PB CONSULT
ENVIRONMENTAL MANAGEMENT SERVICES

BOTANICAL ASSESSMENT

ERF 878, RIEBEEK KASTEEL

PROPOSED URBAN DEVELOPMENT ON ERF 878 (RIEBEEK KASTEEL), MALMESBURY SWARTLAND LOCAL MUNICIPALITY, WESTERN CAPE PROVINCE

7 May 2021

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EXECUTIVE SUMMARY

VEGETATION TYPE

Swartland Shale Renosterveld (Figure 5)

Classified as "**Critically Endangered**" (GN 1002, December 2011). More recently the 2018 National Biodiversity Assessment (NBA) was published. Swartland Shale Renosterveld vegetation remains classified as "Critically Endangered" in terms of the 2018 NBA.

VEGETATION ENCOUNTERED

The site visit shows that the property was clearly cultivated over a long period of time. Very little is known about how to rehabilitate previously ploughed renosterveld, but it is a known fact that ploughed renosterveld will not restore itself for many generations, if ever. Surveys had shown that although a number of hard species may come back (giving it the same structural appearance as the original renosterveld), the plant diversity does not return.

Desktop studies showed areas of darker vegetation which might still contain remaining natural veld. Unfortunately, the site visit confirmed that these areas only supported hardy and pioneer species which had re- established itself after previous disturbance.

CONSERVATION PRIORITY AREAS

According to the WCBSP (Figure 6) the Krom River should be protected as an ecological support area (ESA), while a small are on top of the hill has been included as a critical biodiversity area (CBA). The site visit however, confirmed that there remains no more undisturbed natural veld on the property and the area highlighted as a potential CBA is just as degraded as the surrounding property.

CONNECTIVITY

Erf 878 falls within the urban edge of Riebeek Kasteel and borders on urban developments to its north and east, while it's surrounded by agricultural land to the south and west. The Krom River represents the only remaining potential channel for connectivity, but it has also been badly compromised in the surrounding urban areas and agricultural land.

LAND-USE

The property used to support dry land cultivation of commercial crops (probably for more than 100 years). However, it has not been ploughed for at least the last 10 to 15 years (probably longer) and is currently used for grazing by small number of antelope (springbok). Other smaller game like duiker might still to be present, but the site is surrounded by urban development and agriculture.

PROTECTED PLANT SPECIES

NO protected or endangered species were observed. IN fact most of the plants encountered were hardy or pioneer species. Botanically the most important feature of the site was the presence of a few relative young *Olea europaea* (wild olive) trees at the foot of the small hill.

MAIN CONCLUSION

The proposed development will result in the transformation of less than 12 ha of transformed natural veld. However, it will impact on a small identified as a CBA (but which is already transformed) and an ESA (the disturbed Krom River ecosystem).

From a biodiversity / botanical perspective the only remaining features of significance on the site is considered the degraded Krom River corridor (which can benefit from some protection) and the presence of a few *Olea europaea* (wild olive) trees in between the old fruit trees.

According to the impact assessment given in Table 5 the development (without mitigation) is expected to be **Medium-Low**, mainly as a result of the potential impact on the Krom River, CBA and ESA's, but can be reduced to **Very-Low** through simple and very viable mitigation options.

With the correct mitigation it is 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 plant species.
- Loss of ecosystem connectivity.

WITH THE AVAILABLE INFORMATION IT IS RECOMMENDED THAT PROJECT BE APPROVED, WITH THE PROPOSED MITIGATION ACTIONS.

NO-GO OPTION

The No-Go option is not likely to result in a "no-impact" scenario, for it will have a negative socio-economic impact (and slow degradation may still continue).

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 PB Consult have no interest in secondary or downstream development as a result of the authorization of this proposed 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. PB Consult reserve the right to modify aspects of this report, including the recommendations if new information become available which may have a significant impact on the findings of this report.

RELEVANT QUALIFICATIONS & EXPERIENCE OF THE AUTHOR

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

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

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

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

Mr Botes is a registered Professional Botanical, Environmental and Ecological Scientists at SACNASP (South African Council for Natural Scientific Professions) as required in terms of Section 18(1)(a) of the Natural Scientific Professions Act, 2003, since 2005.

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:

7 May 2021

Date:

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1. INTRODUCTION

PB Consult has been appointed to perform a botanical assessment of Erf 878, Malmesbury, with regards to the potential subdivision and development of the smallholding. The Erf is located within the urban edge of the Riebeek Kasteel and just under 11.1 ha in size. The northern portion of the site is located on a lower lying area bordering onto the Krom River, which rises towards a rounded hill in the south-eastern corner, covering about 40% of the property. The proposed development will trigger listed activities under the National Environmental Management Act, (Act 107 of 1998) (NEMA) and the EIA regulations (as amended).

According to the 2018 vegetation map of South Africa, the property would have been covered by Swartland Shale Renosterveld, a critically endangered vegetation type, a status which it maintained by the more recent, 2018 National Biodiversity Assessment (Skowno, 2019).

However, desktop studies (SANBI BGIS & Google images) suggest that the property is likely to be degraded as a result of past and present agricultural activities. However, Google images clearly show the remaining patterns of previous ploughing activities, which is supported by agricultural crop census data (CapeFarmMapper), but it also shows small patches of vegetation which might be remaining natural veld. The site visit confirmed that the property can only be regarded as seriously degraded (in terms of botanical significance). Some hardy indigenous plant species had re-establish itself on disturbed excavated soils next to the circle road build along the top of the small hill, while some hardy species also re-established themselves next to an old fence line at the foot of the small hill (where they are now protected by the slope of that section and the proximity to the fence line). A number of old fruit trees were also encountered in this area. A number of alien invasive trees had established itself towards the top of the hill (most notably a number of larger Blackwattle trees). In between the Blackwattle trees a two indigenous Wit Karee trees were observed (most probably planted as decorative trees). The Krom River itself is also degraded as a result of its proximity to the urban edge and is currently overgrown with the reed, *Phragmites australis* while Oak trees were planted along the banks of the river as ornamental shade trees.

Unfortunately, renosterveld, once ploughed (especially over a long period of time – as is the case in this instance) is notoriously difficult to rehabilitate. As a result, from a biodiversity / botanical perspective the only remaining features of significance on the site is considered the degraded Krom River corridor (which can benefit from some protection) and the presence of a few *Olea europaea* (wild olive) trees in between the old fruit trees. These olive trees are not very old (<20 years) and probably only established themselves relatively recently under the protection of the old fruit trees, but they might be considered for replanting into green belts or gardens.

1.1. Terms of reference

The terms of reference for this appointment were to:

- Evaluate the proposed site(s) in order to determine whether any significant botanical features will be impacted as a result of the proposed development.

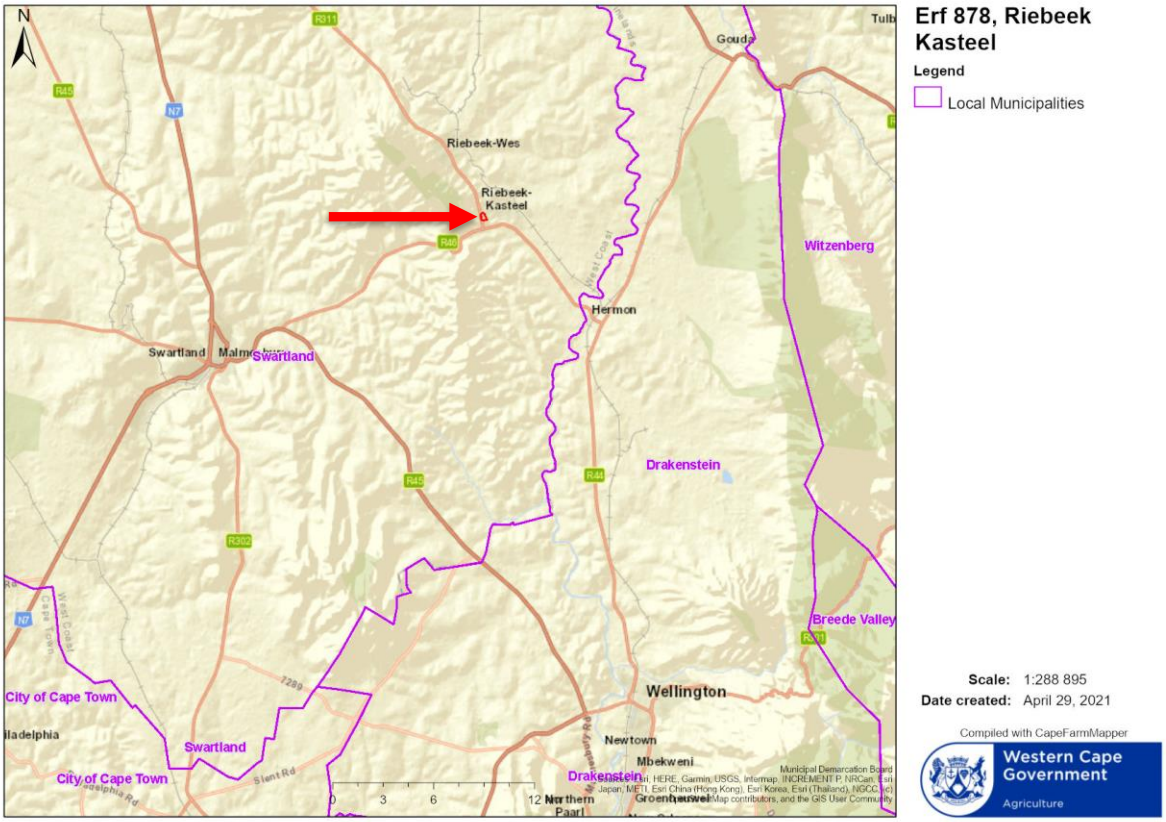
- Determine and record the position of any plant species of special significance (e.g. protected tree species, or rare or endangered plant species) that should be avoided or that may require "search & rescue" intervention.
- Locate and record sensitive areas from a botanical perspective within the proposed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

2. STUDY AREA

2.1. Location & Layout

Riebeek-Kasteel is one of the oldest towns in South Africa, located just off the R46, about at 20 km east-north-east of Malmesbury, in the Riebeek Valley together with its sister town Riebeek West (Refer to Figure 1). The town falls within the Swartland Local Municipality of the Western Cape Province. The Riebeek Valley has been under cultivation since the early 1700's.

Figure 1: The location of the farm in relation to Robertson and Worcester in the Western Cape (CapeFarmMapper)



Erf 878 is located within the urban edge of the Riebeek Kasteel and just under 11.1 ha in size (Figure 2). The owners would like to subdivide and develop the property into residential erven.

Figure 2: The location of Erf 878 (red) within the town of Riebeek Kasteel (CapeFarmMapper)

Figure 3: A Google image showing Erf 878 (red) with 5m contour lines

Figure 3, gives a Google image overview of Erf 878, and also an idea of the topography of the site.

2.2. Topography and Climate

Erf 878 is located on the western boundary of the main town, but bordering on the R311 (or main road) running through Riebeek Kasteel (Figure 2). The Krom River borders (run through) on the northern portion of the Erf, which is also the lower lying area of the property (with an altitude of about 145 m above sea level). The elevation increases steadily to the south and west of the property and then rises towards a small hill (with an altitude of about 175m above sea level), which covers (about 40%) the south-eastern portion of the site. Even with the variation in topography it was clear that aspect did not have a significant influence on the vegetation encountered. The presence of a number of Olea europaea trees at the foothill of the small hill is ascribed more to the protective cover given by the old orchards than any direct influence resulting from the slope of the site.

Riebeek Kasteel has a winter-rainfall regime with an annual precipitation varying between 270 – 670 mm/year (mean of 430 mm/year), which peaks from May to August. The hottest part of the year is during summer from November to March/April with mean maximum temperatures at about 30°C, while winter (June – August) is generally cold with average temperatures of about 11°C (Refer to Table 1). (www.climate-data.org).

Table 1: Weather averages for Riebeek Kasteel (www.climate-data.org)

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature °C	23.8 °C	23.8 °C	21.8 °C	18.3 °C	14.5 °C	11.3 °C	10.5 °C	11.1 °C	13.1 °C	16.7 °C	19.2 °C	22.2 °C
(°F)	(74.8) °F	(74.8) °F	(71.3) °F	(65) °F	(58.2) °F	(52.3) °F	(51) °F	(52) °F	(55.6) °F	(62.1) °F	(66.6) °F	(71.9) °F
Min. Temperature °C	16.6 °C	16.8 °C	15.2 °C	12.1 °C	9.2 °C	6 °C	5.1 °C	5.7 °C	7.1 °C	10 °C	12.2 °C	15 °C
(°F)	(61.8) °F	(62.2) °F	(59.4) °F	(53.9) °F	(48.6) °F	(42.8) °F	(41.2) °F	(42.3) °F	(44.8) °F	(50) °F	(53.9) °F	(59) °F
Max. Temperature °C	31.5 °C	31.6 °C	29.5 °C	25.4 °C	20.9 °C	17.3 °C	16.8 °C	16.9 °C	19.3 °C	23.5 °C	26.5 °C	29.5 °C
(°F)	(88.6) °F	(88.8) °F	(85) °F	(77.8) °F	(69.5) °F	(63.2) °F	(62.3) °F	(62.5) °F	(66.7) °F	(74.3) °F	(79.6) °F	(85.2) °F
Precipitation / Rainfall	17	15	19	52	87	137	118	101	69	42	36	22
mm (in)	(0.7)	(0.6)	(0.7)	(2)	(3.4)	(5.4)	(4.6)	(4)	(2.7)	(1.7)	(1.4)	(0.9)
Humidity(%)	48%	49%	52%	57%	69%	75%	76%	78%	73%	61%	54%	50%
Rainy days (d)	2	2	2	4	6	8	7	7	6	4	4	3
avg. Sunhours (hours)	11.3	10.7	9.8	8.4	7.0	6.3	6.6	6.4	7.4	9.2	10.4	11.2

2.3. Geology and soils

Renosterveld is usually found on nutrient-rich, shale based clayey soils. According to Mucina & Rutherford (2006), the geology and soils of Swartland Shale Renosterveld can be described as clayey soils derived from Malmesbury Group shales (specifically the Porterville Formation in the north and east and the Moorreesburg Formation in the west). The soils contain prismacutanic and pedocutanic diagnostic horizons and Glenrosa and Mispah forms are predominant.

3. EVALUATION METHOD

Desktop studies coupled with a site survey were performed. Spatial information from online databases such as SANBI BGIS, CapeFarmMapper and Google Earth were used to evaluate the site in terms of vegetation type(s) expected, potential significant features that might be encountered (e.g. variations in soil type, rocky outcrops etc.) and obvious differences in landscape or vegetation densities, which might indicate differences in plant community or species composition. Expected plant species lists were prepared and species of special significance were flagged (to be used as reference during the site visit).

Figure 4: Google image showing the GPS tracks walked and/or driven (blue) during the site visit

The following general conclusions were drawn on completion of the desktop assessment:

- The seems to have been transformed as a result of past and present agricultural activities;
- The vegetation type is expected to be Swartland Shale Renosterveld, considered "*critically endangered*" in terms of the National list of threatened terrestrial ecosystems (2011) (The more resent 2018 National Spatial Biodiversity Assessment also lists Swartland Shale Renosterveld as "*critically endangered*") Refer to Heading 5).
- According to the Critical Biodiversity Areas Map (Refer to Heading 5);
    - The Krom River and potential other watercourses should be protected as Ecological Support Areas (ESA);
    - A small area on top of the hill is considered a Critical Biodiversity Area.

The botanical survey was conducted on the 17th of March 2021. The timing of the site visit was slightly early in that renosterveld is known for its richness in bulb species, which has two peak seasons, namely autumn, when lilies may appear and late winter and spring when irises, legumes, succulents and many other bulb species starts to bloom. However, because of the poor condition of the site, timing is not likely to have a significant impact on species observed as renosterveld rarely

recovers, once ploughed. In this case the site seems to have been under cultivation over a long period of time.

The survey was conducted by walking the site and examining, marking and photographing any area of interest (Refer to Figure 4). A hand-held Garmin GPSMAP 62s was used to track the sampling route and for recording waypoints of locations of specific importance. During the survey notes, together with a photographic record, were compiled for the vegetation and landscape. The author endeavoured to identify and locate all significant biodiversity features, special plant species and or specific soil conditions which might indicate special botanical features (e.g. rocky outcrops or silcrete patches).

4. VEGETATION

In accordance with the 2018 Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006), the proposed footprint(s) will only one impact on one broad vegetation type, namely **Swartland Shale Renosterveld** (Figure 5), a vegetation type classified as "critically endangered" in terms of the NEM: BA "*national list of ecosystems that are threatened and in need of protection*" (GN 1002, December 2011). A conservation target of 26% has been set for this vegetation type, but since more than 90% of the area has already been totally transformed (mainly cropland), the target remains unattainable.

Figure 5: Vegetation map of South Africa (2018), showing the expected vegetation types

More recently the 2018 National Biodiversity Assessment (NBA) was published (Skowno *et al.*, 2019a & Skowno *et a*l, 2019b). Although the findings of the 2018 NBA it is not yet formally adopted by

NEM: BA in terms of regulations it is important to consider these findings. Swartland Shale Renosterveld vegetation remains classified as "critically endangered" in terms of the 2018 NBA.

Mucina & Rutherford (2006) describe Swartland Renosterveld as low to moderately tall leptophyllous shrubland of varying canopy cover as well as low, open shrubland dominated by renosterbos, located on moderately undulating plains and valleys, with heuweltjies (old termite mounts) a prominent in places.

4.1. The Vegetation in context

Swartland Shale Renosterveld is a part of the Fynbos Biome. Renosterveld has long been the least understood component of the Fynbos Biome, with very little known of its functioning and ecological requirements. It is, however becoming increasingly appreciated for its uniqueness and high species diversity, especially geophytes. Four of the 30 recognised types of renosterveld occur in the Swartland, namely Swartland Shale, Granite, Silcrete and Alluvium Renosterveld. Three of these types are classified as Critically Endangered and the fourth as Vulnerable. Swartland Shale Renosterveld contains the highest concentration of threatened plant species: 214 species in total, 25 of which are endemic to the vegetation type. A very prominent feature of Swartland renosterveld is its *heuweltjies* (earth mounds). These are the distinctive circular patches or 'spots' in the veld that give the Tygerberg its name. *Heuweltjies* are associated with termite nests. These patches are subject to constant disturbance by termites and their predators, and the on-going transportation of plant material by termites to the *heuweltjies* results in nutrient enrichment of the mounds

Swartland Shale Renosterveld is restricted to fertile fine-grained soils in the winter rainfall region of the Western Cape. Between 91% and 97% of this vegetation type is transformed, mostly due to agriculture. Remaining fragments have an irreplaceable conservation value due to a high richness of endemic geophytes (Walton, 2006).

5. CRITICAL BIODIVERSITY AREAS MAPS

The 2017 Western Cape Biodiversity Spatial Plan (WCBSP) includes a map of biodiversity importance for the entire province, covering both the terrestrial and freshwater realms, as well as major coastal and estuarine habitats (Pool-Stanvliet, 2017). The WCBSP is the product of a systematic biodiversity plan that delineates, on a map, Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), which require safeguarding to ensure the continued existence and functioning of species and ecosystems, including the delivery of ecosystem services.

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

- **Critical biodiversity areas (CBA's)** are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity conservation targets

cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses.

- **Ecological support areas (ESA's)** are areas that are not essential for meeting biodiversity representation targets/thresholds but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree of restriction on land use and resource use in these areas may be lower than that recommended for critical biodiversity areas.

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

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

Figure 6: Critical Biodiversity Areas Map (2017) associated with the property (CapeFarmMapper)

According to the WCBSP (Figure 6), the Krom River and potential other watercourses should be protected as Ecological Support Areas (ESA), while a small area on top of the hill is considered a Critical Biodiversity Area.

6. NATIONAL LAND COVER

According to the 2018 National Land Cover map (Figure 5), almost the whole of the property has been used to cultivate commercial annual (dry land) crops (which were confirmed during the site visit). Historic Google images show that the site had already been cultivated before 2005 (the 2005 images looking remarkably similar than those of today). However, the land cover map also showed potential areas which may still support low shrubland and dense forest or trees (supported by recent Google images of the site). Unfortunately, the site visit shows that these patches only support a few hardy shrubs that had re-established on areas previously disturbed

Figure 7: The 2018 DEA Land Cover map (73-class) showing the property in red

7. VEGETATION ENCOUNTERED

As expected, the site visit shows that the property was clearly cultivated over a long period of time. Very little is known about how to rehabilitate previously ploughed renosterveld, but it is a known fact that ploughed renosterveld will not restore itself for many generations, if ever. Surveys had shown that although a number of hard species may come back (giving it the same structural appearance as the original renosterveld), the plant diversity does not return.

Figure 8: Overview of Erf 878, showing the property boundaries (red), previously cultivated areas (yellow) and potential remaining natural veld (green) as well as a small wet area (blue)

The site visit showed that basically the whole property had previously been cultivated or impacted from associated infrastructure (e.g. farm roads). The yellow area in Figure 8 indicates the area impacted by previous cultivation (which is basically the whole site). The green areas (marked 1 – 3) indicates the areas that may potentially still support natural veld, while the blue area shows a small wet area encountered on the site (it may be a small drainage line or a pipe leak).

7.1. Previously cultivated land

The property is currently used as game camp, supporting about 20 Springbok and seems not to have been cultivated in the immediate past. However, the evidence of past cultivation can still be seen in the as the soil is still clearly scarified from past ploughing practices. The cultivated land is clearly degraded with no natural veld left (Photo 1 to 4). At the time of the site visit these areas are dominated by a dense grass layer reaching up to 50cm in height, dominated by what seems to be *Hyparrhenia hirta* and *Merxmuellera* species, while *Cynodon dactylon* usually dominated the bottom layer with species of *Fingherhuthia* and *Sporobolus* in between. The alien grass, *Pennisetum* cf. *setaceum* were also observed, especially next to the road at the top of the small hill as was the naturalised weed, *Atriplex semibaccata.* A number of hardy shrubs are slowly re-establishing themselves within the old agricultural land or along its edges (indicating that the land had not been ploughed during the last 5 - 10 years). They include shrubs and small trees like the renosterbos,

Dicerothamnus rhinocerotis, *Dodonaea viscosa* (sand olive), the weed *Gomphocarpus fruticosus*, *Helichrysum patulum* (kooigoed) and the hardy *Stoebe plumosa* (slangbos).

Photo 1: Looking from north to south over the site, with old agricultural land in the foreground and the small hill in the background. Note the transformed status of the bottom part of the site.

Photo 2: Showing some of the Springbok grazing on the terrain. Again note the disturbed old fields.

Photo 3: A view of the south-western corner of the property, looking from north-east (the foot of the small hill) to south-west. The old agricultural land with its grassy cover remains apparent.

Photo 4: The old agricultural land at the top of the small hill (looking from east to west).

7.2. Area 1: Potential remaining natural veld

From the desktop studies there were potentially three areas that might still support remaining natural veld or trees of potential significance (refer to the green areas in Figure 8).

All along the northern foot of the small hill longitudinal stretch of darker vegetation can be seen, which might be remnants of remaining natural veld (Refer to Area 1 in Figure 8). Unfortunately, the site visit showed that even this area had been impacted by agricultural practices. At some stage a fence had been erected along this section which then allowed some protection from physical disturbance like ploughing resulting in some hardy species being able to re-establish themselves (Photo 5 & 6).

Photo 5: Looking from east to west along the old fence line along the foot of the small hill. Note the fence in front and the renosterbos shrubs in the background.

This stretch of vegetation was for the most part dominated by *Dicerothamnus rhinocerotis* (a disturbance indicator by itself in this case), with patches of *Diospyros glabra*, *Salvia chamelaeagnea* (lower down) and *Searsia angustifolia* in between. *Stoebe plumosa* and *Galenia africana* were also observed in this area.

Photo 6: The vegetation along the old fence line. Note the dens stands of *Dicerothamnus rhinocerotis* in the foreground. Slightly lower down *Salvia chamelaeagnea* stands can be observed.

Towards the west the slope becomes much steeper, which allowed for some further protection from being ploughed, but in this area an old orchard with fruit trees had been planted in years gone by (Photo 7 & 8). This patch of trees consists mostly of old, delepatated fruit trees (e.g. Quince trees). This woody patch seems to have been a patch of planted fruit trees, which had been neglected over time. Under the shade and protection of these trees a number of indigenous trees had now started to establish itself (these trees would have been actively controlled in years past). The most notable being a small number of *Olea europaea* and *Searsia lancea* trees in between the Quince trees.

Photo 7: Looking from east to west along the lower slopes of the small hill. Note the start of the woody section.

Photo 8: A portion of the old patch of fruit trees, with a number of *Olea europaea* in between.

7.3. Area 2: Potential remaining natural veld

In Figure 8, next to the circle road along the top of the small hill a darker stretch of vegetation can also be observed. The observations made during the site visit, suggest that this circle road had been slightly enlarged or levelled some time ago. In doing so, excavated material taken from the road had been dropped to the lower side and stacked in a ridge to the top of the road. This again resulted in a physical obstruction (could not be ploughed). Because of the obstructions it might also have benefitted from rains (retaining some water and receiving water from the road surface. Being protected it allowed for the re-establishment of a number of hardy plant species.

Again this vegetation was mostly dominated by *Dicerothamnus rhinocerotis* (renosterbos), with *Dodonaea viscosa* also very prominent (Photo 9), while in other patches *Dodonaea* would dominate, in combination with renosterbos and *Searsia* shrubs (Photo 10). Again the species were almost without exception hardy species which had been able to re-establish itself along this ridge after it was disturbed. Other plant species observed included: *Deverra* cf. *denudata, Euryops* species, *Gomphocarpus fruticosus*, *Helichrysum patulum* (along the lower slopes), *Salvia chamelaeagnea, Salvia* species (a garden variety), *Searsia glauca, S. laevigata* and *Stoebe plumosa.*

Photo 9: A picture of the southern entrance to the circle road. Note the dominant stands of renosterbos with a *Dodonaea viscosa* tree to the right of picture.

Photo 10: The southern portion of the circle road with dense *Dodonaea* stands to the left.

Photo 11: The lower slopes to the east of the hill, looking from south to north (the circle road can be seen to the top left of the photo).

It was again clear that this area only supported hardy and pioneer species which had re- established itself after previous disturbance. The number and size of the Searsia and Dodonaea shrubs and small trees would suggest that this specific area had not been disturbed for at least the last 10 years.

7.4. The Krom River

The northern boundary of the property borders on the Krom River. It is clear that the original riparian vegetation had been compromised as a result of being within the urban edge. Presently the river is almost overgrown with *Phragmites australis*, which had replaced the expected riparian zone. Only the occasional *Searsia* shrub was observed, while other ornamental plants like Oak trees and *Bougainvillea* plants were also observed within the old riparian corridor.

Photo 12: The Krom River riparian vegetation to the right of picture. Note the dense stands of *Phragmites australis*.

Although the riparian zone associated with the Krom River had been compromised it can benefit from a more formal conservation approach. The developer should consider fencing off the river section and allow for a more formal protection zone. Invasive alien trees within the riparian zone should be removed.

Photo 13: A view from the top of the top of the small hill looking down over the Krom River corridor in the background (behind the blue line).

Photo 14: *Typha capensis* observe in wet area indicated by the blue area in Figure 8.

7.5. Flora encountered

Table 2 gives a list of the plant species encountered during this study. Because of the limitations (single site visits) it is likely that a number of annuals and geophytes might have been missed, but the author is confident that a good understanding of the vegetation was achieved and confidence in the findings is high.

Thirty (66) different plant species where identified of which eighteen (18) is South African endemics, and two (2) are naturalised weeds. No red-listed species were observed (SANBI, 2016).

Table 2: Species checklist of flora observed within the study areas

No.	Species name	FAMILY	Status	Additional notes
1.	*Atriplex semibaccata*	AMARANTHACEAE	Naturalised weed	Prostrate herb
2.	*Cynodon dactylon*	POACEAE	LC	Low growing grass
3.	*Deverra* cf. *denudata*	APIACEAE	LC	Medium herb/shrub
4.	*Dicerothamnus rhinocerotis (=Elytropappus rhinocerotis)*	ASTERACEAE	LC	Pioneer shrub
5.	*Diospyros glabra*	EBENACEAE	LC	Medium shrub
6.	*Dodonaea viscosa*	SAPINDACEAE	LC	Small tree
7.	*Euryops* species (not in flower)	ASTERACEAE		Medium shrub

No.	Species name	FAMILY	Status	Additional notes
8.	*Fingherhuthia* species	POACEAE		Small grass
9.	*Galenia africana**	AIZOACEAE	LC	Medium shrub
10.	*Gomphocarpus fruticosus*	APOCYNACEAE	LC	Weedy herb/shrub
11.	*Helichrysum patulum*	ASTERACEAE	LC (SA endemic)	Herb / shrub
12.	*Hyparrhenia hirta*	POACEAE	LC	Large grass
13.	*Merxmuellera* species	POACEAE		Large grass
14.	*Olea europaea*	OLEACEAE	LC	Medium to large tree
15.	*Pennisetum setaceum*	POACEAE	Naturalised Weed	Large grass
16.	*Phragmites australis*	POACEAE	LC	Large grass / reed.
17.	*Salvia* (garden escapee)	LAMIACEAE	Garden variety	Large shrub
18.	*Salvia chamelaeagnea*	LAMIACEAE	LC	Medium shrub
19.	*Searsia angustifolia*	ANACARDACEAE	LC	Medium shrub
20.	*Searsia glauca*	ANACARDACEAE	LC	Medium shrub
21.	*Searsia laevigata*	ANACARDACEAE	LC	Small Tree
22.	*Searsia lancea*	ANACARDACEAE	LC	Large tree
23.	*Searsia lancea*	ANACARDACEAE	LC	Large shrub
24.	*Searsia pendulina*	ANACARDACEAE	LC	Large shrub
25.	*Sporobolus* species	POACEAE		Small grass
26.	*Stoebe plumosa*	ASTERACEAE	LC	Low shrub
27.	*Typha capensis*	TYPHACEAE	LC	Hydrophyte / herb

* Abundance of these species is often seen as a disturbance indicator (although they can play a vital role in soil protection through its rapid germination and spread) (Vlok & Schutte-Vlok, 2015).

7.6. Alien and invasive species

Alien infestation is relative low, but a number of *Acacia mearnsii* (Black wattle), one Syringa tree (*Melia azedarach*) and most alarming of all a patch of suckers of *Populus alba* (white poplar) has been observed not far from the Krom River. All of these plants will have to be removed, with special care taken with the white poplar. The White Poplar can easily form dense stands from roots suckers, which can narrow and block water channels, causing flooding and increased siltation. Extensive stands are likely to cause a significant reduction in stream flow.

7.7. Threatened and protected plant species

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

highlight species that are at low risk of extinction, but may nonetheless be of high conservation importance. As a result a SANBI uses an amended system of categories in order to highlight species that may be of low risk of extinction but are still of conservation concern (SANBI, 2015).

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

- The National Environmental Management: Biodiversity Act, Act 10 of 2004, provides for the protection of species through the "*Lists of critically endangered, endangered, vulnerable and protected species*" (GN. R. 152 of 23 February 2007).
- National Forest Act, Act 84 of 1998, provides for the protection of forests as well as specific tree species through the "*List of protected tree species*" (GN 908 of 21 November 2014).
- Western Cape Nature Conservation Board Act, Act 15 of 1998 (WCNCBA), provides for the protection of "*endangered flora*" (Schedule 3) and "*protected flora*" (Schedule 4).

7.7.1. Protected species observed

- **No red-listed species** was encountered, although a number of South African endemics were observed (refer to Table 2) (SANBI, 2020).
- **No NEM: BA protected species was observed.**
- **No NFA protected species was observed**.
- **No plant protected in terms of the WCNCBA** was encountered.

8. IMPACT ASSESSMENT METHOD

The objective of this study was to evaluate the botanical value of the study area in order to identify significant environmental resources that might be impacted as a result of the development. The Ecosystem Guidelines for Environmental Assessment (De Villiers *et. al*., 2005), were used to evaluate the botanical significance of the property with emphasis on:

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

8.1. 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 (Refer to Table 3).

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

Table 3: Categories and criteria used for the evaluation of the significance of a potential impact

ASPECT / CRITERIA	LOW (1)	MEDIUM/LOW (2)	MEDIUM (3)	MEDIUM/HIGH (4)	HIGH (5)
CONSERVATION VALUE Refers to the intrinsic value of an attribute 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	The attribute is transformed, degraded not sensitive (e.g. Least threatened), with unlikely possibility of species loss.	The attribute is in good condition but not sensitive (e.g. Least threatened), with unlikely possibility of species loss.	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.	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.	The attribute is considered critically endangered or is part of a proclaimed provincial or national protected area.
LIKELIHOOD Refers to the probability of the specific impact occurring as a result of the proposed activity	Under normal circumstances it is almost certain that the impact will not occur.	The possibility of the impact occurring is very low, but there is a small likelihood under normal circumstances.	The likelihood of the impact occurring, under normal circumstances is 50/50, it may or it may not occur.	It is very likely that the impact will occur under normal circumstances.	The proposed activity is of such a nature that it is certain that the impact will occur under normal circumstances.
DURATION Refers to the length in time during which the activity is expected to impact on the environment.	Impact is temporary and easily reversible through natural process or with mitigation. Rehabilitation time is expected to be short (1-2 years).	Impact is temporary and reversible through natural process or with mitigation. Rehabilitation time is expected to be relative short (2-5 years).	Impact is medium-term and reversible with mitigation, but will last for some time after construction and may require on-going mitigation. Rehabilitation time is expected to be longer (5-15 years).	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 on-going mitigation. Rehabilitation time is expected to be longer (15-50 years).	The impact is expected to be permanent.
EXTENT Refers to the spatial area that is likely to be impacted or over which the impact will have influence, should it occur.	Under normal circumstances the impact will be contained within the construction footprint.	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.	Under normal circumstances the impact might extent outside of the property boundaries and will affect surrounding land owners or –users, but still within the local area (e.g. within a 50 km radius).	Under normal circumstances the impact might extent to the surrounding region (e.g. within a 200 km radius), and will regional land owners or –users.	Under normal circumstances the effects of the impact might extent to a large geographical area (>200 km radius).
SEVERITY Refers to the direct physical or biophysical impact of the activity on the surrounding environment should it occur.	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.	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.	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.	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.	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.

8.2. Significance categories

The formal NEMA EIA application process was developed to assess the significance of impacts on the surrounding environment (including socio-economic factors), associated with any specific development proposal in order 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. In order 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, in order to determine its potential significance. The potential significance is then described in terms of the categories given in Table 4.

Table 4: 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 as a result 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 as a result 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 either 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 fairly 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 cannot be mitigated and usually result in very severe effects, beyond site boundaries, national or international.

9. DISCUSSING BOTANICAL SENSITIVITY

The aim is to determine the vulnerability of a habitat to a specific impact. In order to do so, the sensitivity of the habitat should be determined by identifying and assessing the most significant environmental aspects of the site against the potential impact(s). For this development the following biodiversity aspects were considered:

- **Location**: Erf 878 (<11.1 ha) falls within the urban edge of the town of Riebeek Kasteel. The proposed development is expected to incorporate all the developable area available on this property. In terms of biodiversity, the site itself has been degraded in totality as a result of past and present agricultural practices, although a few hardy and pioneer species had re-established itself in areas (also previously disturbed) now protected from the direct impact of ploughing. The development footprint is expected to impact almost exclusively on degraded (even transformed) veld, with very little change of rehabilitation.
- **Activity**: The proposed activity is expected to result in a permanent transformation of approximately 11.1 ha of degraded natural veld (with little hope of rehabilitation) urban erven.
- **Geology & Soils**: No heuweltjies or are other special habitat was observed on the property.
- **Land use and cover**: The property used to support dry land cultivation of commercial crops (probably for more than 100 years). However, it has not been ploughed for at least the last 10 to 15 years (probably longer) and is currently used for grazing by small number of antelope (springbok). Other smaller game like duiker might still to be present, but the site is surrounded by urban development and agriculture.
- **Vegetation status**: The proposed development footprints will only impact one vegetation type, namely Swartland Shale Renosterveld (Figure 5). The vegetation type is considered "critically endangered" with conservation targets that are no longer achievable.
- **Conservation priority areas**: According to the WCBSP (Figure 6) the Krom River should be protected as an ecological support area (ESA), while a small are on top of the hill has been included as a critical biodiversity area (CBA). The site visit however, confirmed that there remains no more undisturbed natural veld on the property and the area highlighted as a potential CBA is just as degraded as the surrounding property.
- **Connectivity**: Erf 878 falls within the urban edge of Riebeek Kasteel and borders on urban developments to its north and east, while it's surrounded by agricultural land to the south and west. The Krom River represents the only remaining potential channel for connectivity, but it has also been badly compromised in the surrounding urban areas and agricultural land.
- **Watercourses and wetlands**: The property borders on the Krom River to the north. However, the ecological function of this river had been badly compromised as a result of past and present agricultural and urban development. Google images show that the portion of the river bordering on Erf 878 is probably some of the best protected portions of the river in the vicinity of Riebeek Kasteel (even if it also degraded in this section).
- **Protected or endangered plant species**: NO protected or endangered species were observed. IN fact most of the plants encountered were hardy or pioneer species. Botanically the most important feature of the site was the presence of a few relative young *Olea europaea* (wild olive) trees at the foot of the small hill.
- **Alien and Invasive Plant species**: Alien infestation is relative low, but a number of *Acacia mearnsii* (Black wattle), one Syringa tree (*Melia azedarach*) and most alarming of all a patch of suckers of *Populus alba* (white poplar) has been observed not far from the Krom River. All of these plants will have to be removed, with special care taken with the white poplar. The White Poplar can easily form dense stands from roots suckers, which can narrow and block water channels, causing flooding and increased siltation. Extensive stands are likely to cause a significant reduction in stream flow.

9.1. Impact assessment

Table 5 rates the significance of environmental impacts associated with the proposed development. For each aspect, the worst case scenario (of the combined sites) were taken as "*without mitigation*" with reference to specific mitigation actions given for the specific site mitigation actions required when scoring "*with mitigation*". It also evaluates the expected accumulative effect of the proposed development as well as the No-Go option.

Table 5: Impact assessment associated with the proposed development

Impact assessment								
Aspect	**Mitigation**	**CV**	**Lik**	**Dur**	**Ext**	**Sev**	**Significance**	Short discussion
Geology & soils: Potential impact on special habitats (e.g. true quartz or "heuweltjies")	Without mitigation	1	1	5	1	1	8	No special habitats observed.
	With mitigation	1	1	3	1	1	6	Protection of the Krom River corridor.
Landuse and cover: Potential impact on socio-economic activities.	Without mitigation	2	3	5	1	1	20	Permanent transformation of approximately 11.1 ha of grazing field used for grazing used by game.
	With mitigation	2	3	5	1	1	20	Potential beneficial socio-economic impact.
Vegetation status: Loss of vulnerable or endangered vegetation and associated habitat.	Without mitigation	3	2	5	1	1	27	Permanent transformation of 11.1 ha of transformed, but critically endangered vegetation.
	With mitigation	2	1	3	1	1	12	Protect significant indigenous trees and the Krom River corridor.
Conservation priority: Potential impact on protected areas, CBA's, ESA's or Centre's of Endemism.	Without mitigation	3	3	5	2	2	36	The development will impact on a transformed CBA and potentially on an ESA associated with the Krom River.
	With mitigation	2	2	3	1	1	14	Protect significant indigenous trees and the Krom River corridor.
Connectivity: Potential loss of ecological migration corridors.	Without mitigation	2	2	3	1	3	18	The property falls within the urban edge surrounded by urban development and agriculture. The only remaining corridor is along the disturbed Krom River.
	With mitigation	2	1	1	1	1	8	Protect and potentially enhance the Krom River ecological corridor.
Watercourses and wetlands: Potential impact on natural water courses and it's ecological support areas.	Without mitigation	3	2	5	2	3	36	The property borders on the degraded Krom River to the north.
	With mitigation	2	1	3	1	1	12	Protect and potentially enhance the Krom River ecological corridor.
Protected & endangered plant species: Potential impact on threatened or protected plant species.	Without mitigation	2	1	5	1	2	18	The vegetation type is critically endangered, but no protected or vulnerable species were observed on the site.
	With mitigation	1	1	3	1	1	6	Protect significant indigenous trees and the Krom River corridor

Impact assessment								
Aspect	**Mitigation**	**CV**	**Lik**	**Dur**	**Ext**	**Sev**	**Significance**	Short discussion
Invasive alien plant species: Potential invasive plant infestation as a result of the activities.	Without mitigation	3	3	3	2	3	33	Alien infestation is relative low, but a number of species have been observed most alarmingly root shoots of the Populus alba just north of the Krom River.
	With mitigation	2	1	1	1	1	8	Remove all alien and invasive species that might impact on the Krom River from within in the site and along the Krom River ecological corridor.
Veld fire risk: Potential risk of veld fires as a result of the activities.	Without mitigation	2	2	3	2	2	18	Veld fire risk medium, but danger relative low.
	With mitigation	1	1	2	1	1	5	Address fire danger throughout construction.
Cumulative impacts: Cumulative impact associated with proposed activity.	Without mitigation	3	3	5	2	3	39	Permanent transformation of approximately 11.1 ha of transformed veld for urban development, within transformed critically endangered vegetation.
	With mitigation	2	1	3	1	1	12	Refer to all the mitigation recommendations above.
The "No-Go" option: Potential impact associated with the No-Go alternative.	Without mitigation	3	3	4	2	2	33	Very little is known about how to rehabilitate previously ploughed renosterveld, but it is a known fact that ploughed renosterveld will not restore itself for many generations, if ever. However, the Krom River ecological corridor (even though compromised to west and east) should be enhanced if possible.
	With mitigation						0	

According Table 5, the main impacts associated with the proposed development will be:

- The potential impact on ESA's and CBA's;
- The potential impact on the Krom River;
- The potential long term impact of poor alien and invasive plant management (especially if it results in further degradation of the Krom River).

The proposed footprint will be relatively small (<12 ha) within the urban edge and impacting only on transformed natural veld.

The No-Go option is not likely to result in a "no-impact" scenario, for it will have a negative socio-economic impact (and slow degradation may still continue).

The cumulative impact (without mitigation) is expected to be **Medium-Low**, mainly as a result of the potential impact on the Krom River, CBA and ESA's, but can be reduced to **Very-Low** through simple and very viable mitigation options.

10. RECOMMENDATIONS

The proposed development will result in the transformation of less than 12 ha of transformed natural veld. However, it will impact on a small identified as a CBA (but which is already transformed) and an ESA (the disturbed Krom River ecosystem).

From a biodiversity / botanical perspective the only remaining features of significance on the site is considered the degraded Krom River corridor (which can benefit from some protection) and the presence of a few *Olea europaea* (wild olive) trees in between the old fruit trees.

According to the impact assessment given in Table 5 the development (without mitigation) is expected to be **Medium-Low**, mainly as a result of the potential impact on the Krom River, CBA and ESA's, but can be reduced to **Very-Low** through simple and very viable mitigation options.

With the correct mitigation it is 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 plant species.
- Loss of ecosystem connectivity.

10.1. Impact minimisation recommendations

The following general mitigation actions should also be implemented:

- All construction must be done in accordance with an approved construction and operational phase Environmental Management Plan (EMP), which must include the recommendations made in this report.
- 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 layout of the development footprint should take the sensitivity of the Krom River into account and should aim to establish a suitable corridor along this river system in order to allow for potential rehabilitation of this ecosystem
- The olive trees discussed under Heading 7.1 should be considered for replanting into green belts or gardens.
- All listed alien invasive tree species must be removed from the site, while special care must be taken with the removal of white poplar (in order to ensure it does not enter the river system.
- Lay-down areas or construction sites must be located at least 30m away from the Krom River corridor;
- An integrated waste management approach must be implemented during construction.
    - Construction related general and hazardous waste may only be disposed of at suitably approved waste disposal sites.

11. REFERENCES

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

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

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

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

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

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

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

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

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

South African National Biodiversity Institute. 2006. South African National Botanical Institute: Biodiversity GIS Home. http://bgis.sanbi.org (as updated).

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

South African National Biodiversity Institute. 2016. Botanical Database of Southern Africa (BODATSA) [dataset]. doi: to be assigned.

South African National Biodiversity Institute. 2020. Statistics: Red List of South African Plants version 2020.1. Downloaded from Redlist.sanbi.org on 2021/02/11.

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

Walton, BA. 2006. Vegetation Patterns and Dynamics of Renosterveld at Agter-Groeneberg Conservancy, Western Cape, South Africa. Thesis presented in partial fulfilment of the requirements for the degree of Master of Science at the Stellenbosch University. April 2006

APPENDIX 1: COMPLIANCE WITH APPENDIX 6 OF GN. NO. 982 (4 DECEMBER 2014)

Specialist reports

1. A specialist report prepared in terms of these regulations must contain -	
a) Details of –	**Refer to:**
(i) The specialist who prepared the report; and	Refer to Page ii & Appendix 2
(ii) The expertise of the specialist to compile a specialist report including a curriculum vitae;	Refer to Appendix 2
b) A declaration that the specialist is independent in a form as may be specified by the competent authority;	Refer to Page ii
c) An indication of the scope of, and the purpose for which the report was prepared;	Refer to Heading 1.1
d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Refer to Heading 3
e) A description of the methodology adopted in preparing the report or carrying out the specialist process inclusive of equipment and modelling used;	Refer to Heading 3
f) Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructures, inclusive of a site plan identifying site alternatives;	Refer to Headings 4.1 & 5.
g) An identification of any areas to be avoided, including buffers;	Refer to Figure 8
h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Refer to Figure 8
i) A description of any assumptions made and any uncertainties or gaps of knowledge;	Refer to Heading 3
j) A description of the findings and potential implications of such findings on the impact of the proposed activity, [including identified alternatives on the environment] or activities;	Refer to Heading 9
k) Any mitigation measures for inclusion in the EMPr;	Refer to Heading 10.1
l) Any conditions for inclusion in the environmental authorization;	None
m) Any monitoring requirements for inclusion in the EMPr or environmental authorization;	Refer to Heading 10.1
n) A reasoned opinion -	
(i) [as to] whether the proposed activity, activities or portions thereof should be authorized;	Refer to the "*Main conclusion*" within the executive summary (Page i)
(iA) regarding the acceptability of the proposed activity or activities; and	
(ii) if the opinion is that the proposed activity, activities or portions thereof should be authorized, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable the closure plan;	Refer to Heading 10.1
o) A description of any consultation process that was undertaken during the course of preparing the specialist report;	N/a
p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/a
q) Any information requested by the competent authority.	N/a
2. Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	

Curriculum Vitae: Peet JJ Botes

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

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

BRIEF RESUME OF RELEVANT EXPERIENCE

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

2005-2010: Joined Enviroscientific, as an independent environmental consultant specializing in wastewater management, botanical and biodiversity assessments, developing environmental management plans and

strategies, environmental control work as well as doing environmental compliance audits and was also responsible for helping develop the biodiversity part of the Farming for the Future audit system implemented by Woolworths. During his time with Enviroscientific he performed more than 400 biodiversity and environmental legal compliance audits.

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

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

LIST OF MOST RELEVANT BOTANICAL & BIODIVERSITY STUDIES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Botes, P. 2014(a): Brandvlei Bulk Water Supply: Proposed construction of a 51 km new bulk water supply pipeline (replacing the existing pipeline) from Romanskolk Reservoir to the Brandvlei

Reservoir, Brandvlei (Northern Cape Province). A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required). 24 February 2014.

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

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

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

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

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

Botes, P. 2015(b): Steenkampspan proving ground. Proposed establishment of a high speed proving (& associated infrastructure) on the farm Steenkampspan (No. 419/6), Upington, ZF Mgcawu (Siyanda) District Municipality, Northern Cape Province. Biodiversity and Botanical Scan of the proposed footprint. 20 February 2015.

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

Botes, P. 2016(a): OWK Raisin processing facility, Kuruman, 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): Kuruman Bulk Water Supply – Ground water desalination, borehole- and reservoir development, Kamiesberg, Northern Cape Province. Botanical scan of the proposed footprint. 20 February 2018

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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