PB CONSULT
ENVIRONMENTAL MANAGEMENT SERVICES

BOTANICAL ASSESSMENT

KURUMAN ERF 4440

PROPOSED DEVELOPMENT OF A NEW BUSINESS PREMISES ON ERF 4440, KURUMAN GA-SEGONYANA LOCAL MUNICIPALITY, NORTHERN CAPE PROVINCE

9 October 2020

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EXECUTIVE SUMMARY

VEGETATION TYPE

Kuruman Thornveld

Classified as "Least Threatened" (GN 1002, December 2011). Only a small percentage of this vegetation type had been transformed, but it is poorly protected (none conserved in statutory conservation areas).

VEGETATION ENCOUNTERED

The area investigated was about 4.1 ha in size (Figure 5), covered in Kuruman Thornveld in fair to good condition. The site itself showed little signs of previous disturbance, but had been somewhat degraded by littering and illegal dumping. The vegetation can be described as a well-developed closed herbaceous bottom layer dominated by grass, with a well-developed open tree top layer consisting mostly of *Vachellia erioloba*. In the northern corner denser woodlands were observed, consisting of a mixture of trees, dense shrubs and climbers.

CONSERVATION PRIORITY AREAS

According to the Northern Cape CBA maps the proposed site falls within a CBA area, but also within the urban edge of Kuruman. There is no alternative on the property that will not impact on the CBA.

In addition the site is located within the Griqualand West Centre (GWC) of endemism. But the deeper sandy soils encountered would suggest that the property is more likely located on an intrusion of the Kalahari Desert than on soils associated with the GWC which is more associated with shallow rocky sediments of chemical origin. It is thus fair to say that even though the proposed site overlaps the GWC of endemism it is unlikely to have a significant impact on the core vegetation type associated with this centre of endemism.

CONNECTIVITY

The proposed development will be located within a 4.1 ha Erf on Municipal property, within the urban edge of Kuruman. To the west and north-west the Erf borders on industrial or business erven. However, the Erf also sits on the edge of an extended area of natural veld (approximately 30 -40 ha in size) remaining in the middle of the extended town (Various extensions of the town surrounds this remaining piece of natural veld, but it still have relative good connectivity to the south and north-east - albeit interrupted by major road systems). The transformation of the proposed 1 ha of land is not expected to add significantly to the existing impact on connectivity and will not add to the impact on the surrounding area, where connectivity is still very good.

LAND-USE

The property is on municipal land within the urban edge of Kuruman. It seems that because of its location (towards the centre of town) it is not currently used for livestock grazing or any other specific land-use that could be determined other than to be converted to urban land.

PROTECTED PLANT SPECIES

Botanically the most prominent feature of the site was the presence of 24 protected *Vachellia erioloba* (Camel thorn) trees encountered on site (Table 4), while one species protected in terms of the Northern Cape Nature Conservation Act, was also encountered (Refer to Table 5).

MAIN CONCLUSION

The proposed application is for the development of a small business premises within the urban edge of Kuruman. The activity is expected to result in a permanent transformation of approximately 1 ha of Kuruman Thornveld (least threatened). The site overlaps an identified critical biodiversity area (according to the 2016, Northern Cape Critical Biodiversity Areas maps). Botanically the most prominent feature of the site was the presence of 24 protected *Vachellia erioloba* (Camel thorn) trees encountered on site.

According to the impact assessment given in Table 8 the development is likely to result in a **High** impact, mainly as a result of the potential impact on a number of the protected *Vachellia erioloba* trees, but can be easily reduced to **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, as constant slow degradation is expected to continue as a result of urban activities and grazing in and around the site.

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:

9 October 2020

Date:

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1. INTRODUCTION

Kuruman is located on the Ghaap Plateau near the southern border of the Kalahari region in the Northern Cape Province on the main route (the N14) between Upington and Gauteng. The name Kuruman is derived from the Tswana Chief who lived in the area, named Kudumane. Robert Moffat, a missionary from the London Missionary Society, also lived there from 1820 to 1870. Moffat helped build the famous Moffat Church which was completed in 1838 and is still used for regular church services. While living in Kuruman, Moffat translated the bible into the Tswana language, which was the first bible in an indigenous southern African language. Kuruman is one of the main towns in the Kalahari, often referred to as the "Oasis of the Kalahari" because of the natural spring known as "*Die Oog*" or "*Gasegonyane*" which delivers 20 to 30 million litres of crystal clear underground water daily. It is the biggest natural fountain in the Southern Hemisphere. The Tswana name, "*Gasegonyane*", means "*small water calabash with bubbling water*". Mining and agriculture (cattle and game) supports Kuruman's thriving economy. Various minerals are mined in the area, including Manganese, Iron Ore, Tiger's eye and Crocidolite (some of the richest deposits of Crocidolite in the world are found near Kuruman). The area and the town itself are known for its scenic beauty, while the Kuruman River, which is dry except for flash floods after heavy rain, were named after the town (https://en.wikipedia.org/wiki/Kuruman).

The Ga-Segonyana Local Municipality would like to establish a new business premises on approximately 1 ha of Erf 4440, which is located, just off Livingstone Street in the north eastern part of the town. Erf 4440 falls within the Kuruman Thornveld vegetation, which occur from Postmasburg and Danielskuil in the south extending *via* Kuruman to Tsineng and Dewar in the north. The site is characterised by a deeper sandy soils with rocky outcrops supporting a dense grass bottom layer and an open shrub- and tree layer. The proposed project will trigger listed activities under the National Environmental Management Act, (Act 107 of 1998) (NEMA) and the EIA regulations (as amended). EnviroAfrica was appointed to perform the NEMA EIA application and PB Consult was appointed to conduct a botanical assessment of the proposed sites.

Botanically the most prominent feature of the site was the presence of almost 40 of the protected *Vachellia erioloba* (Camel thorn) trees encountered on site. However, only 24 of these were within the larger footprint of Erf 4440 (about 12 was outside of the footprint – but in the immediate vicinity). Of the 24 within the site, about 17 are taller than 5 m and in excellent condition. However, Erf 4440 is about 4.1 ha in size, and the proposed business premises can easily be fitted into the Erf without having to compromise any of these trees. No water courses or wetlands were observed within or near the site. However, the seasonal Kuruman River runs about 100 – 300m south and west of the site, but various infrastructures (e.g. roads and buildings) separates (or have been constructed between) the river from Erf 4440.

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

Kuruman is located on the N14, between Vryburg and Upington (Figure 1), within the Ga-Segonyana Local Municipality (John Taolo Gaetsewe District Municipality – Formerly Khalagadi) of the Northern Cape Province.

Figure 1: Map showing the location of Kuruman in relation to Vryburg and Upington in the Northern Cape

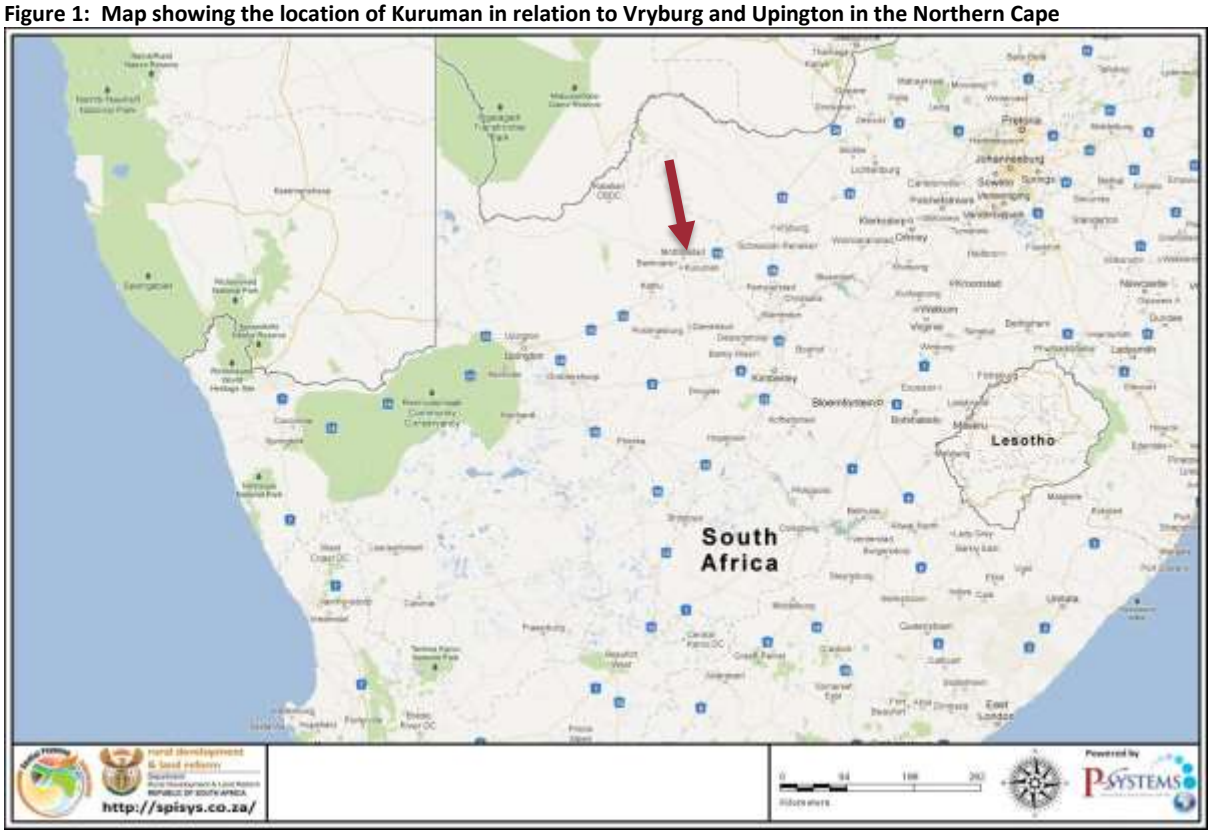


Figure 2: The location of Erf 4440 within Kuruman

Erf 4440 is located within the Kuruman Urban edge, to the north east of the main town (Figure 2). The site is about 4.1 ha in size of which approximately 1 ha will be needed for the proposed development.

2.2. CLIMATE

The macroclimatic patterns of the Savanna Biome region are tightly linked to climatic differences between the Atlantic and Indian Ocean coast of the South African subcontinent and is characterized by an alteration of wet summer and dry winter periods with no or usually low incidence of frost.

Kuruman experiences highly unpredictable summer rainfall (October to April). At Kuruman the hottest part of the year is during summer, which is from October to March, with January normally being the warmest month with an average maximum temperature of 31°C and July normally being the coldest month with an average maximum temperature of 18°C (Refer to Table 1). Average annual precipitation is 452 mm which falls during the summer months, with February normally the wettest month of the year, while July normally is the driest month of the year (Table 2) (www.weather-and-climate.com).

Table 1: Average day and night temperatures at Kuruman (www.weather-and-climate.com)

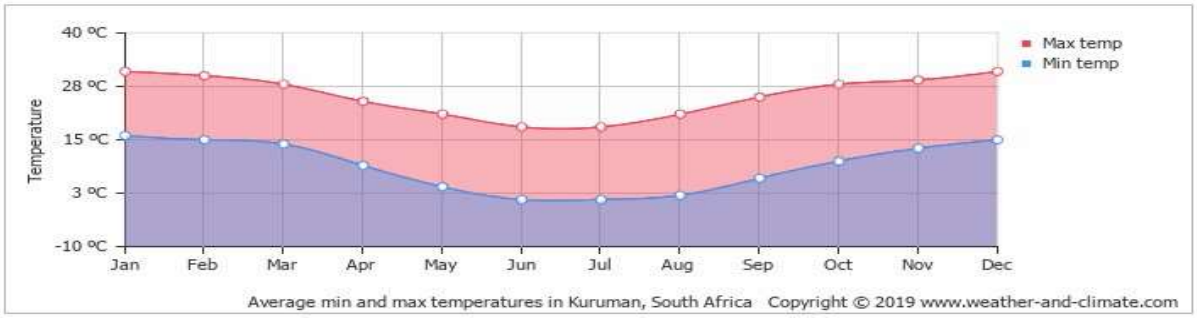
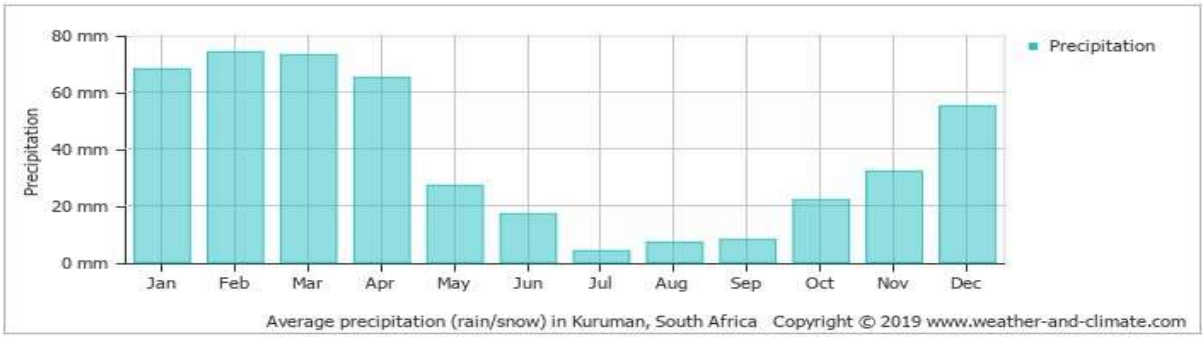


Table 2: Mean monthly precipitation at Kuruman (www.weather-and-climate.com)



2.3. TOPOGRAPHY, GEOLOGY AND SOILS

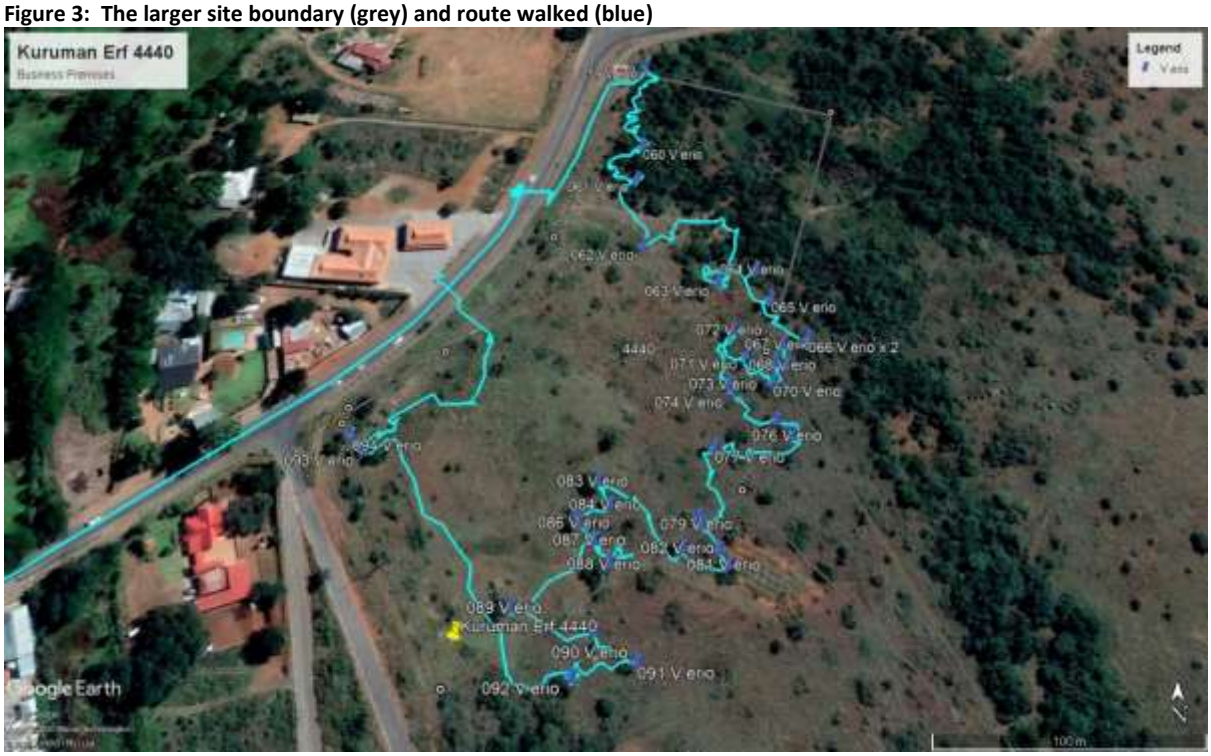
The town of Kuruman is located at an elevation of approximately 1 300 m above mean sea level. Elevation does not vary much over the study area, apart from a very gentle slope towards the Kuruman River (east to west). Aspect is not expected to play any significant role in the vegetation encountered.

According to the Mucina & Rutherford (2006), the geology and soils can be described as Campbell Group dolomite and chert and mostly younger, superficial Kalahari Group sediments, with red wind-blown sand. Locally rocky pavements are formed in places. Exposed rock, believed to be exposed Campbell Rand carbonate bedrocks were observed in between deeper sandy soils (Almond, 2019). The soils are generally described as red well-drained sandy soils with a high base status.

3. EVALUATION METHOD

Because of the urgent need for these upgrades the Botanical study had to be done during 2020 lockdown period. The original site visit was conducted on the 22nd of May 2020. The timing of the site visit was good as it was just past the main rainy season expected for this area of the Northern Cape. Although most of the Northern Cape was still in the grip of a severe drought, the Kuruman areas seems to have had some summer rains, which could be seen in the dense grass layer as well as other annual plants observed. Season therefore did not impose any limitations on the survey.

Figure 3: The larger site boundary (grey) and route walked (blue)



Desktop studies coupled with a site survey were performed. Spatial information from online databases such as SANBI BGIS 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). The following general conclusions were drawn on completion of the desktop assessment:

- The site and surrounding areas still seems to support natural vegetation;
- The vegetation type is expected to be Kuruman Thornveld, considered least threatened in terms of the National list of threatened terrestrial ecosystems (2011);
- According to the 2016 Northern Cape Critical Biodiversity Map, the footprint overlap an area identified as a critical biodiversity area;
- According to Van Wyk & Smith (2001) Kuruman falls within the Griqualand West Centre of endemism.

The survey was conducted by walking the site and examining, marking and photographing any area of interest (Refer to Figure 3). 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).

Probably the most noteworthy observation in terms of botanical importance were the presence of a number full grown *Vachellia erioloba* (Came Thorn) trees which formed an open tree layer along the back of the site (north and eastern part of the site). In Figure 3, the waypoints marked as "*V erio*" refer to these trees observed. A number of small trees might have been missed, but all trees larger than 3 m were marked by waypoint.

4. THE VEGETATION

The Northern Cape contains about 3500 plant species in 135 families and 724 genera, with about 25% of this flora endemic to the region. It is also home to an exceptionally high level of insect and reptile endemism, with new species still being discovered. However, it must be noted that this remarkable diversity is not distributed evenly throughout the region, but is concentrated in many local centres of endemism (NDBSP, 2008).

The savanna vegetation of South African and Swaziland represents the southernmost extension of the most widespread biome in Africa. In accordance with the 2018 Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006) only one broad vegetation type is to be expected within the proposed footprint, namely **Kuruman Thornveld** (Figure 4), a vegetation type classified as "Least Threatened" (GN 1002, December 2011).

Figure 4: Vegetation map of South Africa (2018), showing the expected vegetation types

4.1. THE VEGETATION IN CONTEXT

Kuruman Thornveld is part of the Eastern Kalahari Bushveld Bioregion, which is a sub-bioregion for the Savanna Biome. The Savanna Biome is the most widespread Biome in Africa and also occupies most of the far-northern part of the Northern Cape, including the Kalahari Duneveld. According to Rutherford *et. Al.* (2006), the Savanna in South Africa has a low species to area ratio, and become even lower in the southern Kalahari

part of the biome (with a sharply decreasing diversity of trees from east to west). On the other hand, Savanna is well known for its diversity of mammals. Rainfall seasonality and frequency are too unpredictable and winter temperatures too low to enable leaf succulents to dominate (like in the Succulent Karoo), while summers are too dry for dominance by perennial grasses alone, and the soils are generally too shallow and rainfall too low for trees.

Most Savanna has an herbaceous layer dominated by grass species and discontinuous to sometimes very open tree layer. In many Savanna areas in southern Africa the term bushveld is appropriate since the woody component does often not form a distinct layer but rather presents an irregular series of interlocking, often low, canopies with openings and sometimes little distinction between all shrubs and trees. The woody component is important to animals and can determine available browse, can form impenetrable barriers or determine available shade and protection against predators or scavengers. There is often excellent correlation between vegetation patterns and soil types, but rainfall gradients can result in large floristic variation even on similar substrates.

Kimberley Thornveld vegetation occurs in the North West, Free State and Northern Cape Provinces: Most of the Kimberley, Hartswater, Bloemhof and Hoopstad Districts as well as substantial parts of the Warrenton, Christiana, Taung, Boshof and to some extent the Barkley West District at altitudes varying between 1050m – 1400m (Mucina & Rutherford, 2006).

4.2. VEGETATION ENCOUNTERED

The area investigated was about 4.1 ha in size (Figure 5), covered in very homogenous vegetation, apart from a denser patch of woodland in the northern corner of the site. The site itself showed little signs of previous disturbance, but had been somewhat degraded by littering and illegal dumping. The denser woodlands in the northern corner also showed signs of people using it for shelter (overnight sleeping area). Carbonate bedrocks of the Cambellrand Subgroup were observed, but generally poorly exposed and kastified near-surface (Almond, 2019).

Figure 5: An overview of the site, with an indication of the most sensitive portions of the site (green), based on the locations of the protected *Vachellia erioloba* trees encountered

In general the vegetation can be described as well-developed closed herbaceous layer dominated by grass varying between 0.7 – 1.5 m in height, with a well-developed open tree top layer consisting mostly of *Vachellia erioloba* which can be between 3 – 10 m in height. In the northern corner denser woodlands (which could reach up to 12 m in height) were observed, consisting of a mixture of trees, dense shrubs and climbers. Although the Northern Cape in general was still in the grips of a severe drought, Kuruman had experienced recent rains, which could be seen in the dense grassy layer and various annual plants that were visible during the site visit.

The vegetation was well covered by the sample route as shown by the blue line in Figure 5. Observations made during the field study confirmed the vegetation as being typical of Kuruman Thornveld (which is typically not very rich in species). The top tree layer dominated by *Vachellia erioloba* (Photo 1) trees often in association with the following small trees; *Diospyros lycioides*, *Grewia flava*, *Gymnosporia buxifolia, Tarchonanthus camphorates*, *Searsia lancea*, *Senegalia mellifera*, *Vachellia karroo, Ziziphus mucronata* and with larger shrubs like*: Ehretia alba and Lycium hirsutum* (Photo 2)*.*

Photo 1: Looking from north to south over Erf 4440, showing open tree top stratum typically dominated by *Vachellia erioloba* (as in this picture).

Photo 2: *Vachellia erioloba* trees with a bush clump of various other small trees and shrubs at it base (including *Searsia lancea*, *Tarchonanthus camphorates, Gymnosporia buxifolia* and *Ziziphus mucronata)*.

The herbaceous layer (Photo 3 and Photo 4) included the shrubs; *Geigeria ornativa, Grewia flava, Elephantorrhiza elephantina*, *Ehretia alba, Helichrysum* species*, Lasiosiphon polycephalus, Senegalia mellifera, Senna italica, Tarchonanthus camphorates, Vachellia hebeclada* the herbs, *Citrullus lanatus*, *Clematis brachiata* (old man's beard), *Geigeria ornativa, Justicia spartioides, Leonotis* cf. *ocymifolia*, *Melolobium macrocalyx, Momordica balsamina* (laloentjie)*, Moraea cf. polystachya, Otoptera burchellii, Sesamum capense* and a number of grasses, including *Aristida meridionalis*, *Enneapogon cenchroides*, *Eragrostis lehmanniana* and *Stipagrostis uniplumis*.

Photo 3: Looking from north to south over Erf 4440, showing the closed herbaceous bottom layer with the open tree top stratum visible in the background. Note the *Vachellia hebeclada* and *Senegalia mellifera* shrubs in the foreground.

Photo 4: Looking south-west from approximately the middle of the site, showing the typical vegetation encountered.

Photo 5: The striking puffy white seeds of the climber *Clematis brachiata* within a *Vachellia hebeclada* bush.

The denser woodland was dominated by *Vachellia karroo, Searsia lancea* and *Vachellia erioloba* together with smaller trees and shrubs like, *Diospyros lycioides*, *Grewia flava*, *Gymnosporia buxifolia, Lycium hirsutum, Ziziphus mucronata* and climbers like *Momordica balsamina, Otoptera burchellii* and *Pergularia daemia* (bobbejaankambro).

Photo 6: A picture showing the southern edge of the denser woodland. *Searsia lancea, Grewia, Tarchonanthus* and *Vachellia karroo* observed.

Photo 7: Evidence of littering under a large Soetdoring tree (*Vachellia karroo*) within the denser woodlands.

4.3. CRITICAL BIODIVERSITY AREAS MAPS

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 as a whole (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.

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.

Figure 6: The Northern Cape Critical Biodiversity Areas Map (2016) showing the location of the proposed development

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).

According to the Northern Cape CBA map (Figure 6), the proposed development falls within a terrestrial CBA. However, there is no alternative site on the property or its immediate vicinity that is not located within the CBA.

4.4. POTENTIAL IMPACT ON CENTRES OF ENDEMISM

The Griqualand west centre (GWC) of endemism (Figure 7) was named after the Griqua people (who used to live there) and is found in the Hay- and part of the Barkley West districts of the Northern Cape Province (Van Wyk & Smith, 2001). According to Van Wyk & Smith (2001) the GWC is best described in geological terms, with its core area mostly linked to surface outcrops of the Ghaap Group (notably limestone and dolomite) and those of the Olifantshoek Supergroup (notably quartzite). However, in floristic terms the outer boundaries of the centre are rather diffuse as floristic elements can spill over onto related substrates, especially alkaline substrates rich in calcium. The GWC separates the Kalahari basin from the sediments of the Karoo Supergroup further south and floristically the GWC is sometimes described as a Kalahari-Highveld transition zone (White, 1983).

Figure 7: Griqualand West Centre of endemism (highlighted), taken from Van Wyk & Smith (2001)

It is important to note that the GWC is associated with the geology and soils of the Ghaap Group of the Transvaal Supergroup, which consists mainly of sediments of chemical origin, notably limestone (calcareous tufa) and dolomite (Ghaap Plateau). The soils on the limestone are very shallow, black, turfy and highly alkaline. On the dolomite the soils are dark brown to reddish and more sandy. Some of the vegetation in the GWC is exceptionally rich in plant species (e.g. the Asbestos Hills). This region is of special significance for the study of the influence of calcareous soils and certain heavy metals, especially manganese and iron, on plant distribution and speciation (Van Wyk & Smith, 2001). Succulent endemism of the families Asclepiadaceae, Euphorbiaceae and Mesembryanthemaceae are well represented in this centre.

The nearby Kalahari Desert intrudes into the GWC as pockets and tongues of wind-blown, orange-red Kalahari sand accumulating in valleys between the rocky outcrops and mountains of this region, signified by the presence of the camel thorn tree (*Vachellia erioloba*), which only occurs on deep sandy soils. This is very relevant as the GWC is mainly associated with the rocky outcrops of this region. The presence of deep, red sandy soils and camel thorn trees indicates that the footprint is located on an area with vegetation more associated with that of the Kalahari sands than that which relates to the GWC of endemism. This is further confirmed by the presence of a number of typical Kalahari sand species (e.g. *Elephantorrhiza elephantina, Senna italica, Sesamum capense* and *Citrullus lanatus*).

It is thus fair to say that even though the proposed site overlaps the GWC of endemism it is unlikely to have a significant impact on the core vegetation type associated with this centre of endemism, which is more associated with shallow rocky sediments of chemical origin.

Because of the small size of the proposed development and deeper sandy soils associated with the proposed development it is unlikely to have any significant impact on the core of the Griqualand West Centre of endemism.

4.5. FLORA ENCOUNTERED

Table 3 gives a list of the plant species encountered during this study. Because of the limitations (a single site visit) it is likely that a number of annuals 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 (29) different plant species (grass species excluded) where identified of which one (1) was a nationally protected tree species, one (1) a weedy species and rest classified as "Least Concern" (LC) (SANBI, 2016).

Table 3: List of plant species observed within or near the proposed footprint

No.	Species name	FAMILY	Status	Additional notes
1.	*Alternanthera pungens*	AMARANTHACEAE	Alien weed	Prostrate herb
2.	*Asparagus africanus*	ASPARAGACEAE	LC	Scrambler / shrub
3.	*Asparagus capensis*	ASPARAGACEAE	LC	Scrambler / shrub
4.	*Citrullus lanatus*	CUCURBITACEAE	LC	Climber / herb
5.	*Clematis brachiata*	RANUNCULACEAE	LC	Climber / herb
6.	*Diospyros lycioides*	EBENACEAE	LC	Small tree / shrub
7.	*Ehretia alba*	BORAGINACEAE	LC	Shrub
8.	*Elephantorrhiza elephantina*	FABACEAE	LC	Dwarf shrub
9.	*Geigeria ornativa*	ASTERACEAE	LC	Herb
10.	*Grewia flava*	MALVACEAE	LC	shrub
11.	*Gymnosporia buxifolia*	CLEASTRACEAE	LC	Shrub / tree
12.	*Helichrysum* species	ASTERACEAE	LC	Dwarf shrub
13.	*Justicia spartioides (=Monechma)*	ACANTHACEAE	LC	Herb / shrub
14.	*Lasiosiphon polycephalus (=Gnidia)*	THYMELAEACEAE	LC	Shrub
15.	*Leonotis* cf. *ocymifolia*	LAMIACEAE	LC	Herb / shrub
16.	*Lycium hirsutum*	SOLANACEAE	LC	Shrub
17.	*Melolobium macrocalyx*	FABACEAE	LC	Dwarf shrub
18.	*Momordica balsamina*	CUCURBITACEAE	LC	Climber / Herb
19.	*Moraea* cf. *polystachya*	IRIDACEAE	LC	Geophyte / herb
20.	*Opuntia ficus -indica*	CACTACEAE	Declared weed	Succulent
21.	*Otoptera burchellii*	FABACEAE	LC	Climber / Herb
22.	*Pergularia daemia*	APOCYNACEAE	LC NCNCA, Schedule 2 Protected (all species in this Family)	Climber / herb **Apply for a NCNCA Flora permit (DENC)**
23.	*Searsia lancea*	ANACARDACEAE	LC	Tree
24.	*Senegalia mellifera*	FABACEAE	LC	Shrub / small tree
25.	*Senna italica*	FABACEAE	LC	Prostrate / dwarf shrub
26.	*Sesamum capense*	PEDALIACEAE	LC	Herb
27.	*Tarchonanthus camphoratus*	ASTERACEAE	LC	Shrub / small tree
28.	*Vachellia erioloba*	FABACEAE	LC NFA protected species	**Apply for a NFA Tree permit (DAFF)**
29.	*Vachellia hebeclada*	FABACEAE	LC	Shrub
30.	*Vachellia karroo*	FABACEAE	LC	Tree
31.	*Ziziphus mucronata*	RHAMNACEAE	LC	Tree

4.6. THREATENED AND PROTECTED PLANT SPECIES

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

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

- The National Environmental Management: Biodiversity Act, Act 10 of 2004, provides for the protection of species through the "*Lists of critically endangered, endangered, vulnerable and protected species*" (GN. R. 152 of 23 February 2007).
- National Forest Act, Act 84 of 1998, provides for the protection of forests as well as specific tree species through the "*List of protected tree species*" (GN 908 of 21 November 2014).
- Northern Cape Nature Conservation Act, Act of 2009, provides for the protection of "*specially protected species*" (Schedule 1), "*protected species*" (Schedule 2) and "*common indigenous species"* (Schedule 3).

4.6.1. Red list of South African plant species

The Red List of South African Plants online provides up to date information on the national conservation status of South Africa's indigenous plants (SANBI, 2015).

- **No red-listed species** was observed.

4.6.2. NEM: BA protected plant species

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

- **No NEM: BA protected species was observed.**

4.6.3. 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).

- About 36 of the protected *Vachellia erioloba* (Camel thorn) trees were observed within and in the immediate surroundings of the site. However, only **24 of these were within the larger footprint of Erf 4440** (Refer to Table 4 for their locations). Of the 24 within the site, about 17 are taller than 5 m and in excellent condition.

Table 4: List and location of protected tree species encountered within the larger Erf 4440

Waypoint No.	Species name	Coordinates	Comments	Recommendations
060 V erio	*Vachellia erioloba (2 trees)*	S27° 27' 05.9" E23° 26' 17.7"	Two young trees (±6 m in height).	**Do not disturb**: All efforts should be made to protect these trees.
061 V erio	*Vachellia erioloba*	S27° 27' 06.6" E23° 26' 17.6"	Mature tree (8 - 10 m in height).	**Do not disturb**: All efforts should be made to protect these tree).
062 V erio	*Vachellia erioloba*	S27° 27' 07.9" E23° 26' 17.6"	Mature tree (6 – 7 m in height)	**Do not disturb**: All efforts should be made to protect this tree.
063 V erio	*Vachellia erioloba*	S27° 27' 08.6" E23° 26' 18.9"	Mature tree (6 m in height).	**Do not disturb**: All efforts should be made to protect this tree.
064 V erio	*Vachellia erioloba*	S27° 27' 08.3" E23° 26' 19.6"	Mature tree (6 m in height).	**Do not disturb**: All efforts should be made to protect this tree.
065 V erio	*Vachellia erioloba*	S27° 27' 08.9" E23° 26' 19.8"	Mature tree (6 – 7 m in height).	**Do not disturb**: All efforts should be made to protect this tree.
069 V erio	*Vachellia erioloba*	S27° 27' 10.0" E23° 26' 19.7"	Young tree (< 5m).	**Do not disturb**: Efforts should be made to protect this tree or a NFA permit application must be submitted for removal.
070 V erio	*Vachellia erioloba*	S27° 27' 10.3" E23° 26' 19.7"	Young tree (5 - 6 m).	**Do not disturb**: All efforts should be made to protect this tree.
071 V erio	*Vachellia erioloba*	S27° 27' 09.8" E23° 26' 19.3"	Young tree (5 - 6 m).	**Do not disturb**: All efforts should be made to protect this tree.
072 V erio	*Vachellia erioloba*	S27° 27' 09.4" E23° 26' 19.1"	Young tree (5 – 6 m)	**Do not disturb**: All efforts should be made to protect this tree.
073 V erio	*Vachellia erioloba*	S27° 27' 10.3" E23° 26' 18.9"	Young tree (< 5m).	**Do not disturb**: Efforts should be made to protect this tree or a NFA permit application must be submitted for removal.
074 V erio	*Vachellia erioloba*	S27° 27' 10.4" E23° 26' 19.0"	Young tree (< 5m).	**Do not disturb**: Efforts should be made to protect this tree or a NFA permit application must be submitted for removal.
075 V erio	*Vachellia erioloba*	S27° 27' 10.9" E23° 26' 19.7"	Young tree (< 5m).	**Do not disturb**: Efforts should be made to protect this tree or a NFA permit application must be submitted for removal.
076 V erio	*Vachellia erioloba*	S27° 27' 11.1" E23° 26' 19.9"	Mature tree (6 - 7m).	**Do not disturb**: All efforts should be made to protect this tree.
077 V erio	*Vachellia erioloba*	S27° 27' 11.3" E23° 26' 18.7"	Mature tree (6 - 7m).	**Do not disturb**: All efforts should be made to protect this tree.
083 V erio	*Vachellia erioloba*	S27° 27' 11.8" E23° 26' 16.9"	Magnificent tree (8 – 12 m).	**Do not disturb**: All efforts should be made to protect this tree.
084 V erio	*Vachellia erioloba*	S27° 27' 12.1" E23° 26' 17.1"	Young tree (< 5m).	**Do not disturb**: Efforts should be made to protect this tree or a NFA permit application must be submitted for removal.
085 V erio	*Vachellia erioloba*	S27° 27' 12.2" E23° 26' 16.6"	Young tree (< 5m).	**Do not disturb**: Efforts should be made to protect this tree or a NFA permit application must be submitted for removal.
086 V erio	*Vachellia erioloba*	S27° 27' 12.4" E23° 26' 16.6"	Mature tree (6 - 7m).	**Do not disturb**: All efforts should be made to protect this tree.
087 V erio	*Vachellia erioloba*	S27° 27' 12.6" E23° 26' 16.8"	Young tree (< 5m).	**Do not disturb**: Efforts should be made to protect this tree or a NFA permit application must be submitted for removal.
088 V erio	*Vachellia erioloba*	S27° 27' 12.9" E23° 26' 17.1"	Mature tree (6 - 7m).	**Do not disturb**: All efforts should be made to protect this tree.
089 V erio	*Vachellia erioloba*	S27° 27' 13.5" E23° 26' 15.6"	Mature tree (6 - 7m).	**Do not disturb**: All efforts should be made to protect this tree.
093 V erio	*Vachellia erioloba*	S27° 27' 11.3" E23° 26' 13.3"	Mature tree (6 - 7m).	**Do not disturb**: All efforts should be made to protect this tree.
094 V erio	*Vachellia erioloba*	S27° 27' 11.0" E23° 26' 13.0"	Mature tree (6 - 7m).	**Do not disturb**: All efforts should be made to protect this tree.

4.6.4. NCNCA protected plant species

The Northern Cape Nature Conservation Act 9 of 2009 (NCNCA) came into effect on the 12th of December 2011, and also provides for the sustainable utilization of wild animals, aquatic biota and plants. Schedule 1 and 2 of the act give 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).

- Only one species protected in terms of the NCNCA was encountered (Table 6). Recommendations on impact minimisation also included.

Table 5: Plant species protected in terms of the NCNCA encountered within the study area

NO.	SPECIES NAME	COMMENTS	RECOMMENDATIONS
1.	*Pergularia daemia* **Schedule 2 protected**	Occasionally observed, and mostly in the denser woodlands, which should not be impacted by the proposed development.	This plant is a relative common herbaceous climber, which will propagate through seeds. No search & rescue is expected.

5. 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

5.1. 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 6).

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

Table 6: 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	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	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 &	The attribute is considered critically endangered or is part of a proclaimed provincial or national protected area.

ASPECT / CRITERIA	LOW (1)	MEDIUM/LOW (2)	MEDIUM (3)	MEDIUM/HIGH (4)	HIGH (5)
fragmentation or its value in terms of the protection of habitat or species			unlikely possibility of species loss.	endangered species.	
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.

5.2. 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 7.

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 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.

6. 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 was considered:

- **Location**: The proposed development will be located within a 4.1 ha Erf on Municipal property, within the urban edge of Kuruman just north-east of the business centre of town. To the west and north-west the Erf borders on industrial or business erven. However, the Erf also sits on the edge of an extended area of natural veld (approximately 30 -40 ha in size) remaining in the middle of the extended town. Various extensions of the town surrounds this remaining piece of natural veld, but it still have relative good connectivity to the south and north-east (albeit interrupted by major road systems).
- **Activity**: The proposed activity is expected to result in a permanent transformation of 1 ha of Kuruman Thornveld in fair to good condition within the urban edge of Kuruman.
- **Geology & Soils**: No special features such as true quarts patches, heuweltjies or shallow rocky soils (with the geological conditions described in the Griqualand West Centre of Endemism), were observed in or near to the larger footprint area that may result in specialised plant habitat. Note that exposed Campbell Rand carbonate bedrocks were observed but the site seems to be located on deeper sandy intrusions of the Kalahari Desert.
- **Land use and cover**: The property is on municipal land within the urban edge of Kuruman. It seems that because of its location (towards the centre of town) it is not currently used for livestock grazing or any other specific land-use that could be determined other than to be converted to urban land.
- **Vegetation status**: The area investigated was about 4.1 ha in size (Figure 5), covered in Kuruman Thornveld in fair to good condition. The vegetation type is considered "least threatened" and only a small percentage had been transformed, but it is poorly protected (none conserved in statutory conservation areas). The site itself showed little signs of previous disturbance, but had been somewhat degraded by littering and illegal dumping. The vegetation can be described as a well-developed closed herbaceous bottom layer dominated by grass, with a well-developed open tree top layer consisting mostly of *Vachellia erioloba*. In the northern corner denser woodlands were observed, consisting of a mixture of trees, dense shrubs and climbers.
- **Conservation priority areas**: According to the Northern Cape CBA maps the proposed site falls within a CBA area, but also within the urban edge of Kuruman. There is no alternative location on the property that will not impact on the CBA. In addition the site is located within the Griqualand West Centre (GWC) of endemism. But the deeper sandy soils encountered would suggest that the property is more likely located on an intrusion of the Kalahari Desert than on soils associated with the GWC which is more associated with shallow rocky sediments of chemical origin. It is thus fair to say that even though the proposed site overlaps the GWC of endemism it is unlikely to have a significant impact on the core vegetation type associated with this centre of endemism.
- **Connectivity**: The Erf is located on the edge of the larger areas of remaining natural veld (next to existing urban infrastructure). The transformation of the proposed 1 ha of land is not expected to add significantly to the existing impact on connectivity and will not add to the impact on the surrounding area, where connectivity is still very good.
- **Watercourses and wetlands**: No watercourses or wetlands observed on the property or in close proximity.
- **Protected or endangered plant species**: Botanically the most prominent feature of the site was the presence of 24 protected *Vachellia erioloba* (Camel thorn) trees encountered on site (Table 4), while one species protected in terms of the Northern Cape Nature Conservation Act, was also encountered (Refer to Table 5).
- **Alien and Invasive Plant species**: No significant alien and invasive species were observed.

6.1. IMPACT ASSESSMENT

Table 8 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 8: 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	3	1	5	1	1	24	Permanent transformation of approximately 1ha of natural veld. No special habitats observed.
	With mitigation	3	1	5	1	1	24	Ensure good environmental control during the construction phase.
Landuse and cover: Potential impact on socio-economic activities.	Without mitigation	3	2	5	1	1	27	Permanent transformation of approximately 1ha of natural veld within the urban edge.
	With mitigation	3	1	5	1	1	24	Ensure good environmental control during the construction phase.
Vegetation status: Loss of vulnerable or endangered vegetation and associated habitat.	Without mitigation	3	3	5	1	1	30	Permanent transformation of 1ha of Kuruman Thornveld (Least Threatened), within the urban edge.
	With mitigation	3	1	5	1	1	24	Ensure that the site location minimise impacts to the protected *Vachellia erioloba* trees.
Conservation priority: Potential impact on protected areas, CBA's, ESA's or Centre's of Endemism.	Without mitigation	3	3	5	1	2	33	The proposed development will transform 1ha of land within a CBA, but also located within the Kuruman urban edge in veld type considered least threatened.
	With mitigation	3	1	5	1	1	24	Ensure that the site location minimise impacts to the protected *Vachellia erioloba* trees.
Connectivity: Potential loss of ecological migration corridors.	Without mitigation	3	2	5	1	1	27	The proposed development will transform 1ha of land within the Kuruman urban edge in veld type considered least threatened.
	With mitigation	3	1	5	1	1	24	Ensure that the site location minimise impacts to the protected *Vachellia erioloba* trees.
Watercourses and wetlands: Potential impact on natural water courses and it's ecological support areas.	Without mitigation						0	N/a
	With mitigation						0	
Protected & endangered plant species: Potential impact on threatened or protected plant species.	Without mitigation	5	3	5	1	2	55	Botanically the most prominent feature was the presence of 24 protected *Vachellia erioloba* and one species protected in terms of the NCNCA.
	With mitigation	3	1	5	1	1	24	Ensure that the site location minimise impacts to the protected *Vachellia erioloba* trees. With a little planning none of these trees needs to be impacted.
Invasive alien plant species: Potential invasive plant infestation as a result of the activities.	Without mitigation							N/a
	With mitigation							

Impact assessment								
Aspect	**Mitigation**	**CV**	**Lik**	**Dur**	**Ext**	**Sev**	**Significance**	Short discussion
Veld fire risk: Potential risk of veld fires as a result of the activities.	Without mitigation	3	3	3	2	3	33	Veld fire risk very high
	With mitigation	3	1	2	1	1	15	Address fire danger throughout construction.
Cumulative impacts: Cumulative impact associated with proposed activity.	Without mitigation	5	3	5	2	3	65	Permanent transformation of 1ha of natural veld (least threatened) within the urban edge, but also within a CBA with potential impact on protected plant species.
	With mitigation	3	1	5	1	1	24	Minimise the impact on protected plant species and protect as many larger individual trees as possible incorporating them into the layout.
The "No-Go" option: Potential impact associated with the No-Go alternative.	Without mitigation	3	2	2	2	2	24	Slow degradation of the land through urban creep and human activities in the surrounding areas (e.g. littering, dumping, frequent fires etc.).
	With mitigation						0	

According Table 8, the main impacts associated with the proposed development will be:

- The transformation of 1 ha of indigenous vegetation within a proposed CBA; and
- The potential impact on a number of provincially protected plant species.

However, the proposed footprint is very small (1 ha) and located within the urban edge of Kuruman.

The No-Go option is not likely to result in a “no-impact” scenario, as constant slow degradation is expected to continue as a result of the surrounding urban presence.

The cumulative impact (without mitigation) is expected to be **High**, mainly as a result of the potential impact on a number of the protected *Vachellia erioloba* trees, but can be easily reduced to **Low** through simple and very viable mitigation options.

7. IMPACT MINIMISATION RECOMMENDATIONS

The proposed application is for the development of a small business premises within the urban edge of Kuruman. The activity is expected to result in a permanent transformation of approximately 1 ha of Kuruman Thornveld (least threatened). The site overlaps an identified critical biodiversity area (according to the 2016, Northern Cape Critical Biodiversity Areas maps). Botanically the most prominent feature of the site was the presence of 24 protected *Vachellia erioloba* (Camel thorn) trees encountered on site.

According to the impact assessment given in Table 8 the development is likely to result in a **High** impact, mainly as a result of the potential impact on a number of the protected *Vachellia erioloba* trees, but can be easily reduced to **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.

7.1. MITIGATION ACTIONS

The following mitigation actions should be implemented to ensure that the proposed development does not pose a significant threat to the environment:

- 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 map (Figure 8, next page) into account and should aim to stay out of the green sensitive areas, which will ensure that no significant *Vachellia erioloba* tree will be impacted.
- However, if for viable reasons, the layout could not be placed outside of the above mentioned green areas, the layout must aim at minimum impact on the *Vachellia erioloba* trees and a permit application must be made in terms of the National Forest Act (protected species regulations).
- Before construction begins all *Vachellia erioloba* trees in the near vicinity of the construction footprint and entrance roads, laydown areas, site offices etc. must be demarcated as NO-GO areas.
- Lay-down areas or construction sites must be located within the construction footprint or areas of low botanical significance approved by the ECO. If such lay-down areas or construction camp sites must, for viable reasons, be located outside of the construction footprint areas, these areas must be rehabilitated afterwards. Topsoil must be removed from such areas, and protected for the duration of the construction period to be used for rehabilitation after construction is completed.
- No unnecessary clearing of any area outside of the construction footprint may be allowed.
- All waste that had been illegally dumped within the footprint must be removed to a Municipal approved waste disposal site.
- An integrated waste management approach must be implemented during construction.
    - Construction related general and hazardous waste may only be disposed of at Municipal approved waste disposal sites.

Figure 8: Sensitivity map for Erf 4440, Kuruman. Development should stay outside of the green areas marked in the Google image (which will reduce all impact on the protected tree species encountered.

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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, 4.2, 4.3, 4.4, 4.6.
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 5 & Figure 6
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 6
k) Any mitigation measures for inclusion in the EMPr;	Refer to Heading 7.1
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 7.1
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 7.1
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.	

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Nationality:	South African
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Profession:	Environmental Consultant & Auditing
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	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.
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	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-, infrastructue 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.

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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.

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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.

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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.

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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.