, dominated by white grasses.

Photo 6: The southern portion of the study area. Note the prickly pear individuals in the background and *Aloe hereroensis* in the front right of picture.

The only plant species of significance observed were several shepherd's trees (*Boscia albitrunca*), scattered throughout the site (Photo 3), two small shrubs of the stink-bush (*Boscia foetida*) (in the southeast of the site) and several individuals of *Aloe hereroensis* (observed throughout the site) (Photo 6). Almost all the *Boscia albitrunca* individuals were small to medium multi-stemmed shrubs, apart from one magnificent tree of more than 4 m in height that was observed in the southeastern corner, protected in between the dense stands of other larger trees (e.g., *Searsia pendulina*).

According to the **DFFE Environmental Screening Tool** report for this site (Appendix 2), the **plant species theme sensitivity is considered Low Sensitive**, which is supported by the findings of this study. However, it is recommended that all efforts are made to protect at least the *Boscia foetida* plants larger than 4m as well as indigenous trees, larger than 6 m (e.g., *Searsia pendulina*).

5.2. FLORA ENCOUNTERED

Table 8 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 eight (8) species protected in terms of the NCNCA, and one (1) species protected in terms of the NFA were observed.

Table 8: List of plant species observed within the proposed development footprint.

NO.	SPECIES NAME	FAMILY	STATUS	LOCATION
1.	*Adenium oleifolium*	APOCYNACEAE	LC Protected in terms of schedule 2 of the NCNCA	A beautiful tuberous plant, occasionally observed.
2.	*Aloe hereroensis*	ASPHODELACEAE	LC Protected in terms of schedule 2 of the NCNCA	Occasionally observed throughout the site (10 – 20 individual plants).
3.	*Aptosimum indivisum*	SCROPHULARIACEAE	LC	Small herb, occasionally observed.
4.	*Boscia albitrunca*	BRASSICACEAE (CAPPARACEAE)	LC NFA protected species. All *Boscia* species protected in terms of Schedule 2 of NCNCA	About 10 individuals observed, of which only one was a magnificent tree (<4m).
5.	*Boscia foetida*	BRASSICACEAE (CAPPARACEAE)	LC All *Boscia* species protected in terms of Schedule 2 of NCNCA	Only 2 smaller shrubs observed.
6.	*Dicoma capensis*	ASTERACEAE	LC	Rarely observed underneath larger shrubs.
7.	*Euphorbia gariepina*	EUPHORBIACEAE	LC NCNCA, Schedule 2 Protected (all species in this Genus)	A succulent shrub occasionally observed.
8.	*Geigeria pectidea*	ASTERACEAE	LC	Occasionally observed underneath larger shrubs.
9.	*Justicia incana*	ACANTHACEAE	LC	Medium large shrub occasionally observed.
10.	*Kleinia longiflora*	ASTERACEAE	LC	A medium succulent occasionally observed.
11.	*Mesembryanthemum* cf. *pallens (=Prenia)*	AIZOACEAE	LC NCNCA, Schedule 2 Protected (all species in this Family)	Springbokslaai. Small succulent/herb only observed once.
12.	*Mesembryanthemum guerichianum*	AIZOACEAE	LC NCNCA, Schedule 2 Protected (all species in this Family)	Soutslaai, occasionally observed – often considered a disturbance indicator
13.	*Mesembryanthemum leptarthron (=Psilocaulon)*	AIZOACEAE	LC NCNCA, Schedule 2 Protected (all species in this Family)	Occasionally observed throughout.
14.	*Opuntia ficus-indica*	CACTACEAE	**Alien invasive plant species: Must be removed.**	Scattered throughout the site.
15.	*Phaeoptilum spinosum*	NYCTAGINACEAE	LC	Common to dominant throughout the site.
16.	*Prosopis* species	FABACEAE	**Alien invasive plant species: Must be removed.**	Often observed throughout the site.
17.	*Rhigozum trichotomum*	BIGNONIACEAE	LC	Common to dominant throughout the site.
18.	*Salsola zeyheri*	AMARANTHACEAE	LC	Witkoolganna, occasionally observed.
19.	*Searsia pendulina*	ANACARDIACEAE	LC	Several large trees observed in the southeastern corner.
20.	*Senegalia mellifera*	FABACEAE	LC	Medium large thorny shrub dominating the middle stratum
21.	*Senna italica*	FABACEAE	LC	Eland's pea – occasionally observed in sandy patches.
22.	*Tapinanthus oleifolius*	LORANTHACEAE	LC	Stem parasite, often growing in *Senegalia mellifera*.
23.	*Tetraena decumbens*	ZYGOPHYLACEAE	LC	A small succulent shrub, occasionally observed.

NO.	SPECIES NAME	FAMILY	STATUS	LOCATION
24.	*Tetraena retrofracta*	ZYGOPHYLACEAE	LC	A small succulent shrub, occasionally observed.
25.	*Tribulus zeyheri*	ZYGOHYLACEAE	LC	Occasionally observed in the disturbed edges.
26.	*Ziziphus mucronata*	RHAMNACEAE	LC	Occasionally observed.

5.3. 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).

Table 9 gives a summary of threatened and protected species observed within the study area.

Table 9: Threatened or protected plant species observed within the study area.

	SPECIES OBSERVED	STATUS
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 observed.	N/a
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 NEM:BA protected species observed.	N/a
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).	1. ***Boscia albitrunca***.	Almost all were small to medium multi-stemmed shrubs, apart from one magnificent tree of more than 4 m in height (which should be protected). • GPS point for the large tree: S28° 44' 32.3" E21° 51' 30.8"

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).

- Eight (8) species protected in terms of the NCNCA was observed (Refer to Table 10).

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

NO.	SPECIES NAME	COMMENTS	Comments & Recommendations
1.	*Adenium oleifolium* **Schedule 2 protected**		A beautiful tuberous plant with many medicinal uses. Rarely observed within the footprint. **Search & Rescue** An effort should be made to transplant as many of these plants as possible. Care must be taken to remove the whole tuber with the plant.
2.	*Aloe hereroensis* **Schedule 2 protected**		Occasionally observed throughout the site (10 – 20 individual plants). **Search & Rescue** An effort should be made to transplant as many of these plants as possible.
3.	*Boscia albitrunca* **Schedule 2 protected**	Several multi-stemmed shrubs were observed (9 individuals), as well as one magnificent individual larger than 4 m in height.	Refer to the recommendations in Table 9, above.
4.	*Boscia foetida* **Schedule 2 protected**	Two multi-stemmed shrubs were observed.	No search & rescue is proposed. *Boscia* species seldom transplant successfully, because of their extensive and deep root system.
5.	*Euphorbia gariepina* **Schedule 2 protected**		
6.	*Mesembryanthemum cf. pallens* **Schedule 2 protected**	Only one individual observed.	A common plant with a wide distribution. No search & rescue is proposed.
7.	*Mesembryanthemum guerichianum* **Schedule 2 protected**	Soutslaai, occasionally observed – often considered a disturbance indicator	A common plant with a wide distribution. No search & rescue is proposed.
8.	*Mesembryanthemum leptarthron* **Schedule 2 protected**	Occasionally observed throughout.	A common plant with a wide distribution. No search & rescue is proposed.

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 surrounded by existing agriculture. The vegetation itself is in fair good conditions, but species diversity is very low and slowly succumbing to alien infestation. 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.

According to the **DFFE Environmental Screening Tool** report for this site (Appendix 2), the **animal species theme sensitivity is considered Low Sensitive**, which is supported by the findings of this study.

7. IMPACT ASSESSMENT

7.1. SITE SENSITIVITY DISCUSSION

The proposed development footprint will result in the transformation of 14 ha of natural veld for agricultural.

Impact on special habitats: The landscape is relatively homogenous and does not contain any rocky outcrop or any other significant biophysical feature that might have resulted in special habitats for fauna or flora.

Impact on watercourses & wetlands: There are no rivers or watercourses on the property itself (apart from the manmade concrete irrigation canal that runs on or just east of the property boundary). The Orange River is located more than 170 m to the east of the study area (Figure 6).

Impact on land use: Both these properties belong to the applicant. Only a small portion of the property was used for agriculture in the past. The site itself is probably only used for occasional livestock grazing.

Impact on vegetation: The development will impact on 14 ha of Lower Gariep Alluvial Vegetation (Figure 5), which is considered "Least Threatened" (GN. No. 2747 of 18 November 2022). The study area is not particularly rich in plant species and were absolutely dominated by *Senegalia mellifera* and *Rhigozum trichotomum* (which is often seen as an indicator of poor veld management). In addition, the alien invasive plant, Prosopis species, is slowly but surely busy spreading through the site. *Opuntia ficus-indica* was also common (especially in the southern parts of the study area). Overall, the veld can be described as in fair condition, but slowly succumbing to alien infestation. The only plant species of significance observed were several shepherd's trees (*Boscia albitrunca*), scattered throughout the site, two small stink-bush (*Boscia foetida*) shrubs and several individuals of *Aloe hereroensis*.

Impact on conservation priority areas: According to the 2016, Northern Cape critical biodiversity areas maps (Holness & Oosthuysen, 2016), the study area will impact on a critical biodiversity area (Lower Gariep Alluvial Vegetation used to be classified as endangered). According to the **DFFE National Web Based Environmental Screening Tool** the relative Terrestrial Biodiversity theme sensitivity is considered of **Very High Sensitivity** because the site overlap a CBA 1 and falls within an endangered ecosystem and a protected areas expansion strategy area. However:

- However, the proposed development footprint is relatively small, and surrounded by intensive agriculture (no connectivity remaining).
- The vegetation type has now been reclassified as "Least threatened".

Impact on connectivity: The proposed site is surrounded by intensive agriculture, with no direct connectivity with any other area of natural veld. The nearest natural veld is about 650 – 700m to the west or across the Orange River. The study area falls within an area already impacted because of long term anthropogenic (human) activity (agricultural corridor along Orange River). The additional impact on connectivity will be negligible.

Impact on threatened and protected plant species: Table 8 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 eight (8) species protected in terms of the NCNCA, and one (1) species protected in terms of the NFA were observed. The only plant species of significance observed were several shepherd's trees (*Boscia albitrunca*), scattered throughout the site, two small stink-bush (*Boscia foetida*) shrubs and several individuals of *Aloe hereroensis*. According to the **DFFE Environmental Screening Tool** report for this site (Appendix 2), the **plant species theme sensitivity is considered Low Sensitive**, which is supported by the findings of this study (if the mitigation recommendations given in Table 9 & Table 10 are implemented).

Impact on protected fauna & avi-fauna: 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 surrounded by existing agriculture. The vegetation itself is in fair good conditions, but species diversity is very low and slowly succumbing to alien infestation. 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. According to the **DFFE Environmental Screening Tool** report for this site (Appendix 2), the **animal species theme sensitivity is considered Low Sensitive**, which is supported by the findings of this study.

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 minor 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.

Cumulative impacts: Refer to Table 11. In this impact assessment method, cumulative impacts are calculated by using the worst scenarios for each aspect as input into the impact assessment table.

The "No-Go" alternative: The **"No Go" alternative** means there would be no change to the *status quo*. However, the No-Go alternative will not necessary mean no loss of vegetation or connectivity. Infestation by invasive alien species is likely to proceed, which will have an impact on the remaining natural veld over time and will also impact on the National and Provincial protected plant species in the area. The land would remain in its natural state but might slowly succumb to alien infestation. Other changes might be attributed to external factors such as climate change. The 'No Go' alternative is included in the impact table below (Table 11).

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 11: 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	The landscape is relatively homogenous and does not contain any other significant biophysical feature that might have resulted in special habitats for fauna or flora.
	With mitigation	2	1	4	1	1	14	Refer to the recommendations in Table 9 & 10.
Watercourses & Wetlands: Potential impact on natural water resources and it's ecological support areas.	Without mitigation						0	There are no rivers or watercourses on the property itself (apart from the manmade concrete irrigation canal that runs on or just east of the property boundary).
	With mitigation						0	
Landuse and cover: Potential impact on socio-economic activities.	Without mitigation	2	4	4	1	1	20	The site itself is probably only used for occasional livestock grazing.
	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	The development will impact on 14 ha of Lower Gariep Alluvial Vegetation (considered "Least Threatened").
	With mitigation	2	4	4	1	1	20	The impact on 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	3	4	4	1	2	33	The development area will impact on a CBA1, but the vegetation type had been reclassified from endangered to least threatened.
	With mitigation	3	3	4	1	1	27	Refer to the recommendations in Table 9 & 10.
Connectivity: Potential loss of ecological migration corridors.	Without mitigation	3	3	4	1	1	27	The proposed site is surrounded by intensive agriculture, with no direct connectivity with any other area of natural veld.
	With mitigation	3	2	4	1	1	24	Refer to the recommendations in Table 9 & 10.
Protected & endangered plant species: Potential impact on threatened or protected plant species.	Without mitigation	4	4	4	1	2	44	No red-listed plant species was observed, but eight (8) species protected in terms of the NCNCA, and one (1) species protected in terms of the NFA were observed.
	With mitigation	3	3	4	1	1	27	Refer to the recommendations in Table 9 & 10.
Fauna & Avi-fauna Potential impact on mammals, reptiles, amphibians & birds.	Without mitigation	2	2	4	1	2	18	The footprint area is surrounded by existing agriculture, used for livestock grazing.
	With mitigation	2	2	4	1	1	16	Refer to the recommendations in Table 9 & 10.
Cumulative impacts: Cumulative impact	Without mitigation	4	4	4	1	2	44	The transformation of about 14h of natural veld (Least Concern) and potential impact on a CBA and protected plant species.

Impact assessment								
Aspect	**Mitigation**	**CV**	**Lik**	**Dur**	**Ext**	**Sev**	**Significance**	Short discussion
associated with proposed activity.	With mitigation	3	4	4	1	1	30	Refer to the recommendations in Table 9 & 10.
The "No-Go" option: Potential impact associated with the No-Go alternative.	Without mitigation	4	3	2	1	2	32	The No-Go alternative will not necessary mean no loss of vegetation or connectivity, infestation by invasive alien species is likely to proceed and will slowly continue to degrade the natural veld.
	With mitigation							

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

- The site overlaps CBA 1
- It falls within a Protected Areas Expansion Strategy Area.
- It overlaps an endangered ecosystem.

However, the site is small (about 14 ha), located and surrounded by intensive agriculture. The vegetation type has been reclassified from endangered to least threatened.

According, Table 11, the main impacts associated with the proposed development will be:

- A **medium/low** potential impact on NFA and NCNCA protected plant species;
- A **low** potential impact on a CBA;
- A **low** impact on connectivity;

Because of the location and small size of the proposed development even the cumulative impact given in Table 11 is **Medium/Low**. With mitigation this impact can be reduced to **Low**

It is thus 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 **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 a patch of indigenous trees, including one magnificent *Boscia albitrunca*, a NFA protected tree species (Refer to Figure 7, underneath.

Figure 7: Site sensitivity map – focusing on the protection of a patch of mature indigenous trees.

8. MITIGATION RECOMMENDATIONS

The proposed development site is considered of Medium-Low sensitivity in terms of terrestrial biodiversity, which can be reduced to Low sensitivity with impact minimisation. Impact minimisation is based on the protection a patch of larger indigenous trees (including the only large Boscia albitrunca tree on site, as well as the recommendations given in Table 9 and Table 10.

- 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.
- The recommendations given in Table 9 and Table 10 should be implemented.
- A National Forest Act licence application must be submitted if any of the ***Boscia albitrunca*** 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.
- An integrated waste management approach must be implemented during construction.
    - Construction related general and hazardous waste may only be disposed of at approved waste disposal sites.
    - All rubble and rubbish should be collected and removed from the site to a Municipal approved waste disposal site.

9. REFERENCES

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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.