

BOTANICAL ASSESSMENT

(with biodiversity inputs)

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 PLAATJE LOCAL MUNICIPALITY, NORTHERN CAPE PROVINCE.**



15 May 2019

P.J.J. Botes (Pr.Sci.Nat: 400184/05)

Registered Professional Botanical, Environmental and Ecological Scientist

©

SUMMARY - MAIN CONCLUSIONS

| | |
|------------------------------------|--|
| VEGETATION TYPE | <p>Kimberley Thornveld:</p> <p>Only one broad vegetation type is expected in the proposed area and its immediate vicinity, namely Kimberley Thornveld. This vegetation type is considered “Least Threatened” (GN 1002, December 2011), but only 2% is currently statutorily conserved.</p> |
| VEGETATION ENCOUNTERED | <p>In general the natural systems associated with the proposed footprint are still functioning well, except for the areas to the south west and south east which have already been degraded or transformed as a result of the construction of illegal structures (shacks). Floral diversity is considered to be representative of what is to be expected in this vegetation type.</p> |
| CONSERVATION PRIORITY AREAS | <p>According to the Northern Cape CBA maps the proposed site will not impact on any CBA or ESA. In addition the site is already degraded as a result of urban creep.</p> <p>The site will not impact on any centre of endemism.</p> |
| CONNECTIVITY | <p>The proposed activity will result in a permanent footprint enlargement of the Lethabo Park Settlement by approximately 100 ha. However, the proposed footprint joins up with the existing urban edge and should not have any significant additional impact on connectivity (it is also not part of any ESA or CBA, which might be for the protection of migration routes).</p> |
| LAND-USE | <p>The pipeline will cross municipal land which might be used for grazing, but which has been specifically set aside for potential industry enlargements. The potential impact on socio-economic activities is thus expected to be minimal, while there should be Social gain from re-using the treated wastewater, and most importantly ensuring save disposal of treated effluent (the current WWTW is a health risk).</p> |
| PROTECTED PLANT SPECIES | <p>Only one NCNCA protected plant was observed. This plant is not considered endangered and only one patch of these individuals was observed. <i>Aloe</i> species are generally easy to transplant</p> |
| WATER COURSES AND WETLANDS | <p>The proposed development will not impact on any water course or wetland.</p> |
| MAIN CONCLUSION | <p>The terrestrial habitat associated with the project footprint is considered to be of a moderate sensitivity based on the following factors:</p> <ul style="list-style-type: none"> • The vegetation type is classified as least threatened; • The project footprint does not overlap an ESA or a CBA; • The floral habitat and natural systems are mostly still functioning well; • The floral diversity is considered to be largely representative of the vegetation type; • No special habitats or features were observed within the footprint; • No red-list species or nationally protected species were encountered and only one provincially protected species was encountered. <p>The proposed development will result in the permanent transformation of approximately 100ha of natural veld for human settlement. According to the impact assessment given in Table 6, with good environmental control, the development is likely to result in a Low impact on the environment.</p> <p>With the correct mitigation it is unlikely that the development will contribute significantly to any of the following:</p> <ul style="list-style-type: none"> • 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. <p>WITH THE AVAILABLE INFORMATION IT IS RECOMMENDED THAT PROJECT BE APPROVED, WITH THE PROPOSED MITIGATION ACTIONS.</p> |
| NO-GO OPTION | <p>The development will result in significant socio-economic gain, while the no-go option will not contribute significantly to national or provincial conservation targets.</p> |

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 and 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:

12 June 2019

Date:

CONTENTS

| | |
|---|------------------------------|
| SUMMARY - MAIN CONCLUSIONS | I |
| INDEPENDENCE & CONDITIONS..... | II |
| RELEVANT QUALIFICATIONS & EXPERIENCE OF THE AUTHOR | II |
| DECLARATION OF INDEPENDENCE | III |
| 1. INTRODUCTION..... | 1 |
| 1.1. Terms of reference | 1 |
| 2. STUDY AREA | 1 |
| 2.1. Location & Layout..... | 1 |
| 2.2. Climate | 3 |
| 2.3. Topography..... | 3 |
| 2.4. Geology and soils | 4 |
| 2.5. Landuse | Error! Bookmark not defined. |
| 3. EVALUATION METHOD..... | 4 |
| 4. THE VEGETATION | 6 |
| 4.1. The Vegetation in context..... | 6 |
| 4.2. Vegetation encountered | 7 |
| 4.2.1. 7 ha Portion (Erven 17725)..... | 8 |
| 4.2.2. 75 ha Portion (Farm Roodepan No. 70)..... | 9 |
| 4.2.3. 8 ha Portion (Erven 15089)..... | 13 |
| 4.3. Critical biodiversity areas maps | 14 |
| 4.4. Potential impact on centres of endemism | 15 |
| 4.5. Flora encountered | 15 |
| 4.6. Threatened and protected plant species | 16 |
| 4.6.1. Red list of South African plant species | 17 |
| 4.6.2. NEM: BA protected plant species | 17 |
| 4.6.3. NFA Protected plant species..... | 17 |
| 4.6.4. NCNCA protected plant species..... | 17 |
| 5. FAUNA AND AVI-FAUNA | 18 |
| 5.1. Mammals..... | 18 |
| 5.2. Avi-fauna | 18 |
| 5.3. Reptile & amphibians..... | 18 |
| 6. IMPACT ASSESSMENT METHOD | 19 |
| 6.1. Determining significance | 19 |
| 6.2. Significance categories | 21 |
| 7. DISCUSSING BOTANICAL SENSITIVITY..... | 22 |
| 7.1. Impact assessment | 23 |
| 8. IMPACT MINIMISATION RECOMMENDATIONS..... | 25 |
| 8.1. Mitigation actions | 25 |
| 9. REFERENCES..... | 26 |

LIST OF FIGURES

| | |
|--|----|
| Figure 1: Map showing the location of Kimberley in the Northern Cape Province | 2 |
| Figure 2: Location of the proposed Lethabo Park extension, to the north of Kimberley | 2 |
| Figure 3: The three sections of the proposed extension of the Lethabo Park (Kimberley) | 3 |
| Figure 4: The proposed larger footprint that was studied during the site visit..... | 4 |
| Figure 5: Vegetation map of South Africa (2012 beta 2 version), showing the proposed footprint | 6 |
| Figure 6: The 7ha portion of the proposed footprint to the north-west of Lethabo Park, note the existing illegal housing | 8 |
| Figure 7: The western and north western portion of the 75ha area. | 10 |
| Figure 8: The northern and north eastern portion of the 75ha area | 11 |
| Figure 9: The 8 ha portion of the proposed new construction footprint to the north east of the existing Lethabo Park..... | 13 |
| Figure 10: The Northern Cape CBA map showing the location of the proposed development within “Other Natural Areas” | 15 |

LIST OF TABLES:

| | |
|---|----|
| Table 1: Average rainfall and temperatures for Kimberley (www.saexplorer.co.za) | 3 |
| Table 2: List of indigenous species encountered within or near the proposed footprint | 15 |
| Table 3: Plant species protected in terms of the NCNCA encountered within the study area..... | 17 |
| Table 4: Categories and criteria used for the evaluation of the significance of a potential impact | 20 |
| Table 5: Categories used to describe significance rating (adjusted from DEAT, 2002) | 21 |
| Table 6: Impact assessment associated with the proposed development | 23 |

1. INTRODUCTION

The Sol Plaatje Local Municipality is in urgent need to establish additional housing for low and middle income groups. The Lethabo Park extension aims to address some of this urgent need. Lethabo Park, located at Roodepan in the north western suburb of Kimberley, already consist out of a large low- and middle income housing section as well as an informal settlement section and the proposed extension will add on to the existing infrastructure. The study areas are as follows:

- The Remainder of the Farm Roodepan No. 70 (approx. 75ha);
- Erf 17725, Kimberley (approx. 7ha);
- Erf 15089, Kimberley (approx. 8ha).

The proposed project entails the development of approximately 2 000 low income erven with an average size of 300m²; approximately 100 middle income erven of 500-600m² in size and CRU (Community Residential Units) units (number and size yet to be determined). The proposed upgrade will transform approximately 90 ha of veld still containing natural veld, which trigger NEMA EIA activities. EnviroAfrica was appointed to perform the NEMA EIA application and PB Consult was appointed to conduct a botanical assessment of the proposed site expansion.

Only one vegetation type is expected to be impacted by the proposed development, namely Kimberley Thornveld (considered “Least Threatened” in terms of the National list of ecosystems that are threatened and in need of protection). Desktop studies indicated that the site is still likely to support a good cover of natural vegetation including quite a number of trees (which might include protected tree species, as well as other protected plants).

However, the site is located next an existing low- and medium income housing development, which has resulted in urban creep and other urban associated impacts. The site visit revealed a site that has been impacted by dumping, grazing and trampling over a period of time.

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.
- 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

Kimberley is located in the Northern Cape Province where the N12 and the N8 meets (Refer to Figure 1). The proposed development is located to the northwest outskirts of Kimberly on the Remainder of the Farm

Roodepan No. 70 (approximately 75ha) (Figure 2 & 3). It also includes the adjacent erven 17725 (approximately 7ha) and 15089 (approximately 8ha), Kimberley.

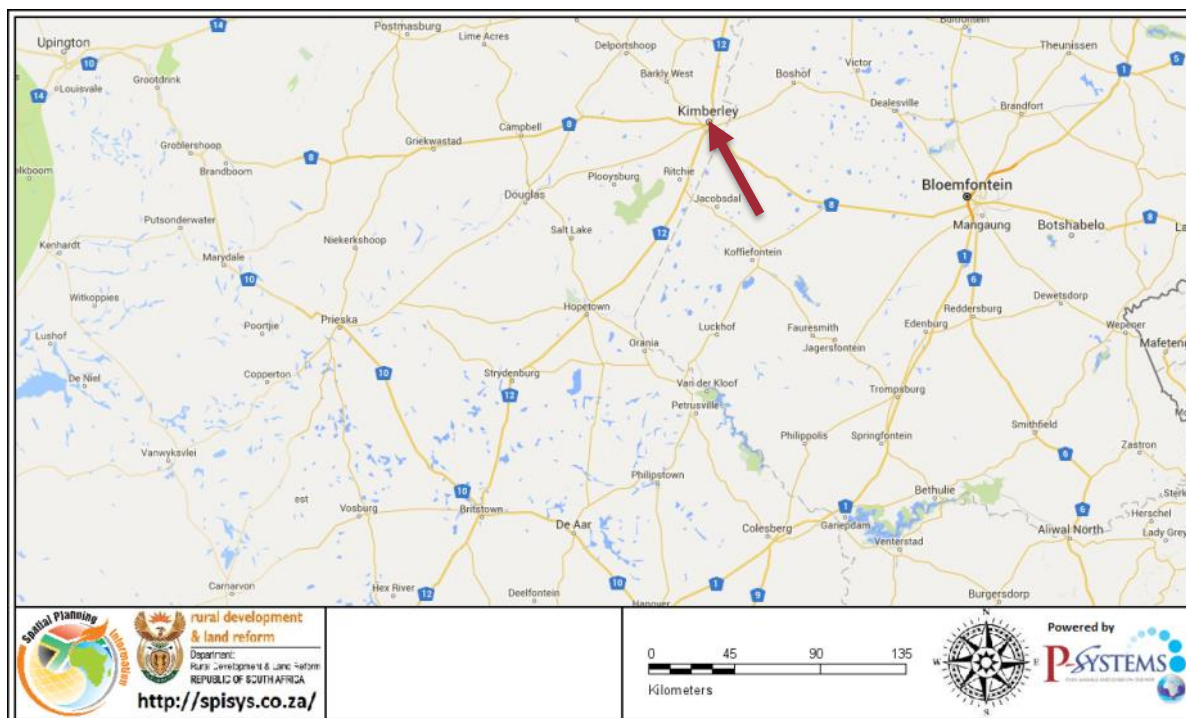


Figure 1: Map showing the location of Kimberley in the Northern Cape Province



Figure 2: Location of the proposed Lethabo Park extension, to the north of Kimberley

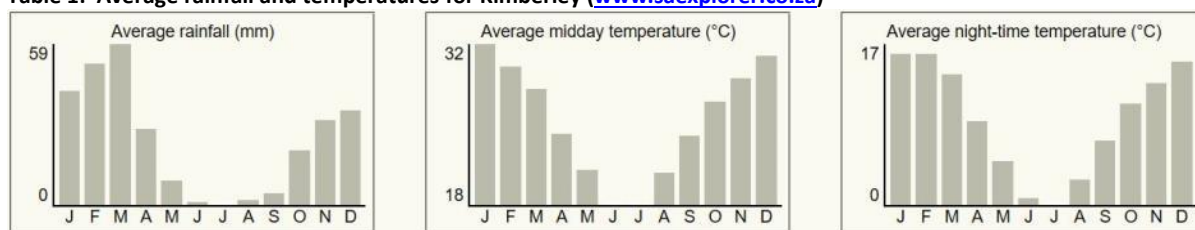


Figure 3: The three sections of the proposed extension of the Lethabo Park (Kimberley)

2.2. CLIMATE

All regions with a rainfall of less than 400 mm per year are regarded as arid. Kimberley receives on average approximately 283mm of rain per year (mainly during the summer). The chart below (lower left) shows the average rainfall values for Kimberley per month. It receives the lowest rainfall (0mm) in July and the highest (59mm) in March. The monthly distribution of average daily maximum temperatures (centre chart below) shows that the average midday temperatures for Kimberley range from 18°C in June to 32°C in January. The region is the coldest during July (0.3°C on average during the night). Consult the chart below (lower right) for an indication of the monthly variation of average minimum daily temperatures (www.saexplorer.co.za).

Table 1: Average rainfall and temperatures for Kimberley (www.saexplorer.co.za)



2.3. TOPOGRAPHY

The three properties are located next to each other, bordering the existing Lethabo Park. The study area is located on the open plains to the north west of Kimberley. The study area itself shows only a slight variation in aspect with a very slight slope from northwest (at about 1181 m above mean sea level) to the southeast (at about 1165 m above mean sea level). It was clear that aspect did not have any significant influence on the vegetation encountered.

2.4. GEOLOGY AND SOILS

According to Mucina and Rutherford (2006), the geology can be described as Andesitic lavas of the Allanridge Formation in the north and west and fine-grained sediments of the Karoo Supergroup in the south and east, while the soils is described as deep (0.6–1.2 m) sandy to loamy soils of the Hutton soil form (Ae and Ah land types) on slightly undulating sandy plains.

3. EVALUATION METHOD

Desktop studies coupled with a site visit were performed. The survey was conducted by walking and driving the site and examining, marking and photographing any area of interest. The site visit was started at by driving slowly along the north eastern boundary of the 8 ha site (Yellow in Figure 4) and the 75 ha site (Blue in Figure 4) and then turning southwest to the 7 ha area (Purple in Figure 4) in order to get an overall “feel” of the landscape and vegetation within the footprint. It also serves to identify differences in the landscape that may result in differences in plant community or species composition. The actual survey was done, by walking the 7 ha block, then the 75 ha block and then the 8 ha block. A hand-held Garmin GPSMAP 62s was used to track the sampling route and for recording waypoints of locations of specific importance, like protected trees (Figure 4). During the survey notes, together with a photographic record, were compiled for the vegetation and landscape.

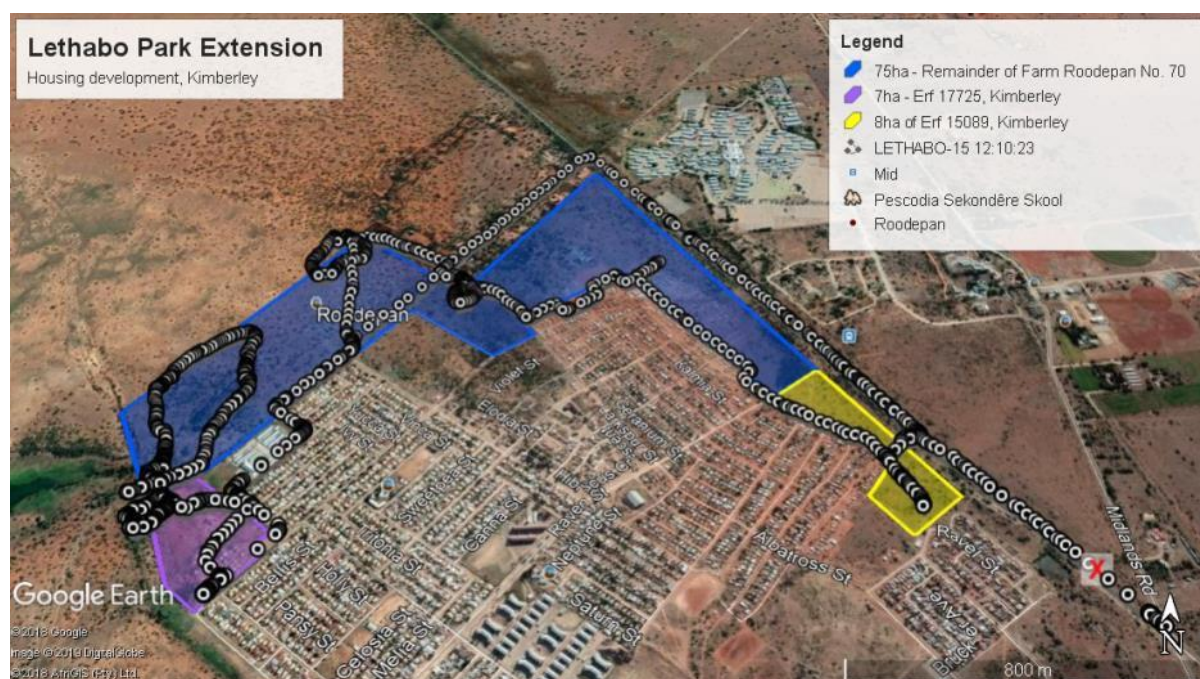


Figure 4: The proposed larger footprint that was studied during the site visit

During the site visit the author endeavoured to identify and record all significant biodiversity features, including rivers, streams or wetlands, special plant species and or specific soil conditions which might indicate special botanical features (e.g. rocky outcrops or silcrete patches). However, no such features were observed.

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

- The project footprint seems to overlap natural land, located along the north-western and north-eastern urban edge of the existing Lethabo Park;
- Some of these areas already seem to have been occupied by informal settlement;

- The vegetation type is expected to be Kimberley Thornveld, considered least threatened in terms of the National list of threatened terrestrial ecosystems (2011);
- According to the 2011 National Biodiversity Assessment the footprint is not located within a formal or informal protected area;
- According to Van Wyk & Smith (2001) the footprint is not located within centre of endemism.

The site visit was conducted during May 2019. The timing of the site visit was reasonable in that, all perennial plants were identifiable. It was also clear that the site had received some late summer rain in the days before the site visit. As a result even some of the herbaceous species were visible. The author is confident that a fairly good understanding of the biodiversity status of the site was obtained. Confidence in the findings is high.

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).

In accordance with the Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006, as updated in the 2012 beta version) only one broad vegetation type is expected in the proposed area and its immediate vicinity, namely **Kimberley Thornveld** (Figure 5). This vegetation type is considered “Least Threatened” (GN 1002, December 2011), but only 2% is currently statutorily conserved in the Vaalbos National Park, the Sandveld Bloemhof Dam and S.A. Lombard Nature Reserves, while some 18% of this vegetation is already transformed, mostly by cultivation. The vegetation is described as occurring on slightly irregular plains with well-developed tree layer with *Vachellia erioloba*, *V. tortilis*, *V. karroo* and *Boscia albitrunca* and well-developed shrub layer with occasional dense stands of *Tarchonanthus camphoratus* and *Senegalia mellifera*. Grass layer open with much uncovered soil.

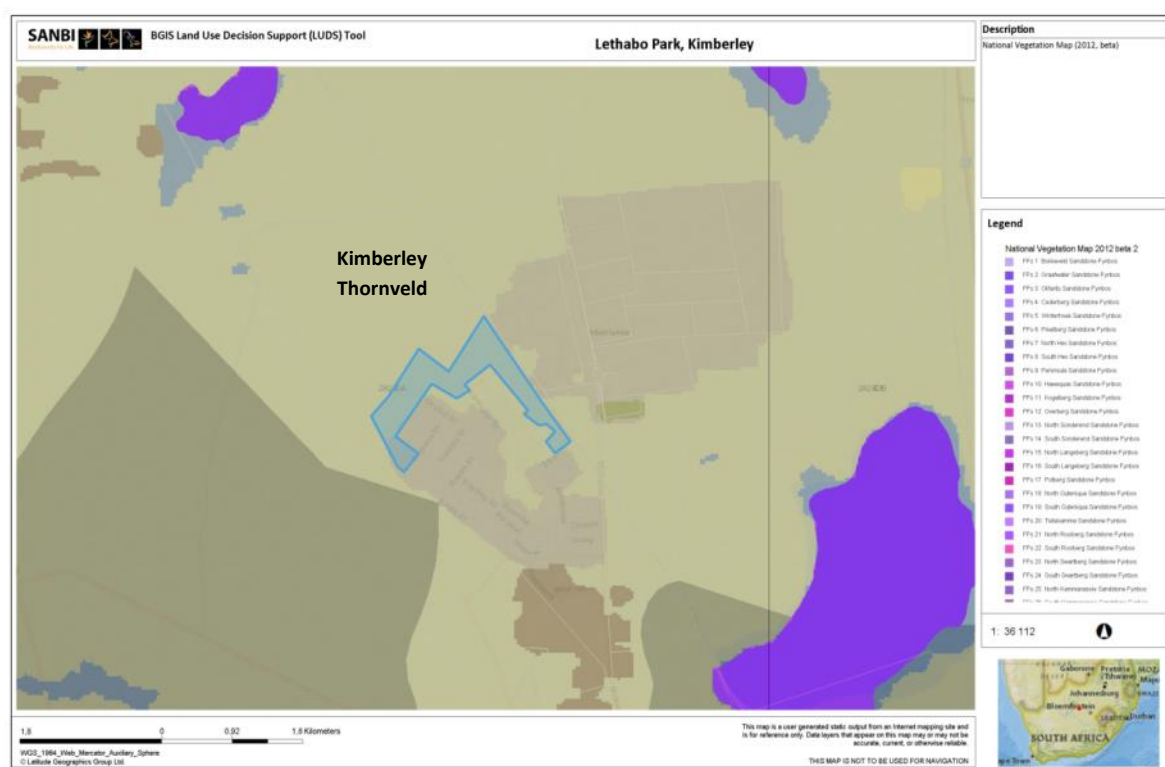


Figure 5: Vegetation map of South Africa (2012 beta 2 version), showing the proposed footprint

4.1. THE VEGETATION IN CONTEXT

Kimberley 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 vegetation encountered can be described as an open thornveld or semi-open to closed mixed-acacia woodland. In general the tree canopy varied in height between 4-8 m and was dominated by *Vachellia tortilis* together with the alien invader tree, *Prosopis glandulosa* and a mixture of *Vachellia karroo* and *Senegalia mellifera* (Black thorn), while *Ziziphus mucronata* was also relatively common. Single individuals of the tall trees *Diospyros lycioides* and *Searsia pendulina* were occasionally observed. Towards the north-east the wild camphor bush, *Tarchonanthus camphoratus*, were more prominent, forming patches within an area where the tree canopy were also slightly lower (<4 m). In these areas *Senegalia mellifera* was the dominant small tree together with *Vachellia tortilis*. It was also in this area that *Senna italica* (eland's pea), *Uhretia rigida* (puzzle bush) and *Asparagus retrofractus* was observed for the first time.

The shrub layer showed a low bottom layer (<40 cm) with species like: *Aloe grandidentata* (only observed at one location), *Aptosimum indivisum* (infrequent), *Ferraria variabilis* (observed once), *Geigeria ornativa* (common), *Moraea cf. tripetala* (common), *Roepera* species (a low growing variety with sharp thorns) and *Tribulus terrestris*. The shrub layer normally reached a height of approximately 1.5 m and included the following species: *Asparagus capensis* (occasionally), *Calicorema capitata* (infrequent), *Chrysocoma ciliata*, *Leonotis ocymifolia* (one observation), *Lycium cinereum*, *Lycium bosciifolium*, *Rhigozum trichotomum*, *Salsola aphylla*, *Sesamum capense* and *Vachellia hebeclada* (occasionally).

Scattered throughout the footprint, but especially prominent in the more disturbed areas associated with the 7 ha and 8 ha portions a number of alien and invasive plant (AIP) species were observed. They include: *Alternanthera pungens* (Khakiweed), *Datura stramonium* (Common thorn apple), *Flaveria bidentis*, *Bidens pilosa* (Blackjack), *Harrisia martinii* (Moon cactus), *Ipomoea purpurea* (Morning glory), *Salsola kali* and *Schinus molle* (Probably planted, and observed in the north-eastern part of the footprint, near the railway line).

Probably because of the recent rains the grasses were quite prominent and included species like: *Cynodon dactylon*, *Enneapogon cenchroides*, various *Eragrostis*- and *Aristida* species, *Cenchrus ciliaris*, *Chloris virgata*, *Fingerhuthia africana*, *Schmidtia pappophoroides*, *Stipagrostis ciliata* and *Themeda triandra*.



Photo 1: Typical thornveld encountered within the larger more undisturbed areas (the western boundaries of the 75 ha block) of the site. Note the prominent grassy layer after the recent rains. *Vachellia karroo* in the foreground with *Vachellia tortilis* in the background.

4.2.1. 7 ha Portion (Erven 17725)

The vegetation were relatively similar for all three sites, but the 7 ha area (Figure 6) was by far the most disturbed of the three sites, with about half of the area already transformed by illegal housing (Photo 2) and the remaining natural veld dominated by the alien invasive tree, *Prosopis* species (Photo 3). The site had also been used as an illegal dumping area (Photo 4), adding to the degraded status of this area.

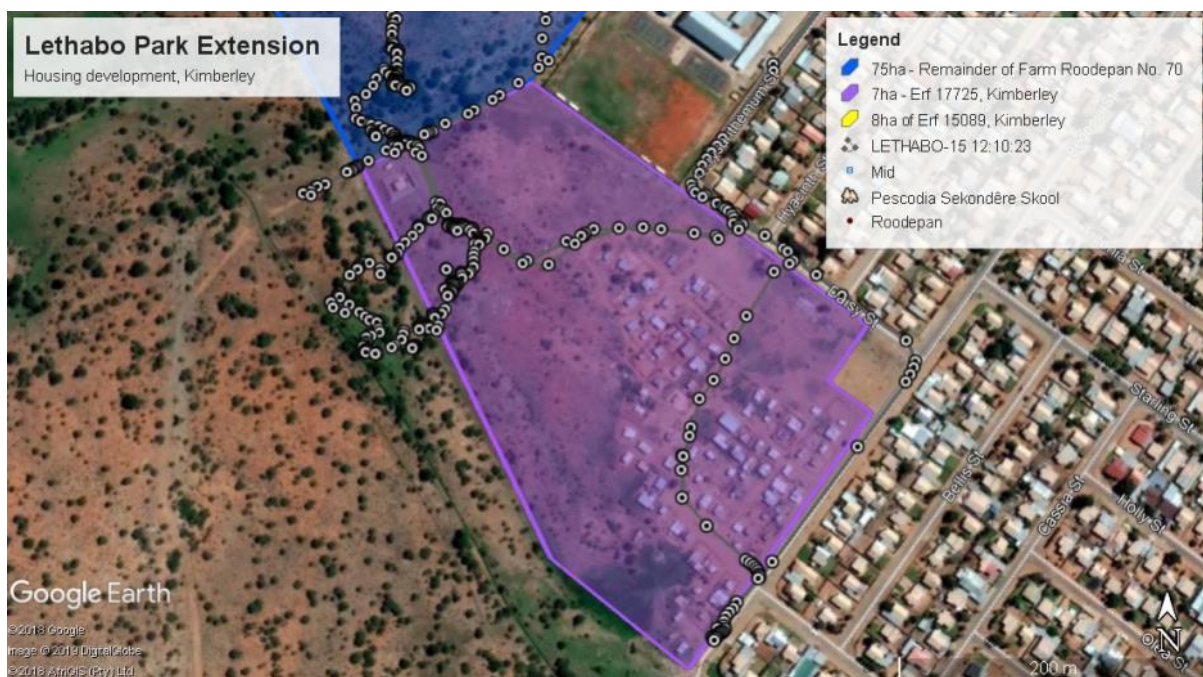


Figure 6: The 7ha portion of the proposed footprint to the north-west of Lethabo Park, note the existing illegal housing

The remaining natural veld has been significantly compromised, as a result of urban creep, illegal dumping and grazing practices. In this area the tree canopy are almost totally replaced by the invasive *Prosopis glandulosa*, with only scattered individuals of *Vachellia tortilis* and *Vachellia karroo* remaining.



Photo 2: Looking over the 7ha portion area from east to west (towards the 75 ha area). Note the poor status of the vegetation and the (illegal) housing already located on the property.



Photo 3: Looking north-east to south-west over the centre area of the 7 ha footprint. Note the dense stands of *Prosopis glandulosa* which has replaced the tree canopy in this area.



Photo 4: Some of the illegal dumping observed with in the 7 ha area.

4.2.2. 75 ha Portion (Farm Roodepan No. 70)

The vegetation encountered in the 75 ha portion of the proposed footprint also shows signs of urban impact, especially the south western corner of the site, which has also been heavily impacted by dumping and other construction related activities (Photo 5).



Photo 5: Some of the physical disturbances observed at the south western corner of the 75 ha site. Also note that the alien *Prosopis* tree still dominates the tree canopy in this area.

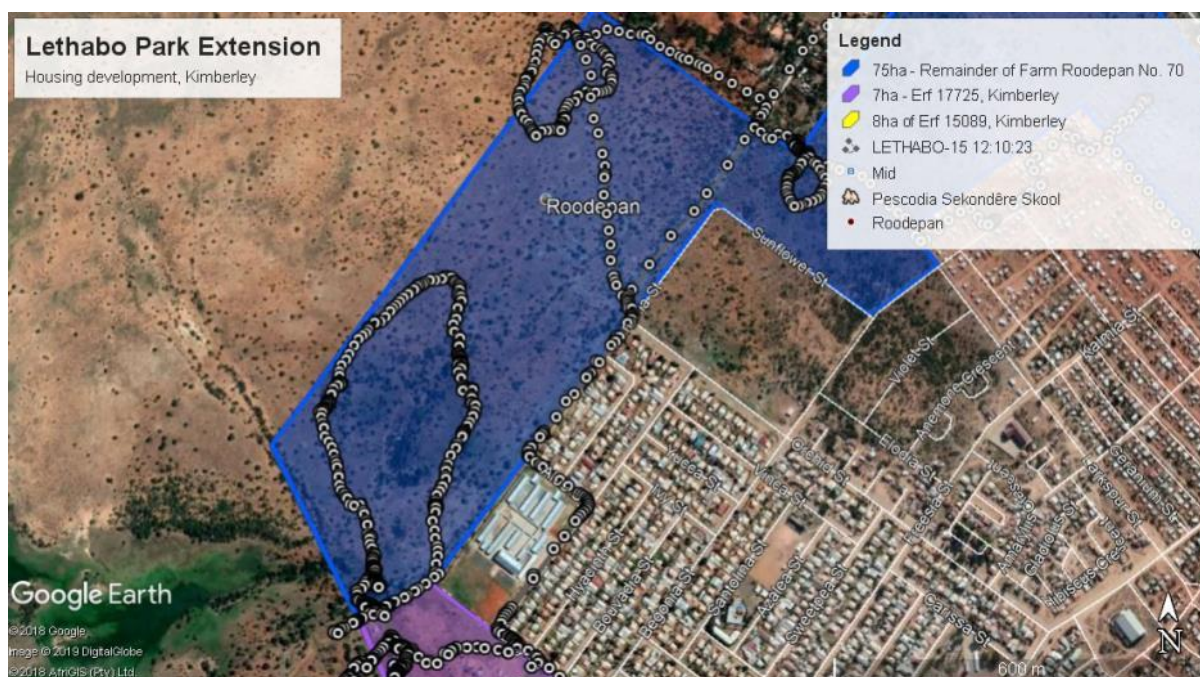


Figure 7: The western and north western portion of the 75ha area.

However, the most of the property is still in fairly good condition and is mainly used for grazing by the local community (a number of herders with their respective flocks of sheep and/or goats were observed during the site visit) (Photo 6).



Photo 6: The vegetation within the 75 ha portion of the footprint. Note the sheep & goat in this picture, as well as the mixed *Prosopis* and *Vachellia tortilis* dominated woody over layer.



Photo 7: A beautiful *Vachellia tortilis* tree towards the northern corner of the 75 ha property.



Photo 8: A further typical view of the veld encountered within north and north western part of the 75 ha area. The impact of grazing can be seen on the grass cover as well as the spreading of *Prosopis* (in the foreground). Towards the back a mix of thorn trees like *Vachellia tortilis*, *Vachellia karroo* and *Senegalia mellifera* can be seen.

Towards the north of the 75 ha area, just west of the footprint area a number of small holdings had been established. In this area the majority of the canopy was again replaced by the invasive *Prosopis* tree.



Figure 8: The northern and north eastern portion of the 75ha area

The northern portion of the 75 ha area (refer to Figure 8) also shows a vegetation still in fairly good condition. However, the tree canopy is slightly lower (< 4 m) and now dominated by a mixture of *Vachellia tortilis* and *Senegalia mellifera* while stands of *Tarchonanthus camphoratus* were also observed for the first time (Photo 9 & Photo 10). The lower canopy cover and the change in vegetation composition might be the result of shallower soils.



Photo 9: Typical vegetation encountered within the north and north eastern portion of the 75 ha area. Note the appearance of *Tarchonanthus camphoratus* and the lower tree canopy.

The vegetation of north eastern portion of the 75 ha area is already transformed as a result of (illegal) housing been erected and new stands still going up (Figure 8 & Photo 11).



Photo 10: A further view of the vegetation encountered within the north western portion of the 75 ha block (just north of the new housing).



Photo 11: Housing that was erected in the north eastern portion of the 75 ha area.

4.2.3. 8 ha Portion (Erven 15089)

The vegetation within the 8 ha portion of the footprint (illustrated in Figure 9) was again heavily degraded as a result of urban creep and associated impacts. Apart from physical disturbance, this area had also been used as a dumping site and playground. The natural vegetation had been reduced to a *Prosopis* dominated tree cover with quite a number of other alien and invasive plant species, including a number of *Schinus molle* trees (probably planted as ornamental trees) were observed in this area (a large old quarry was also observed in this area).



Figure 9: The 8 ha portion of the proposed new construction footprint to the north east of the existing Lethabo Park



Photo 12: The vegetation between the existing housing and the railway line (in the background) looking from south west to north east.



Photo 13: Vegetation towards the most southern part of the 8 ha portion. Note the disturbances as a result of old earthworks.

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.

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 (Refer to Figure 10), the proposed development footprint is not located within an ESA or CBA, but in an area considered "Other Natural Areas". As such the footprint will not interfere directly with any of the proposed conservation targets for the Northern Cape

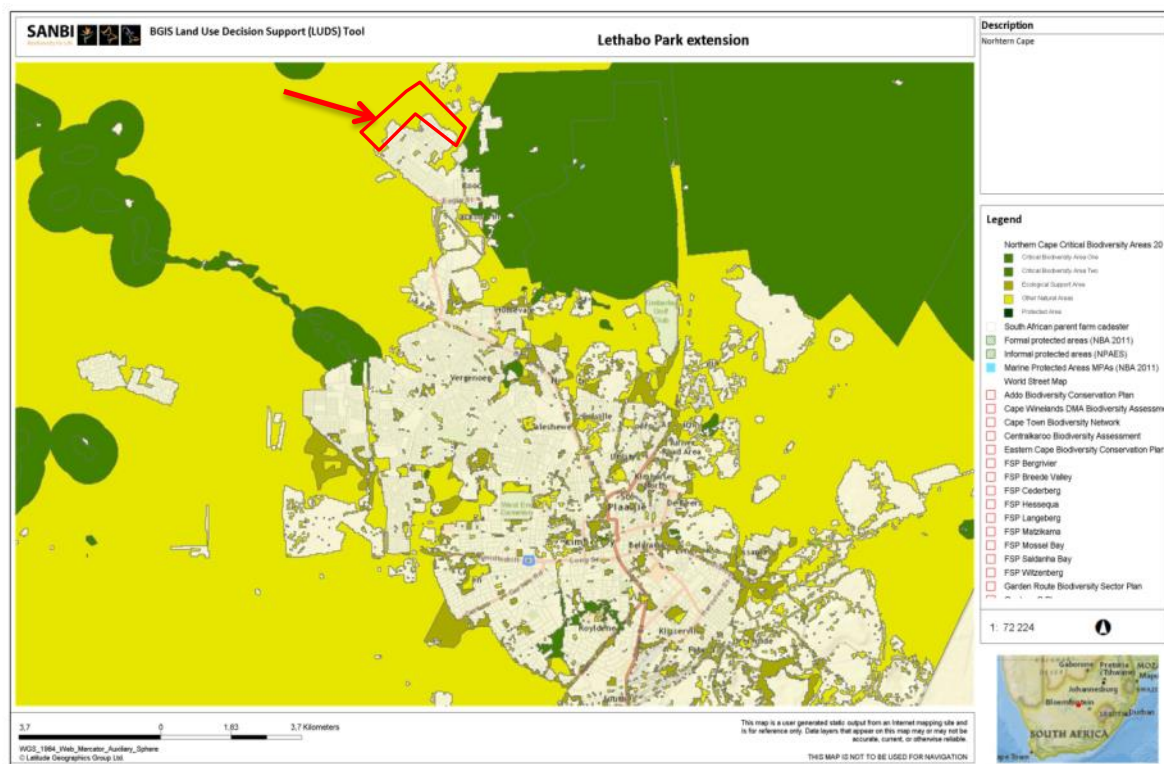


Figure 10: The Northern Cape CBA map showing the location of the proposed development within “Other Natural Areas”

4.4. POTENTIAL IMPACT ON CENTRES OF ENDEMISM

According to Van Wyk en Smith (2001), the proposed development will not impact on any recognised centre of endemism. The nearest centre of endemism is the Griqualand West Centre which starts west of Delportshoop (approximately 50 km west of the proposed site).

The proposed site does not fall within any recognised centre of endemism.

4.5. FLORA ENCOUNTERED

Table 2 gives a list of the plant species encountered during this study and their status in terms of the Red List of South African plants, National Environmental Management: Biodiversity Act, Act 10 of 2004 (NEM:BA), National Forest Act, Act 84 of 1998 (NFA), the Northern Cape Nature Conservation Act, Act 9 of 2009 (NCNCA) and Conservation of Agricultural Resources Act, Act 43 of 1983 (CARA).

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

| No. | Species name | FAMILY | Status | Alien & invader plant (AIP) |
|-----|-------------------------------|------------------|---|---------------------------------------|
| 1. | <i>Aloe grandidentata</i> | ASPHODELACEAE | LC NCNCA, Schedule 2 Protected (all species in this Family) | Apply for a NCNCA Flora permit (DENC) |
| 2. | <i>Alternanthera pungens</i> | AMARANTHACEAE | Alien weed | Not listed |
| 3. | <i>Aptosimum indivisum</i> | SCROPHULARIACEAE | LC | |
| 4. | <i>Asparagus capensis</i> | ASPARAGACEAE | LC | |
| 5. | <i>Asparagus retrofractus</i> | ASPARAGACEAE | LC | |
| 6. | <i>Bidens pilosa</i> | ASTERACEAE | Alien weed | Not listed |

| No. | Species name | FAMILY | Status | Alien & invader plant (AIP) |
|-----|----------------------------------|----------------|---------------------|-----------------------------|
| 7. | <i>Calicorema capitata</i> | AMARANTHACEAE | LC | |
| 8. | <i>Chrysocoma ciliata</i> | ASTERACEAE | LC | |
| 9. | <i>Cynodon dactylon</i> | POACEAE | LC | |
| 10. | <i>Datura stramonium</i> | BRASSICACEAE | Alien weed | CARA Cat 1; NEMBA Cat 1b |
| 11. | <i>Diospyros lycioides</i> | EBENACEAE | LC | |
| 12. | <i>Ehretia rigida</i> | BORAGINACEAE | LC | |
| 13. | <i>Ferraria variabilis</i> | IRIDACEAE | LC | |
| 14. | <i>Flaveria bidentis</i> | ASTERACEAE | Alien weed | NEMBA Cat 1b |
| 15. | <i>Geigeria ornativa</i> | ASTERACEAE | LC | |
| 16. | <i>Harrisia martinii</i> | CACTACEAE | Alien invader | CARA Cat 1; NEMBA Cat 1b |
| 17. | <i>Ipomoea purpurea</i> | CONVOLVULACEAE | Alien weed | CARA Cat 3; NEMBA Cat 1b |
| 18. | <i>Leonotis ocymifolia</i> | LAMIACEAE | LC | |
| 19. | <i>Lycium cinereum</i> | SOLANACEAE | LC | |
| 20. | <i>Lycium bosciifolium</i> | SOLANACEAE | LC | |
| 21. | <i>Moraea cf. tripetala</i> | IRIDACEAE | LC | |
| 22. | <i>Opuntia</i> species | CACTACEAE | Alien invader | CARA Cat 1; NEMBA Cat 1b |
| 23. | <i>Rhigozum trichotomum</i> | BIGNONIACEAE | LC | |
| 24. | <i>Roepera</i> species | ZYGOPHYLLACEAE | | |
| 25. | <i>Salsola aphylla</i> | AMARANTHACEAE | LC | |
| 26. | <i>Salsola kali</i> | AMARANTHACEAE | Naturalised invader | NEMBA Cat 1b |
| 27. | <i>Schinus molle</i> | ANACARDIACEAE | Naturalised tree | Not listed |
| 28. | <i>Searsia pendulina</i> | ANACARDIACEAE | LC | |
| 29. | <i>Senegalia mellifera</i> | FABACEAE | LC | |
| 30. | <i>Senna italica</i> | FABACEAE | LC | |
| 31. | <i>Sesamum capense</i> | PEDALIACEAE | LC | |
| 32. | <i>Tarchonanthus camphoratus</i> | ASTERACEAE | LC | |
| 33. | <i>Thesium lineatum</i> | SANTALACEAE | LC | |
| 34. | <i>Vachellia hebeclada</i> | FABACEAE | LC | |
| 35. | <i>Vachellia karroo</i> | FABACEAE | LC | |
| 36. | <i>Vachellia tortilis</i> | FABACEAE | LC | |
| 37. | <i>Ziziphus mucronata</i> | RHAMNACEAE | LC | |

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** (but species like *Harpagophytum procumbens* is likely to occur in this area).

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). **No trees protected in terms of the NFA** were observed.

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).

- The following plant protected in terms of the NCNCA was encountered. Recommendations on impact minimisation also included.

Table 3: Plant species protected in terms of the NCNCA encountered within the study area

| NO. | SPECIES NAME | COMMENTS | RECOMMENDATIONS |
|-----|--|--|---|
| 1. | <i>Aloe grandidentata</i> Schedule 2 protected | All species in the genus protected by default. Locally scarce. | Search & rescue: Individuals within footprint to be transplanted to surrounding area. |

5. FAUNA AND AVI-FAUNA

Please note that no fauna or avi-fauna screening was done as part of this study and the following notes are just observations with regards to status of the study area and observations made during the botanical site visit. The location of the study area, on the urban edge of Kimberley (Lethabo Park), the current land-use (livestock grazing), the adjacent farming practices (including wild game hunting) and the poor status of the veld in many parts of the proposed footprint will all contribute to a disturbance factor, which is likely to have driven most wild animals away from this area. It is considered highly unlikely that any large game remains in this area. This in turn would have affected the food chain and ultimately the density of tertiary predators, particularly mammals and larger birds of prey, while smaller predators and scavengers such as jackal and caracal would have been eradicated by farmers in fear of their livestock. Because of the long-term impact of human settlement on the larger areas and especially because of the close proximity of the proposed development areas to the urban edge a comprehensive faunal survey is not deemed necessary.

5.1. MAMMALS

The nearby Mokala Nature Reserve still supports an impressive diversity of larger antelope and other mammal species. However, it is highly unlikely that any of this larger game will still frequent or even visit the proposed footprint or its immediate surroundings (because of its location). Smaller game and other mammal species



that may potentially still be found in this area can include the following (deducted from the list of species in the Mokala Nature Reserve: *Orycteropus afer* (Aardvark), *Pedetes capensis* (Springhare), *Phacochoerus africanus* (Common warthog), *Raphicerus campestris* (Steenbok), *Sylvicapra grimmia* (Common duiker) *Suricata suricatta* (Suricate), *Xerus inauris* (Southern African ground squirrel) and *Canis mesomelas* (Black-backed jackal). However of all the potential species listed above only one family of the ground squirrel was observed on site (Refer to picture).

5.2. AVI-FAUNA

Thornveld Savanna can potentially attract a number of bird species including; the blackchested prinia, blacksmith lapwing, melodious lark, cinnamon-breasted bunting, freckled nightjar, short-toed rock thrush, pygmy falcon and northern black korhaan. The removal of a large number of large indigenous trees, may certainly impact on some of these species, but since the proposed footprint is actually relatively small the impact is unlikely to be significant. The following birds have been observed in the nearby Mokala NR: Ashy tit, Cape penduline-tit, Southern fiscal, Crimson-breasted shrike, Familiar chat, Fawn-coloured lark, Fiscal flycatcher, Fork-tailed drongo, Grey-backed cisticola, Kalahari scrub-robin, Karoo scrub-robin, Lark-like bunting, Marico flycatcher, Mountain wheatear, Northern black korhaan, Orange River white-eye, Pririt batis, Red-headed finch, Rufous-eared warbler, Sabota lark, Scaly-feathered finch, Short-toed rock-thrush, Sociable weaver, Southern ant-eating chat, White-backed vulture, White-rumped swift, Yellow-bellied eremomela and the Yellow canary.

5.3. REPTILE & AMPHIBIANS

No reptile or amphibian species were observed during the site survey. The project footprint may provide habitat for a number of reptile species, but they would most likely be terrestrial species adapted to grassland and preying on avifauna and small mammal species. No amphibian species are likely to occur due to a lack of aquatic and wetland habitat in the proposed footprint.

6. IMPACT ASSESSMENT METHOD

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

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

6.1. DETERMINING SIGNIFICANCE

Determining impact significance from predictions of the nature of the impact has been a source of debate and will remain a source of debate. The author used a combination of scaling and weighting methods to determine significance based on a simple formula. The formula used is based on the method proposed by Edwards (2011). However, the criteria used were adjusted to suite its use for botanical assessment. In this document significance rating was evaluated using the following criteria (Refer to Table 4Error! Reference source not found.).

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

Table 4: 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. |

6.2. SIGNIFICANCE CATEGORIES

The formal NEMA EIA application process was developed to assess the significance of impacts on the surrounding environment (including socio-economic factors), associated with any specific development proposal 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 5.

Table 5: 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. |

7. DISCUSSING BOTANICAL SENSITIVITY

The aim of impact assessment 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 footprint is located on Municipal property, adjacent to existing housing infrastructure on natural veld that shows varying degrees of disturbance as a result of historical land use and more recent urban settlement and current land use (livestock grazing).
- **Activity**: The proposed activity is expected to result in a permanent footprint of approximately 90 – 100 ha of natural veld (showing varying degrees of disturbance).
- **Geology & Soils**: No special features such as water courses, wetlands, true quartz patches or heuweltjies were observed in or near to the larger footprint area that may result in specialised plant habitat.
- **Land use and cover**: The footprint is located on municipal land adjacent to the existing Lethabo Park housing area. Portions of the footprint is still in relative good conditions (although heavily grazed), but two sections of the proposed footprint are already transformed by illegal structures (shacks) (with new ones being added daily), while large portions of the footprint had been degraded by previous construction related activities and illegal dumping. Remaining natural veld is utilised for livestock (sheep & goat) grazing by the local community.
- **Vegetation status**: Kimberley Thornveld is not considered to be of conservation concern, but conservation targets have not yet been met. In general the natural systems associated with the proposed footprint are still functioning well, except for the areas to the south west and south east which have already been degraded or transformed as a result of the construction of illegal structures (shacks). Floral diversity is considered to be representative of what is to be expected in this vegetation type.
- **Conservation priority areas**: According to the Northern Cape CBA maps the proposed site will not impact on CBA or ESA areas and is already degraded as a result of urban influences. The site will not impact on any centre of endemism.
- **Connectivity**: The proposed activity will result in a permanent footprint enlargement of the Lethabo Park Settlement by approximately 100 ha. However, the proposed footprint joins up with the existing urban edge and should not have any significant additional impact on connectivity (it is also not part of any ESA or CBA, which might be for the protection of migration routes).
- **Watercourses and wetlands**: No water courses or wetlands were observed or are expected within the proposed footprint.
- **Protected or endangered plant species**: Only one NCNCA protected plant was observed. This plant is not considered endangered and only one patch of these individuals was observed. Aloe species are generally very easy to transplant.
- **Alien and Invasive Plant species**: A number of alien and invasive plant species were observed of which the densities and spread of the alien *Prosopis glandulosa* tree is probably the most concerning.

Conservation value or habitat sensitivity is based on the irreplaceability of the habitat unit, on observations of the abundance and diversity of floral and faunal species present at the time of the assessment, on the presence of endangered or protected species within the habitat units, on the presence of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) and on the degree of disturbance encountered as a result of historical and current activities.

The terrestrial habitat associated with the project footprint is considered to be of a moderate sensitivity based on the following factors:

- The vegetation type is classified as least threatened;
- The project footprint does not overlap an ESA or a CBA;
- The floral habitat and natural systems are mostly still functioning well;
- The floral diversity is considered to be largely representative of the vegetation type;
- No special habitats or features were observed within the footprint;
- No red-list species or nationally protected species were encountered and only one provincially protected species was encountered.

7.1. IMPACT ASSESSMENT

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

Table 6: 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 | 2 | 1 | 5 | 3 | 2 | 22 | No special habitats observed. |
| | With mitigation | 2 | 1 | 5 | 2 | 1 | 18 | Ensure good environmental control during the construction phase. |
| Landuse and cover: Potential impact on socio-economic activities. | Without mitigation | 2 | 5 | 5 | 3 | 2 | 30 | Permanent transformation of approximately 100ha of natural veld for human settlement (in an area used for livestock grazing by the local inhabitants). |
| | With mitigation | 2 | 5 | 5 | 2 | 1 | 26 | Ensure good environmental control during the construction phase. |
| Vegetation status: Loss of vulnerable or endangered vegetation and associated habitat. | Without mitigation | 2 | 5 | 5 | 3 | 2 | 30 | Permanent transformation of 100ha of partially disturbed Kimberley Thornveld (Least Threatened). |
| | With mitigation | 2 | 4 | 5 | 2 | 1 | 24 | Incorporate larger trees within the settlement layout where possible (thus protecting a number of these indigenous trees). |
| Conservation priority: Potential impact on protected areas, CBA's, ESA's or Centre's of Endemism. | Without mitigation | 2 | 1 | 5 | 3 | 2 | 22 | The proposed footprint will not impact on any CBA or ESA. |
| | With mitigation | 2 | 1 | 5 | 2 | 1 | 18 | Incorporate larger trees within the settlement layout where possible (thus protecting a number of these indigenous trees). |
| Connectivity: Potential loss of ecological migration corridors. | Without mitigation | 2 | 5 | 5 | 3 | 2 | 30 | The additional footprint joins the existing urban edge and should not add have any significant additional impact on connectivity. |
| | With mitigation | 2 | 4 | 5 | 2 | 1 | 24 | Incorporate larger trees within the settlement layout where possible (thus protecting a number of these indigenous trees). |

| Impact assessment | | | | | | | | |
|--|--------------------|----|-----|-----|-----|-----|--------------|--|
| Aspect | Mitigation | CV | Lik | Dur | Ext | Sev | Significance | Short discussion |
| Watercourses and wetlands: Potential impact on natural water courses and its 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 | 2 | 5 | 4 | 3 | 2 | 28 | Only one provincially protected plant species was observed. |
| | With mitigation | 2 | 2 | 4 | 2 | 1 | 18 | Search & rescue all Aloe plants. |
| Invasive alien plant species: Potential invasive plant infestation as a result of the activities. | Without mitigation | 2 | 4 | 4 | 3 | 2 | 26 | Dense stands of Prosopis were observed throughout the footprint. |
| | With mitigation | 2 | 2 | 4 | 1 | 1 | 16 | Special care must be taken during their removal (in order to avoid re-sprouting). |
| Veld fire risk: Potential risk of veld fires as a result of the activities. | Without mitigation | 2 | 3 | 3 | 3 | 3 | 24 | Veld fire risk very high |
| | With mitigation | 2 | 1 | 3 | 1 | 1 | 12 | Address fire danger throughout construction. |
| Cumulative impacts: Cumulative impact associated with proposed activity. | Without mitigation | 2 | 5 | 5 | 3 | 2 | 30 | Permanent transformation of approximately 100ha of natural veld for human settlement (in an area used for livestock grazing by the local inhabitants). |
| | With mitigation | 2 | 5 | 5 | 2 | 1 | 26 | Minimise the impact on protected plant species and protect as many larger individual trees as possible incorporating them into the town layout. |
| The "No-Go" option: Potential impact associated with the No-Go alternative. | Without mitigation | 2 | 1 | 1 | 1 | 1 | 8 | No impact on natural veld or protected plant species, but also no social gain. |
| | With mitigation | | | | | | 0 | The Municipality is under enormous pressure to provide suitable and serviced land for human settlement. |

According Table 6, the main impacts associated with the proposed development will be on:

- The permanent transformation of approximately 100ha of natural veld for human settlement (in an area used for livestock grazing by the local inhabitants);
- The potential impact on connectivity;
- The potential impact on protected plant species;
- The potential for spreading alien and invasive plant species; and
- The potential veld fire risk

Because of the location and the degraded status of the site, the cumulative impact (even without mitigation) is expected to be **Low**, but this can be further reduced by mitigation.

8. IMPACT MINIMISATION RECOMMENDATIONS

The proposed development will result in the permanent transformation of approximately 100ha of natural veld for human settlement. According to the impact assessment given in Table 6, with good environmental control, the development is likely to result in a **Low** impact on the environment.

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.

8.1. MITIGATION ACTIONS

The following mitigation actions are recommended:

- 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 EA and the construction phase EMP and any other conditions pertaining to specialist studies.
- The town layout plans should aim to incorporate as many of the larger indigenous trees as possible within its layout (e.g. as shade or ornamental trees within the settlement).
- All protected species discussed in Table 3 must be Search & Rescued to suitable areas in the surrounding area.
- **Before any work is done** the development footprint and access routes must be clearly demarcated and approved by the ECO. The demarcation must include the total footprint necessary to execute the work, but must aim at minimum disturbance.
- Lay-down areas or construction sites must be located within already disturbed areas or areas of low ecological value and must be pre-approved by the ECO.
- Indiscriminate clearing of any area outside of the construction footprint must be avoided.
- All areas impacted as a result of construction must be rehabilitated on completion of the project.
 - This includes the removal of all excavated material, spoil and rocks, all construction related material and all waste material.
 - It also included replacing the topsoil back on top of the excavation as well as shaping the area to represent the original shape of the environment.
- An integrated waste management approach must be implemented during construction.
 - Construction related general and hazardous waste may only be disposed of at Municipal approved waste disposal sites.
 - All rubble and rubbish should be collected and removed from the site to a suitable registered waste disposal site.
- Special attention must be given to alien and invasive control within the construction footprint. All alien invasive species within the footprint and at least 5 m to the side of the footprint must be removed responsibly.
 - Care must be taken with the eradication method to ensure that the removal does not impact or lead to additional impacts (e.g. spreading of the AIP due to incorrect eradication methods);
 - Care must be taken to dispose of alien plant material responsibly.

9. REFERENCES

- Acoks, 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
- Driver, A., Maze, K., Rouget, M., Lombard, A.T., Nel, J.L., Turpie, J.K., Cowling, R.M., Desmet, P., Goodman, P., Harris, J., Jonas, Z., Reyers, B., Sink, K. & Strauss, T. 2005.** National spatial biodiversity assessment 2004: priorities for biodiversity conservation in South Africa. Strelitzia, 17. South African National Biodiversity Institute, Pretoria.
- Edwards, R. 2011.** Environmental impact assessment method. Unpublished report for SiVest (Pty) Ltd. Environmental division. 9 May 2011.
- Holness, S. & Oosthuysen, E. 2016.** Critical Biodiversity Areas of the Northern Cape: Technical Report. Available from the Biodiversity GIS website at <http://bgis.sanbi.org/project.asp>
- Le Roux, A. 2015.** Wild flowers of Namaqualand. A botanical society guide. Fourth revised edition. Struik Nature. Cape Town.
- Low, A.B. & Rebelo, A.(T.)G. (eds.) 1996.** *Vegetation of South Africa, Lesotho and Swaziland*. Department of Environmental Affairs and Tourism, Pretoria.
- Manning, J. 2008.** Namaqualand Eco Guide. Briza Publications. Pretoria
- 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.
- Rutherford, M.C., Mucina, L., Lötter, M.C., Bredenkamp, G.J., Smit, J.H.L., Scott-Shaw, C.R., Hoare, D.B., Goodman, P.S., Bezuidenhout, H., Scott, L., Ellis, F., Powrie, L.W., Siebert, F., Mostert, T.H., Henning, B.J., Venter, C.E., Camp, K.G.T., Siebert, S.J., Matthews, W.S., Burrows, J.E., Dobson, L., Van Rooyen, N., Schmidt, E., Winter, P.J.D., Du Preez, P.J., Ward, R.A., Williamson, S. & Hurter, P.F.H.** Savanna Biome. In Mucina, L. & Rutherford, M.C. 2006. (eds.) *The Vegetation of South Africa. Lesotho & Swaziland*. Strelitzia 19. South African National Biodiversity Institute, Pretoria. pp. 439 – 538.
- Shearing, D. 1994.** Karoo. South African Wild Flower Guide 6. Botanical Society of South Africa. Kirstenbosch.
- 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. 2015.** Statistics: Red List of South African Plants version (as updated). Downloaded from Redlist.sanbi.org on 2017/06/15.
- Van Wyk, A.E., & Smith, G.F. 2001.** Regions of floristic endemism in South Africa. A review with emphasis on succulents. Umdaus press. Hatfield.