

# BOTANICAL ASSESSMENT (Addendum 1)

## CALVINIA BULK WATER SUPPLY

PROPOSED ALTERNATIVE PIPELINE ROUTE, EAST OF CALVINIA  
OVER ERVEN NO'S 1459, 1447 & 300, CALVINIA  
HANTAM LOCAL MUNICIPALITY, NORTHERN CAPE PROVINCE



28 September 2021

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## EXECUTIVE SUMMARY

<b>VEGETATION TYPE</b>	<b>Hantam Karoo (Figure 3)</b> Classified as “Least Threatened” (GN 1002, December 2011). More recently the 2018 National Biodiversity Assessment (NBA) was published. Hantam Karoo vegetation remains classified as “Least Threatened” in terms of the 2018 NBA.
<b>VEGETATION ENCOUNTERED</b>	The proposed footprint(s) will only impact on one broad vegetation type, namely Hantam Karoo, which is considered “Least Threatened”. The vegetation to the south of the Oorlogskloof river (Green area marked in Figure 4) was in relatively good condition (although the impact of the prolonged drought can still be seen). North of the Oorlogskloof River the pipeline will overlap the disturbed old agricultural areas (Orange area marked in Figure 4) for most of the way, before crossing a small patch of remaining natural veld just south of the R355 (Purple area marked in Figure 4). However, in this area the vegetation showed signs of grazing and were generally not in as good shape as that to the south of the river
<b>CONSERVATION PRIORITY AREAS</b>	According to the NCCBA (Figure 5), portions of the pipeline route will impact on a CBA and existing agricultural land. However, the original route would also have impacted the CBA around Calvinia. It was taken into account that the placement of the pipeline (underground) will only result in a short to medium term temporary impact will also reduce the impact
<b>CONNECTIVITY</b>	The impact will be temporary, or nature and the proposed development is not expected to have any significant additional (long lasting) impact on connectivity
<b>LAND-USE</b>	The impact will be temporary of nature, which can be managed with good communications with the landowner.
<b>PROTECTED PLANT SPECIES</b>	Twelve (12) additional plant species were observed in this study of which one is considered endangered and two are protected species in terms of the NCNCA.
<b>MAIN CONCLUSION</b>	The conclusions of the original report still stands.  With the correct mitigation it is unlikely that the development will contribute significantly to any of the following: <ul style="list-style-type: none"> <li>• Significant loss of vegetation type and associated habitat.</li> <li>• Loss of ecological processes (e.g. migration patterns, pollinators, river function etc.) due to construction and operational activities.</li> <li>• Loss of local biodiversity and threatened plant species.</li> <li>• Loss of ecosystem connectivity.</li> </ul> <p style="text-align: center;"><b>WITH THE AVAILABLE INFORMATION IT IS RECOMMENDED THAT PROJECT BE APPROVED, WITH THE PROPOSED MITIGATION ACTIONS.</b></p>
<b>NO-GO OPTION</b>	The No-Go option is not likely to result in a “no-impact” scenario, for it will have a negative socio-economic impact (and slow degradation may still continue).

## COMPLIANCE WITH APPENDIX 6 OF GN. 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 iv – v & Appendix 1
(ii) The expertise of the specialist to compile a specialist report including a curriculum vitae;	Refer to Appendix 1
b) A declaration that the specialist is independent in a form as may be specified by the competent authority;	Refer to Page iii
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 modeling 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 4.5
g) An identification of any areas to be avoided, including buffers;	Refer to the original report. <b>Error! Reference source not found.</b>
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 the original report.
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 6
l) Any conditions for inclusion in the environmental authorization;	Refer to Heading 6 <b>Error! Reference source not found.</b>
m) Any monitoring requirements for inclusion in the EMPr or environmental authorization;	Refer to Heading 6
n) A reasoned opinion -	
(i) [as to] whether the proposed activity, activities or portions thereof should be authorized;	Refer to the “ <i>Main conclusion</i> ” 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 6
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
<b>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.</b>	

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## **INDEPENDENCE & CONDITIONS**

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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.

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## **RELEVANT QUALIFICATIONS & EXPERIENCE OF THE AUTHOR**

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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.

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## DECLARATION OF INDEPENDENCE

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### 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.



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Signature of the specialist:

PB Consult (Sole Proprietor)

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Name of company:

28 September 2021

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Date:

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## ABBREVIATIONS

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BGIS	Botanical Geographical Information System
CARA	Conservation of Agricultural Resources Act 43 of 1983
CBA	Critical Biodiversity Areas (Municipal)
DEA	Department of Environmental Affairs
EAP	Environmental assessment practitioner
EIA	Environmental impact assessment
EMF	(Municipal) Environmental Management Framework
EMP	Environmental management plan
NCNCA	Northern Cape Nature Conservation Act, Act 9 of 2009
NEMA	National Environmental Management Act, Act 107 of 1998
NEMAQA	National Environmental Management Air Quality Act 39 of 2004
NEMBA	National Environmental Management Biodiversity Act, Act 10 of 2004
NEMPAA	National Environmental Management Protected Areas Act 57 of 2003
NEMWA	National Environmental Management Waste Act 59 of 2008
NFA	National Forests Act 84 of 1998
NSBA	National Spatial Biodiversity Assessment
NVFFA	National Veld and Forest Fire Act 101 of 1998
NWA	National Water Act 36 of 1998
SABIF	South African Biodiversity Information Facility
SANBI	South African National Biodiversity Institute
SIBIS	SANBI's Integrated Biodiversity Information System
SKEP	Succulent Karoo Ecosystem Project



## 1. INTRODUCTION

PB Consult did a full botanical assessment for the proposed Calvinia Bulk Water Supply (BWS) pipeline during March 2021 (Refer to Botes, 2021). Entering the vicinity of Calvinia the original Kreitzberg pipeline would have skirted the southern boundary of the town (Refer to Figure 6 of the original report). BVi Engineers has recently proposed an alternative route for this section of the pipeline that will re-route this section of the pipeline to the east of Calvinia through Erven 1459, 1447 and 300, Calvinia.

This report is not a stand-alone botanical assessment but must be read as an addendum to the original report (Botes, 2021). According to the 2018 Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006), the proposed alternative will only impact on one broad vegetation type, namely Hantam Karoo, which is considered “Least Threatened” (a status which it maintained in the 2018 National Biodiversity Assessment, Skowno, 2019). But it must be noted that the Hantam Karoo also falls within the Succulent Karoo Biome (the fourth largest Biome in South Africa), which is proclaimed as one of the most biologically distinct areas in South Africa (Mucina *et. al*, 2006). The route will cross the Oorlogskloof River and seasonal wetland areas (associated with the river). This report deals only with the potential impacts on vegetation. A freshwater consultant had been appointed to address the potential impacts on the river and seasonal wetlands.

The vegetation to the south of the Oorlogskloof River was well preserved, but the wetland areas to the north of the Oorlogskloof River had been used for agriculture over a long period of time and can only be described as disturbed.

### 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

As it nears Calvinia from the R355, the original Kreitzberg pipeline route would have followed the R27 into town, crossed the Oorlogskloof River (using the existing bridge) and then followed a route through several small holdings and erven to the south of Calvinia (Refer to the red route in Figure 1). The proposed alternative route will cross the R27 (approximately where southern R355 or the Ceres-Karoo Road meets the R27) running directly north until it meets up with the pipeline along the R355 north (Calvinia – Loeriesfontein Road). It will cross through several land parcels, while also crossing the Oorlogskloof River and associated wetland areas (Figure 1).

**Figure 1: A Google image showing the original pipeline route (red) and the proposed alternative route (white)**



## 3. EVALUATION METHOD

The botanical survey was conducted 8<sup>th</sup> of September 2021. The timing of the site visit was good, in that the area received some recent rains. Desktop studies coupled with a site survey were performed. Spatial information from online databases such as SANBI BGIS, CapeFarmMapper and Google Earth were used to evaluate the site in terms of vegetation type(s) expected, potential significant features that might be encountered (e.g. variations in soil type, rocky outcrops etc.) and obvious differences in landscape or vegetation densities, which might indicate differences in plant community or species composition. Expected plant species lists were prepared and species of special significance were flagged (to be used as reference during the site visit).

Figure 2: Google image showing the larger area and the GPS tracks and sample points that was driven and walked (blue)



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

- The area to the south of the Oorlogskloof River still seems to support natural vegetation in relatively good condition;
- The area to the north of the Oorlogskloof River seems to be much disturbed because of ongoing agricultural practices;
- The vegetation type is expected to be Hantam Karoo, considered “*least threatened*” in terms of the National list of threatened terrestrial ecosystems (2011) (The more recent 2018 National Spatial Biodiversity Assessment still lists Hantam Karoo as “*least threatened*”) Refer to Heading 4.2 of the original report, Botes, 2021).
- According to the 2016 Northern Cape Critical Biodiversity Map (Refer to Heading 4.3), the pipeline route will overlap critical biodiversity areas (CBA) and areas identified as disturbed.
- According to Van Wyk & Smith (2001) the site falls within the **Hantam-Roggeveld Centre of endemism** (Refer to Heading 4.4 of the original report, Botes, 2021).

The survey was conducted over 1 day, starting from the R355 (north) through the various properties until it meets up with the R27 (Refer to Figure 2). Sampling was done by walking the site and examining, marking, and photographing any plant or feature of interest. A hand-held Garmin GPSMAP 62s was used to track the sampling route and for recording waypoints of locations of specific importance. During the survey notes, together with a photographic record, were compiled for the vegetation and landscape. The author endeavoured to identify and locate all significant biodiversity features, special plant species and or specific soil conditions which might indicate special botanical features (e.g. rocky outcrops or silcrete patches).

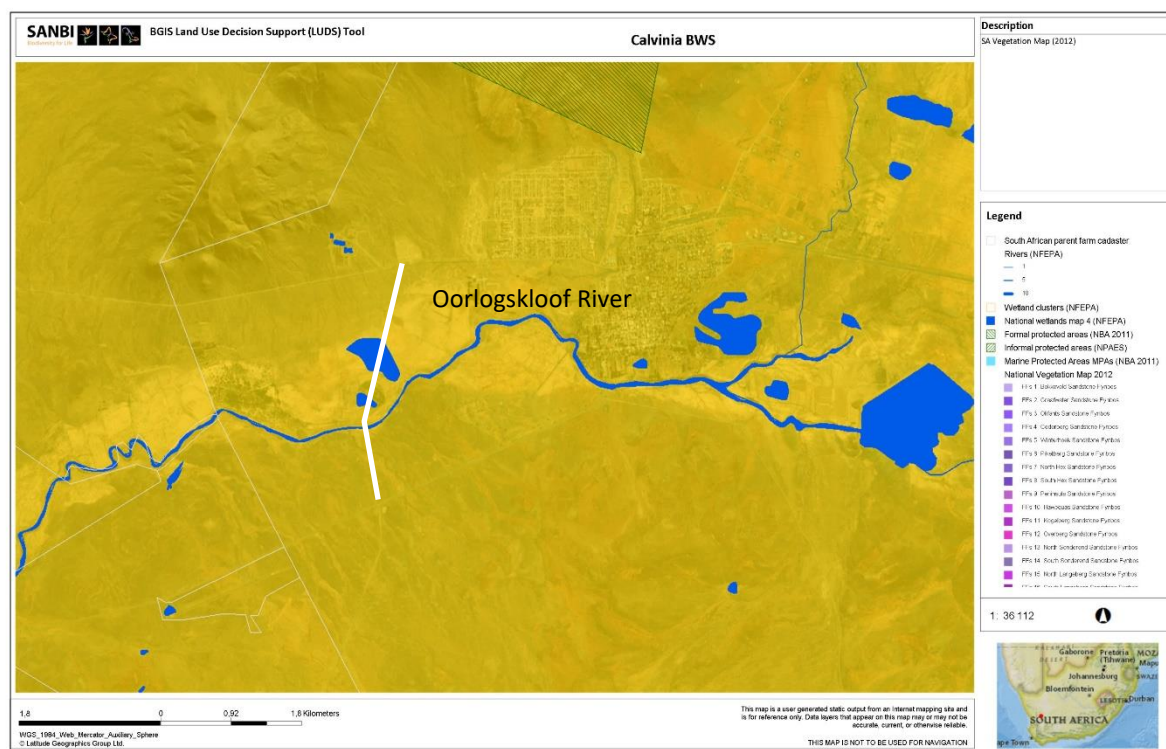


## 4. THE VEGETATION

Hantam Karoo corresponds largely with Acock's (1953) Western Mountain Karoo veld and to Low & Rebello's (1996) Upland Succulent Karoo vegetation type. In accordance with the 2018 Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006), the proposed footprint(s) will only impact on one broad vegetation type, namely **Hantam Karoo** (Figure 3), a vegetation type classified as "Least Threatened" in terms of the NEM: BA "national list of ecosystems that are threatened and in need of protection" (GN 1002, December 2011).

More recently the 2018 National Biodiversity Assessment (NBA) was published (Skowno *et al.*, 2019a & Skowno *et al.*, 2019b). Although the findings of the 2018 NBA it is not yet formally adopted by NEM: BA in terms of regulations it is important to consider these findings. However, Hantam Karoo vegetation remains classified as "Least Threatened" in terms of the 2018 NBA.

**Figure 3: Vegetation map of South Africa (2018), showing the alternative route (white) and the expected vegetation types**



### 4.1. THE VEGETATION IN CONTEXT

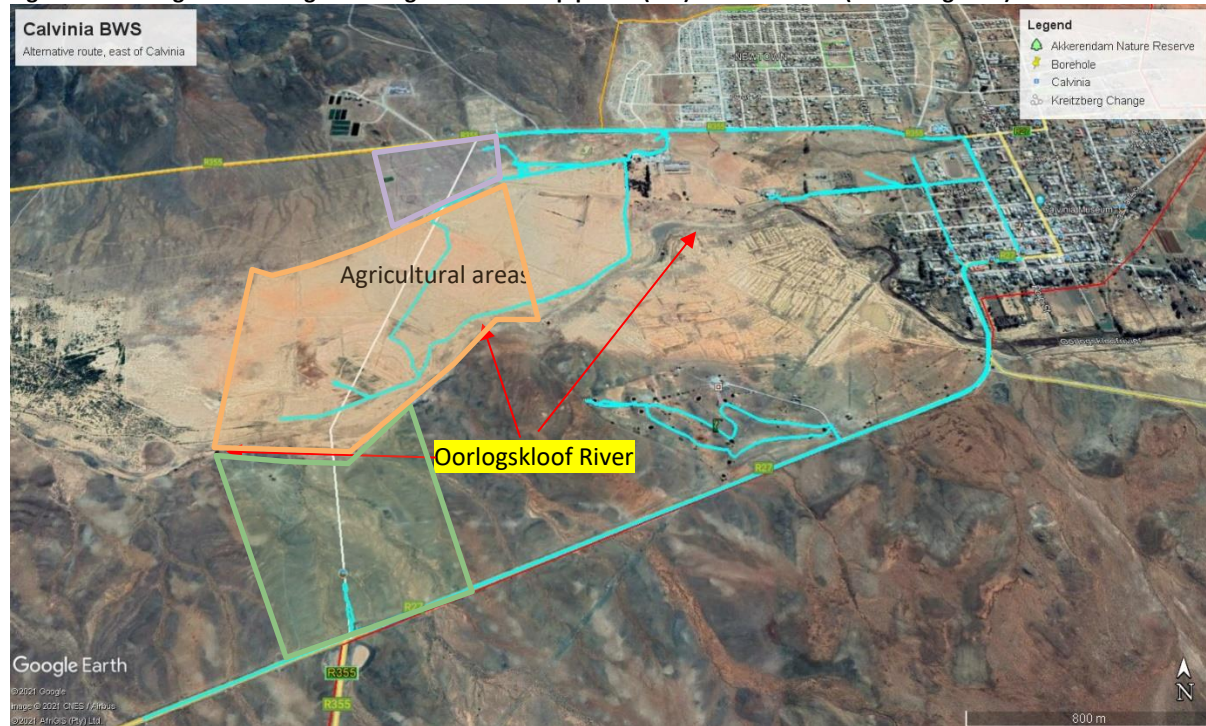
Refer to the same paragraph in the original report (Botes, 2021).

### 4.2. VEGETATION ENCOUNTERED

At the time of the site visit the area had experienced some rain since the original site visit was done. As a result, several annuals (mostly weedy pioneer species) and succulent were observed, which were not noticeable during the original site visit. The vegetation to the south of the Oorlogskloof river (Green area marked in Figure 4) was in relatively good condition (although the impact of the prolonged

drought can still be seen). North of the Oorlogskloof River the pipeline will overlap the disturbed old agricultural areas (Orange area marked in Figure 4) for most of the way, before crossing a small patch of remaining natural veld just south of the R355 (Purple area marked in Figure 4). However, in this area the vegetation showed signs of grazing and were generally not in as good shape as that to the south of the river.

Figure 4: A Google earth image showing the southern pipeline (red) and boreholes (Kreitzberg area)



#### 4.2.1. The vegetation south of the Oorlogskloof River

The vegetation encountered to the south of the Oorlogskloof River was very similar that encountered along the southern portions of the R355 and the Kreitzberg areas (Photo 1 & 2) and mostly dominated by a combination of *Ruschia intricata*, *Mesembryanthemum noctiflorum*, *Eriocephalus africanus*, *E. ericoides*, *Osteospermum sinuatum*, *Pentzia incana*, *Pteronia glauca* and *Pteronia incana*. For a full description of this vegetation refer to Heading 4.2.1 of the original report.

Because of the recent rains, several annual and geophytic plants were also visible.

Annuals included: "Wildemagriet" (*Dimorphotheca nudicaulis*), "Hongerblom" (*Senecio* species), "Botterblom" (*Gazania* species),

Geophytic plants included: *Bulbine praemorsa* (blougif), *Lapeirousia* species (no flowers), *Gethyllis* species (no flowers), *Homeria* cf. *vallisbelli*, *Wurmbea variabilis*.

Other species observed included *Astridia longifolia*, *Cephalophyllum* cf. *rigidum*, *Drosanthemum* cf. *framesii*, *Euphorbia mauritanica*, *Hermannia* cf. *cuneifolia*, *Oncosiphon piluliferus* and *Pentzia incana*.





Photo 1: Typical natural veld observed in the area south of the Oorlogskloof River. *Ruschia intricata* together with *Eriosephalus* and *Osteospermum* dominated veld. Looking from the R27 north towards the Hantam Mountains.



Photo 2: The same veld observed near the Oorlogskloof River.



Photo 3: *Wurmbea variabilis* observed in this veld (*Osteospermum* visible in the background).

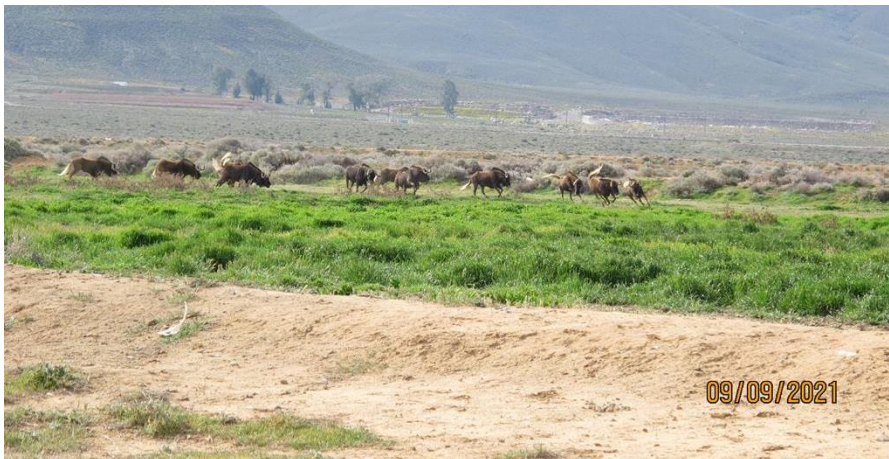


#### 4.2.2. The agricultural area

The longest section of this alternative pipeline route will cross old agricultural land (which seems to be old floodplain areas associated with the river (Refer to Figure 4). The soils are markedly more clayey. Most of these areas are still used for agriculture or for grazing by game. Indigenous antelope and several Ostrich were observed in these camps. Large areas had been planted to grazing and are still irrigated. Other intensive agriculture seems also still be practiced in places (potentially on a rational basis) (Photo 4 – 6)



**Photo 4:** *Salsola* and *Atriplex* dominated vegetation encountered within the floodplain areas (Agricultural land).



**Photo 5:** Wildebeest observed grazing on patches of kikuyu grazing within the agricultural area.



**Photo 6:** Existing agricultural practices within the agricultural area.



Most of the areas associated with the pipeline route through the agricultural area (old floodplain area) shows signs of historic cultivation or existing cultivation. Remaining natural veld is found in small patches or along the edges of the agricultural areas. The vegetation is mostly dominated by a mixture of *Salsola* and *Atriplex* ("Soutbos") plants.

Other species observed along the edges of the floodplain includes: *Atriplex semibaccata*, *A. lindleyi*, *Drosanthemum* cf. *hispidum*, *Lycium cinereum*, *Manochlamys albicans* ("Seepbos"), *Mesembryanthemum guerichianum*, *Mesembryanthemum noctiflorum*, *Salsola aphylla*, *S. kali*, *Salvia disermas*. The invasive alien *Prosopis* tree was also often observed scattered throughout this area.

#### 4.2.3. The vegetation between the Loeriesfontein road and the agricultural area

The vegetation encountered in the remaining natural veld south of the Loeriesfontein road (the R355 north), between the road and the agricultural area seems to be a dryer version of that described under Heading 4.2.1, above and like the vegetation described under Heading 4.2.2 of the original report (Botes, 2021).



**Photo 7:** Natural vegetation encountered to the south of the Loeriesfontein road.

The veld was usually dominated by *Eriocephalus ericoides* in combination with *Pentzia incana*, *Galenia africana*, *Mesembryanthemum dinteri* (= *Psilocaulon*), *Osteospermum sinuatum*, *Mesembryanthemum noctiflorum* (= *Aridaria*), *Pteronia incana*, *Ruschia intricata* and *Lycium cinereum*. The herb *Tetragonia fruticosa*, *Asparagus* species as well as *Euphorbia mauritanica*, the weed *Salsola aphylla* and the succulents *Mesembryanthemum amplexens* were again observed.



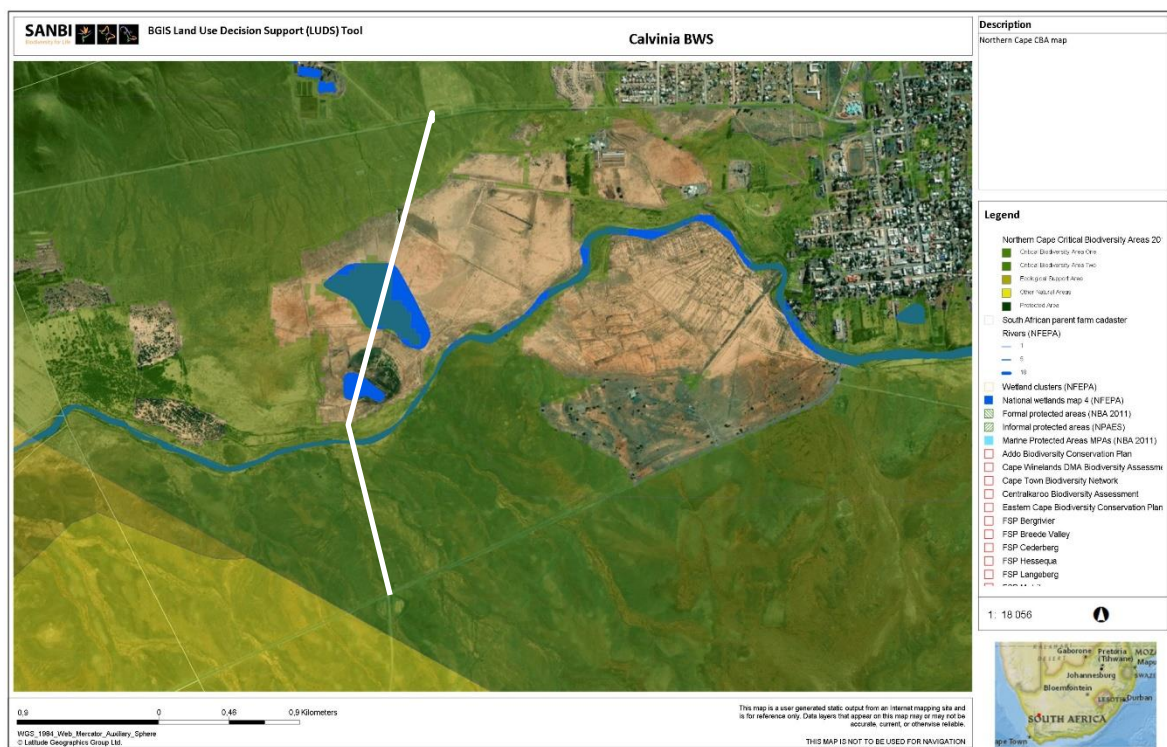
**Photo 8:** A typical view of the vegetation encountered along most of the Toren road.

In disturbed areas species like *Galenia africana*, *Mesembryanthemum guerichianum*, *Salsola kali*, *Oncosiphon piluliferus*, *Ursinia nana* and *Mesembryanthemum dinteri* were prominent.

#### 4.3. CRITICAL BIODIVERSITY AREAS MAPS

According to the NCCBA (Figure 5), portions of the pipeline route will impact on a CBA and existing agricultural land. However, the original route would also have impacted the CBA around Calvinia. It was taken into account that the placement of the pipeline (underground) will only result in a short to medium term temporary impact will also reduce the impact.

Figure 5: Northern Cape Critical Biodiversity Areas Map (2016) showing the alternative route in white (SANBI BGIS)



#### 4.4. CENTRES OF ENDEMISM: POTENTIAL IMPACT

Refer to Heading 4.4 of the original report.

#### 4.5. FLORA ENCOUNTERED

Table 1 gives an updated list of plant species encountered (new species are highlighted in the species name column). Because of the limitations (single site visits) it is likely that a number of annuals and geophytes might have been missed, but the author is confident that a good understanding of the vegetation was achieved and confidence in the findings is high.

Eighty-five (85) different plant species were identified of which one is considered endangered and a number is South African endemics, and three (3) are naturalised weeds. No species protected in terms of the National Environmental Management: Biodiversity Act, (Act 84 of 1998) or the National Forest Act (Act 84 of 1998) protected species were observed, but twenty nine (29) Northern Cape Nature Conservation Act (Act 9 of 2009) protected species were encountered (a number of which were weedy/pioneer species often viewed as disturbance indicator species) (Refer to Table 2).

**Table 1: Species checklist of flora observed within the study areas**

No.	Species name	FAMILY	Status	Additional notes
1.	<i>Afroscirpoides dioeca</i>	CYPERACEAE		Large sedge
2.	<i>Anisodonteia triloba</i>	MALVACEAE	LC	Medium herb
3.	<i>Astridia longifolia</i>	AIZOACEAE	EN NCNCA, Schedule 2 protected	Dwarf succulent shrub
4.	<i>Asparagus capensis</i>	ASPARAGACEAE	LC	Scrambler / shrub
5.	<i>Asparagus</i> species (dried out remains)	ASPARAGACEAE		Scrambler / shrub
6.	<i>Atriplex lindleyi</i> *	AMARANTHACEAE	Naturalised weed	Small shrub/herb
7.	<i>Atriplex semibaccata</i> *	AMARANTHACEAE	Naturalised weed	Prostrate herb
8.	<i>Ballota africana</i>	LAMIACEAE	LC	Dwarf shrub/herb
9.	<i>Berkheya cf. fruticosa</i>	ASTERACEAE	LC	Thorny Shrub
10.	<i>Berkheya heterophylla</i>	ASTERACEAE	LC	Thorny herb
11.	<i>Bulbine praemorsa</i>	ASPHODELACEAE	LC	Succulent geophyte
12.	<i>Bulbinella cf. elegans</i>	ASPODELACEAE	LC (SA endemic) NCNCA, Schedule 2 protected	Large geophyte
13.	<i>Cephalophyllum cf. rigidum</i>	AIZOACEAE	LC NCNCA, Schedule 2 protected	Succulent
14.	<i>Cheiridopsis namaquensis</i>	AIZOACEAE	LC (SA Endemic) NCNCA, Schedule 2 protected	Small succulent
15.	<i>Chrysocoma ciliata</i>	ASTERACEAE	LC	Small shrub
16.	<i>Cotyledon orbiculata</i>	CRASSULACEAE	LC (SA endemic) NCNCA, Schedule 2 protected	Succulent shrub
17.	<i>Crassula subaphylla</i>	CRASSULACEAE	LC NCNCA, Schedule 2 protected	Straggling succulent
18.	<i>Cysticapnos vesicaria</i>	FUMARIACEAE	LC	Climber / herb
19.	<i>Dicerotheramnus rhinocerotis</i> (= <i>Elytropappus rhinocerotis</i> )	ASTERACEAE	LC	Pioneer shrub
20.	<i>Diospyros austro-africana</i>	EBENACEAE	LC	Small tree
21.	<i>Dimorphotheca nudicaulis</i>	ASTERACEAE	SA (endemic)	Shrub
22.	<i>Drosantheum cf. framesii</i>	AIZOACEAE	LC (SA endemic) NCNCA, Schedule 2 protected	Succulent
23.	<i>Ehrharta calycina</i>	POACEAE	LC	Slender graminoid
24.	<i>Eriocephalus africanus</i>	ASTERACEAE	LC (SA endemic)	Small shrub
25.	<i>Eriocephalus ericoides</i>	ASTERACEAE	LC	Small Shrub
26.	<i>Euphorbia mauritanica</i> *	EUPHORBIACEAE	LC NCNCA, Schedule 2 protected	Succulent shrub
27.	<i>Euryops lateriflorus</i>	ASTERACEAE	LC	Large shrub
28.	<i>Euryops multifidus</i>	ASTERACEAE	LC (SA endemic)	Medium shrub

No.	Species name	FAMILY	Status	Additional notes
29.	<i>Euryops nodosus</i>	ASTERACEAE	LC (SA endemic)	Medium shrub
30.	<i>Euryops</i> species	ASTERACEAE		Medium shrub
31.	<i>Felicia australis</i>	ASTERACEAE	LC (SA endemic)	Small herb
32.	<b>Gazania species</b>	ASTERACEAE		Annual herb
33.	<i>Galenia africana</i> *	AIZOACEAE	LC NCNCA, Schedule 2 protected	Medium shrub
34.	<i>Galenia fruticosa</i>	AIZOACEAE	LC NCNCA, Schedule 2 protected	Leaf succulent shrub
35.	<i>Gethyllis lanuginosa</i>	AMARYLLIDACEAE	LC (SA endemic) NCNCA, Schedule 2 protected	Small geophyte
36.	<b>Hermannia cf. cuneifolia</b>	MALVACEAE	LC	Dwarf shrub
37.	<i>Hirpicium alienatum</i>	ASTERACEAE	LC	Dwarf shrub
38.	<b>Homeria cf. vallisbelli</b>	IRIDACEAE	LC	Medium geophyte
39.	<i>Lachenalia cf. carnosa</i>	HYACINTACEAE	LC (SA endemic) NCNCA, Schedule 2 protected	Small geophyte
40.	<b>Lapeirousia species (no flowers)</b>	IRIDACEAE		Small geophyte
41.	<i>Lessertia frutescens</i>	FABACEAE	LC NCNCA, Schedule 1 protected	Small shrub
42.	<i>Limonium sinuatum</i>	PLUMBAGINACEAE	Naturalised weed	Small herb
43.	<i>Lycium amoenum</i>	SOLANACEAE	LC (SA endemic)	Large Shrub
44.	<i>Lycium cinereum</i>	SOLANACEAE	LC	Medium shrub
45.	<b>Manochlamys albicans</b>	AMARANTHACEAE	LC	Medium shrub
46.	<i>Melianthus comosus</i>	MELIANTHACEAE	LC	Medium shrub
47.	<i>Mesembryanthemum amplexens</i>	AIZOACEAE	LC (SA endemic) NCNCA, Schedule 2 protected	Succulent shrub
48.	<i>Mesembryanthemum cf. nitidum</i>	AIZOACEAE	LC (SA endemic) NCNCA, Schedule 2 protected	Succulent shrub
49.	<i>Mesembryanthemum dinteri</i> (= <i>Psilocaulon dinteri</i> )*	AIZOACEAE	LC NCNCA, Schedule 2 protected	Succulent shrub
50.	<i>Mesembryanthemum fastigiatum</i> *	AIZOACEAE	LC (SA endemic) NCNCA, Schedule 2 protected	Prostrate succulent
51.	<i>Mesembryanthemum guerichianum</i> *	AIZOACEAE	LC NCNCA, Schedule 2 protected	Succulent shrub
52.	<i>Mesembryanthemum junceum</i> (= <i>Psilocaulon junceum</i> )*	AIZOACEAE	LC NCNCA, Schedule 2 protected	Succulent shrub
53.	<i>Mesembryanthemum noctiflorum</i> (= <i>Aridaria noctiflora</i> )	AIZOACEAE	LC NCNCA, Schedule 2 protected	Succulent shrub
54.	<i>Mesembryanthemum subnodosum</i> (= <i>Psilocaulon subnodosum</i> )*	AIZOACEAE	LC NCNCA, Schedule 2 protected	Succulent shrub
55.	<i>Microloma sagittatum</i>	APOCYNACEAE	LC NCNCA, Schedule 2 protected	Climbing herb
56.	<i>Moraea cf. bifida</i>	IRIDACEAE	LC (SA endemic) NCNCA, Schedule 2 protected	Medium geophyte
57.	<i>Moraea cf. pritzeliana</i>	IRIDACEAE	LC (SA endemic) NCNCA, Schedule 2 protected	Small geophyte
58.	<i>Nenax microphylla</i>	RUBIACEAE	LC	Dwarf shrub



No.	Species name	FAMILY	Status	Additional notes
59.	<i>Oncosiphon piluliferus*</i>	ASTERACEAE	LC	Small herb
60.	<i>Osteospermum sinuatum*</i>	ASTERACEAE	LC	Shrub
61.	<i>Pelargonium rapaceum</i>	GEREANIACEAE	LC (SA endemic) NCNCA, Schedule 1 protected	Small herbaceous plant
62.	<i>Pentzia incana</i>	ASTERACEAE	LC	Medium shrub
63.	<i>Phragmites australis</i>	POACEAE	LC	Large graminoid
64.	<i>Pteronia camphorata</i>	ASTERACEAE	LC (SA endemic)	Large shrub
65.	<i>Pteronia glauca</i>	ASTERACEAE	LC	Medium shrub
66.	<i>Pteronia glomerata</i>	ASTERACEAE	LC (SA endemic)	Medium/small shrub
67.	<i>Pteronia incana</i>	ASTERACEAE	LC	Shrub
68.	<i>Radyera urens*</i>	MALVACEAE	LC	Prostrate herb
69.	<i>Roepera flexuosa (=Zygophyllum flexuosum)</i>	ZYGOPHYLLACEAE	LC	Dwarf succulent shrub
70.	<i>Rosenia cf. glandulosa</i>	ASTERACEAE	LC (SA endemic)	Low shrub
71.	<i>Ruschia intricata</i>	AIZOACEAE	LC NCNCA, Schedule 2 protected	Small thorny succulent
72.	<i>Salvia disermas</i>	LAMIACEAE	LC	Medium - large herb/shrub
73.	<i>Salsola aphylla</i>	AMARANTHACEAE	LC	Woody shrub
74.	<i>Salsola kali*</i>	AMARANTHACEAE	Naturalised weed	Herb
75.	<i>Salsola tuberculata</i>	AMARANTHACEAE	LC	Dwarf shrub
76.	<i>Searsia lancea</i>	ANACARDACEAE	LC	Tree
77.	<i>Searsia undulata</i>	ANACARDACEAE	LC	Small Tree
78.	<i>Senecio species</i>	ASTERACEAE		Weedy herb
79.	<i>Tetragonia fruticosa</i>	AIZOACEAE	LC NCNCA, Schedule 2 protected	Succulent herb
80.	<i>Tylecodon wallichii</i>	CRASSULACEAE	LC NCNCA, Schedule 2 protected	Succulent shrub
81.	<i>Typha capensis</i>	THYPHACEAE	LC	Hydrophyte herb
82.	<i>Ursinia nana</i>	ASTERACEAE	LC	Small herb
83.	<i>Viscum cf. hoolei</i>	SANTALACEAE	LC	Parasitic shrub
84.	<i>Willdenowia incurvata</i>	RESTIONACEAE	LC NCNCA, Schedule 2 protected	Dwarf Restioid
85.	<i>Wurmbea variabilis</i>	COCHICACEAE	LC	Small geophyte

\* These species are often seen as disturbance indicators (although they can play a vital role in soil protection through its rapid germination and spread) (Vlok & Schutte-Vlok, 2015).

#### 4.6. THREATENED AND PROTECTED PLANT SPECIES

Apart from the species identified in the original botanical assessment (Botes, 2021) the following additional threatened or protected plants were observed.

##### 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).

- **One red-listed species was observed**, namely *Astridia longifolia* (Refer to Table 1). Fortunately, this plant was only observed well away to the east of the proposed route on the interface between the southern portion of Hantam Karoo vegetation and the floodplain area associated with the agricultural land.

#### 4.6.2. NCNCA protected plant species

The Northern Cape Nature Conservation Act 9 of 2009 (NCNCA) came into effect on the 12<sup>th</sup> 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).

- Twenty-seven (27) species protected in terms of the NCNCA encountered in the original study (Refer to Table 4 of the original study).
- **Two additional species** protected in terms of the NCNCA were identified during this study (Refer to Table 2, which also gives recommendations on impact minimisation).

**Table 2: Plant species protected in terms of the NCNCA encountered within the study area**

NO.	SPECIES NAME	COMMENTS	RECOMMENDATIONS
1.	<i>Astridia longifolia</i> Schedule 2 protected	Small to medium succulent plant with bright red flowers.	<b>Search &amp; rescue</b> all plants. Replant to adjacent veld. Fortunately, only observed well away from the proposed footprint on the interface between the natural veld just north of the Oorlogskloof River and the floodplain area.
2.	<i>Cephalophyllum</i> cf. <i>rigidum</i> Schedule 2 protected	A smallish succulent, occasionally observed in the same area as the plant above.	<b>Search &amp; rescue</b> all plants, and replant to adjacent veld.

## 5. 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). The discussion underneath only considers the potential additional impact that might result because of the route change in terms of the following biodiversity aspects:

- **Location:** The proposed alternative is about 2.7 km in length, while the original route would have been almost 7 km in length. However, the original route would have impacted almost exclusively on veld already disturbed or transformed. However, the new alternative route will only impact on about 800 m of veld in relatively good condition which is also within a CBA.
- **Activity:** The construction of the pipeline will result in a temporary disturbance along approximately 800 m of veld in relatively good condition, and a further 1.9 km within disturbed agricultural land and veld in also showing signs of disturbance.
- **Land use and cover:** 1.5 km of the proposed 2.7 km alternative route will be in veld already transformed through agriculture. 800 m will impact on veld in relatively good condition (within a CBA), while a further 400 m will impact on veld slightly to medium degraded because of grazing practices (but also within a CBA).
- **Vegetation status:** The proposed footprint(s) will only impact on one broad vegetation type, namely Hantam Karoo, which is considered “Least Threatened”. Hantam Karoo is a subtype of the Succulent Karoo Biome with a low winter rainfall and hot and dry summers. Globally there are few other places than can claim to be as biologically distinct as the Succulent Karoo Biome. The vegetation differed considerably between that of the remaining natural veld and that encountered in the agricultural area (associated with the old floodplains). The vegetation to the south of the Oorlogskloof River was also in much better condition than that to the north of the agricultural area.
- **Conservation priority areas:** According to the NCCBA (Figure 5), the alternative pipeline route will also (as will the original route) impact on the proposed CBA to the west of Calvinia. However, the larger portion of the alternative route will impact on areas already transformed (agricultural land) and only about 1.2 km will impact on natural veld of varying condition.
- **Connectivity:** The impact will be temporary, or nature and the proposed development is not expected to have any significant additional (long lasting) impact on connectivity.
- **Protected or endangered plant species:** Twelve (12) additional plant species were observed in this study of which one is considered endangered and two are protected species in terms of the NCNCA.
- **Alien and Invasive Plant species:** The presence of several the invasive alien *Prosopis* tree is concerning, and care will have to be taken to ensure that this plant does not become a serious invader in this area.



### 5.1. IMPACT ASSESSMENT

It was considered unnecessary to re-evaluate the impact assessment for the following reasons:

- The alternative route is very short in terms of the larger project and the impact will be temporary of nature within a veld type considered “Least Threatened”;
- The original route would have been about 7 km in length while the alternative is about 2.7 km in length;
- The most significant difference between the original route and the alternative is the new route will impact on approximately 800m of natural veld in relatively good condition and a further 400m of veld in slightly poorer condition, while the original route would have been in road reserves and generally in veld in poorer condition because of the edge effect of the urban developments in Calvinia.
- Both routes will impact the CBA area associated with Calvinia;
- Two additional plants protected in terms of the NCNCA might be impacted, of which one is endangered. Fortunately, both these plants were only observed well away from the proposed pipeline route.

Overall, the route alternative will have almost no additional impacts and is highly unlikely to influence the impact assessment as discussed within the original report (Botes, 2021). As a result the original impact assessment still stands.

## 6. IMPACT MINIMISATION RECOMMENDATIONS

The impact minimisation recommendations given in the original report, are valid and only the following additional recommendation must be included:

- Search & rescue as described in Table 4 of the original report and Table 2 of this report must be done before construction may commence;

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More than 20 years of experience in the Environmental Management Field (Since 1997 to present).

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### **BRIEF RESUME OF RELEVANT EXPERIENCE**

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**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 Enviroscentific, as an independent environmental consultant specializing in wastewater management, botanical and biodiversity assessments, developing environmental management plans and

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

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

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

#### **LIST OF MOST RELEVANT BOTANICAL & BIODIVERSITY STUDIES**

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- Botes, P. 2012(c): Proposed Kakamas Keren Energy Holdings Solar Facility on Remainder of the Farm 666, Kakamas. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 13 March 2012.
- Botes, P. 2012(d): Proposed Keimoes Keren Energy Holdings Solar Facility at Keimoes. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 9 March 2012.
- Botes, P. 2012(e): Proposed Leeu-Gamka Keren Energy Holdings Solar Facility on Portion 40 of the Farm Kruidfontein no. 33, Prince Albert. A Biodiversity Assessment (with botanical input) taking

into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 27 March 2012.

- Botes, P. 2012(f): Proposed Mount Roper Keren Energy Holdings Solar Facility on Farm 321, Kuruman. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 28 March 2012.
- Botes, P. 2012(g): Proposed Whitebank Keren Energy Holdings Solar Facility on Farm no. 379, Kuruman. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 27 March 2012.
- Botes, P. 2012(h): Proposed Vanrhynsdorp Keren Energy Holdings Solar Facility on Farm Duinen Farm no. 258, Vanrhynsdorp. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 13 April 2012.
- Botes, P. 2012(i): Askham (Kameelduin) proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required). 1 November 2012.
- Botes, P. 2013(a): Groot Mier proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required). January 2013.
- Botes, P. 2013(b): Loubos proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required). January 2013.
- Botes, P. 2013(c): Noenieput proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required). January 2013.
- Botes, P. 2013(d): Rietfontein proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required). January 2013.
- Botes, P. 2013(e): Welkom proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required). January 2013.
- Botes, P. 2013(f): Zyperfontein Dam Biodiversity & Botanical Scan. Proposed construction of a new irrigation dam on Portions 1, 3, 5 & 6 of the Farm Zyperfontein No. 66, Vanrhynsdorp (Northern Cape) and a scan of the proposed associated agricultural enlargement. September 2013.
- Botes, P. 2013(g): Onseepkans Canal: Repair and upgrade of the Onseepkans Water Supply and Flood Protection Infrastructure, Northern Cape. A Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required). August 2013.
- Botes, P. 2013(h): Biodiversity scoping assessment with regards to a Jetty Construction On Erf 327, Malagas (Matjiespoort). 24 October 2013.
- Botes, P. 2013(i): Jacobsbaai pump station and rising main (Saldanha Bay Municipality). A Botanical Scan of the area that will be impacted by the proposed Jacobsbaai pump station and rising main. 30 October 2013.
- Botes, P. 2014(a): Brandvlei Bulk Water Supply: Proposed construction of a 51 km new bulk water supply pipeline (replacing the existing pipeline) from Romanskolk Reservoir to the Brandvlei Reservoir, Brandvlei (Northern Cape Province). A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required). 24 February 2014.

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- Botes, P. 2014(b): Kalahari-East Water Supply Scheme Extension: Phase 1. Proposed extension of the Kalahari-East Water Supply Scheme and associated infrastructure to the Mier Municipality, ZF Mgcawu District Municipality, Mier Local Municipality (Northern Cape Province). Biodiversity & Botanical scan of the proposed route to determine the possible impact on biodiversity with emphasis on vegetation and plant species. 1 July 2014.
- Botes, P. 2014(c): The proposed Freudenberg Farm Homestead, Farm no. 419/0, Tulbagh (Wolseley Area). A Botanical scan of possible remaining natural veld on the property. 26 August 2014.
- Botes, P. 2014(d): Postmasburg WWTW: Proposed relocation of the Postmasburg wastewater treatment works and associated infrastructure, ZF Mgcawu District Municipality, Tsantsabane Local Municipality (Northern Cape Province). Biodiversity and botanical scan of the proposed pipeline route and WWTW site. 30 October 2014.
- Botes, P. 2015(a): Jacobsbaai pump station and rising main (Saldanha Bay Municipality) (Revision). A Botanical Scan of the area that will be impacted by the proposed Jacobsbaai pump station and rising main. 21 January 2015.
- Botes, P. 2015(b): Steenkampspan proving ground. Proposed establishment of a high speed proving (& associated infrastructure) on the farm Steenkampspan (No. 419/6), Upington, ZF Mgcawu (Siyanda) District Municipality, Northern Cape Province. Biodiversity and Botanical Scan of the proposed footprint. 20 February 2015.
- Botes, P. 2015(c): Proposed Bredasdorp Feedlot, Portion 10 of Farm 159, Bredasdorp, Cape Agulhas Municipality, Northern Cape Province. A Botanical scan of the area that will be impacted. 28 July 2015.
- Botes, P. 2016(a): OWK Raisin processing facility, Kuruman, Erf 151, Kenhardt, Northern Cape Province. A Botanical scan of the proposed footprint. 26 May 2016.
- Botes, P. 2016(b): Onseepkans Agricultural development. The proposed development of ±250 ha of new agricultural land at Onseepkans, Northern Cape Province. Biodiversity and Botanical Scan. January 2016.
- Botes, P. 2016(c): Henkries Mega-Agripark development. The proposed development of ±150 ha of high potential agricultural land at Henkries, Northern Cape Province. Biodiversity and Botanical Scan of the proposed footprint. 28 February 2016.
- Botes, P. 2016(d): Proposed Namaqualand Regional Water Supply Scheme high priority bulk water supply infrastructure upgrades from Okiep to Concordia and Corolusberg. Biodiversity Assessment of the proposed footprint. March 2016.
- Botes, P. 2017: The proposed new Namaqua N7 Truck Stop on Portion 62 of the Farm Biesjesfontein No. 218, Springbok, Northern Cape Province. Botanical scan of the proposed footprint. 10 July 2017.
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- Botes, P. 2018(b): Rooifontein Bulk Water Supply – Ground water desalination, borehole- and reservoir development, Rooifontein, Northern Cape Province. Botanical scan of the proposed footprint. 23 February 2018
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- Botes, P. 2018(e): Kakamas Bulk Water Supply – New bulk water supply line for Kakamas, Lutzburg & Cillie, Khai !Garib Local Municipality, Northern Cape Province. Botanical assessment of the proposed footprint. 4 August 2018.
- Botes, P. 2018(f): Wagenboom Weir & Pipeline – Construction of a new pipeline and weir with the Snel River, Breede River Local Municipality, Northern Cape Province. Botanical assessment of the proposed footprint. 7 August 2018.
- Botes, P. 2018(g): Steynville (Hopetown) outfall sewer pipeline – Proposed development of a new sewer outfall pipeline, Hopetown, Northern Cape Province. Botanical assessment of the proposed footprint. 8 October 2018.
- Botes, P. 2018(h): Tripple D farm agricultural development – Development of a further 60 ha of vineyards, Erf 1178, Kakamas, Northern Cape Province. Botanical assessment of the proposed footprint. 8 October 2018.
- Botes, P. 2018(i): Steynville (Hopetown) outfall sewer pipeline – Proposed development of a new sewer outfall pipeline, Hopetown, Northern Cape Province. Botanical assessment of the proposed footprint. 8 October 2018.
- Botes, P. 2019(a): Lethabo Park Extension – Proposed extension of Lethabo Park (Housing Development) on the remainder of the Farm Roodepan No. 70, Erf 17725 and Erf 15089, Roodepan Kimberley. Sol Plaaitye 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 !Gariëp Local Municipality, Northern Cape Province. 6 February 2020.
- Botes, P. 2020(b): Feldspar Prospecting & Mining, Farm Rozyne Bosch 104, Kakamas. Botanical assessment of the proposed prospecting and mining activities on Portion 5 of The Farm Rozyne 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 proposed 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): Gariiep housing project – Botanical assessment of the proposed formalization and development of 135 new erven on Plot 113, Gariiep Settlement, !Kheis Local Municipality, Northern Cape Province. 20 July 2020.

## **APPENDIX 2: BIODIVERSITY REPORT - BIRDS**

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