PB CONSULT
ENVIRONMENTAL MANAGEMENT SERVICES

BOTANICAL SCAN & TERRESTRIAL BIODIVERSITY COMPLIANCE STATEMENT

TIERHOKSKLOOF BULK WATER PIPELINE

THE PROPOSED REPLACEMENT/UPGRADE OF THE BULK WATER SUPPLY PIPELINE FOR THE TOWN OF WOLSELEY (FARMS 1886 & 1887, CERES), WITZENBERG LOCAL MUNICIPALITY, WESTERN CAPE PROVINCE.

PREPARED FOR:

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5 May 2023

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EXECUTIVE SUMMARY

Wolseley is a small town in the upper Breede River Valley of the Western Cape Province. Bulk water for the town is extracted from the Tierhokskloof River (a tributary to the Breede River). The Tierhokskloof is about 8 km east of town within the Michells Pass, which connects Wolseley with Ceres. Water is abstracted through an inlet structure in the Tierhokskloof River from where it gravitates within a pipeline to the Witbrug water treatment works (WTW). The pipeline is about 2.42 km in length and had been constructed around 1953 (>70 years ago). The integrity of the pipeline had been compromised over time and it is in urgent need of replacement.

VEGETATION TYPE & STATUS

According to the "*Revised List of ecosystems that are threatened and in need of protection*" (GN 47526 of 18 November 2022), promulgated in terms of the National Environmental Management Biodiversity Act, Act 10 of 2004, neither North Hex Sandstone Fynbos or Fynbos Riparian Vegetation are considered vulnerable or endangered. North Hex Sandstone Fynbos is listed as Least Concern with only 6% transformed, mostly due to cultivation, and very low erosion and well protected. **Breede Alluvium Fynbos**, on the other hand, is considered **Endangered** because of high rates of habitat loss in the past 28 years, placing the ecosystem type at risk of collapse. However, the area in which the Breede River Alluvium Fynbos is expected has been disturbed and although it might represent a very disturbed version of Breede Alluvium Fynbos, it is more likely to be disturbed **Fynbos Riparian Vegetation,** dominated by a low *Cynodon dactylon* grassy fields (on the slightly higher and drier areas), replaced by larger grass species and riverbed grass towards the Breede River itself (Refer to Heading 3.1 & 4).

HABITAT CONDITIONS AND VEGETATION

The inlet structure is relatively small and had been constructed as a weir within the Tierhokskloof River.

- The natural riparian vegetation (**Fynbos Riparian Vegetation)** in the vicinity of this inlet are in pristine riparian condition (as is the case with most of the riparian vegetation in this kloof) (refer to Par. 4.1).
- From the inlet works in the Tierhokskloof the pipeline follows the lower slopes of the mountain (well away from the river) towards the Witbrug WTW. The mountain fynbos (North **Hex Sandstone Fynbos**) itself, is pristine condition, varying slightly in age (because of various fire cycles), but being mostly mature veld not yet stagnant. In places the route skirts through the lower distribution of range of *Protea nitida* stands (refer to Par. 4.2).
- The last section of the pipeline will be in the open valley bottom near Witbrug and will potentially overlap **Breede Alluvium Fynbos (**an endangered vegetation type). However, the vegetation encountered might represent a very disturbed version of Breede Alluvium Fynbos but is more likely to be disturbed **Fynbos Riparian Vegetation,** dominated by a low *Cynodon dactylon* grassy fields (on the slightly higher and drier areas), replaced by larger grass species and riverbed grass towards the Breede River itself.

In terms of vegetation, it is considered highly unlikely that the proposed development will contribute significantly to the loss of vegetation type or associated habitat

THREATENED AND PROTECTED PLANT SPECIES

No red-data or NEM:BA protected plant species were observed within the proposed footprint. One species protected in terms of the NFA was observed, namely ***Podocarpus latifolius*** (refer to Heading 4.5), but they were all located within the riparian zones of the Breede River or Tierhokskloof River, away from the proposed footprint area.

- According to the DEA Screening tool report, the relative plant species theme sensitivity is considered of medium sensitivity. Even though the proposed project is located within a statutory reserve, the findings of this study suggest that the **plant species should be of low sensitivity**, since no red-listed species was observed, only

one protected species was observed (which is unlikely to be impacted).

FAUNA & AVI-FAUNA

During the site visit the only physical evidence of mammal species were the calls and barks of the Chacma baboon and droppings of Rock Hyrax (Dassie) and Cape otter. According to the Protected Area Management Plan for the Hexriver Complex (CapeNature, 2021) 24 mammal species has been recorded in the mountain complex, which includes seven rodent's species, seven even-toed ungulates, four carnivores two bat species, one shrew, one hare, one odd-toed ungulate and a single primate species. The only threatened species present is the Cape leopard, *Panthera pardus*, which is listed as Vulnerable. The Hexriver Complex should have a relatively rich reptile fauna but only six reptile species have been recorded to date. The number of bird species recorded for the Hexriver Complex is low (105 species), which are typical of mountain fynbos habitat. The reserve complex is not important in terms of threatened species with only two species of conservation concern recorded, namely the Verreaux's Eagle, *Aquila verreauxii* and the Ground Woodpecker (which is listed regionally as Least Concern but globally as Near Threatened and therefore included) (Refer to Heading 5.1 - 5.3). The animal species theme sensitivity is considered **high sensitive** because the proposed site overlaps the potential distribution range of two bird species (the vulnerable Verreaux's Eagle, the endangered Black Harrier) and three invertebrate (grasshopper) species, namely the Peringquey's Meadow Katydid (vulnerable), the Mute Winter Katydid (vulnerable) and the Striped Restio Katydid (endangered).

- However, it is unlikely that the proposed project will pose any significant impact towards any of these species, as the bulk of the pipeline will be aboveground and the impact temporary and short term, with little direct impact on fynbos vegetation itself (Refer to Heading 5.4 & specifically Table 3). **With** regards **to this project the sensitivity rating should be low sensitive.**

CONSERVATION PRIORITY AREAS

According to the 2017 Western Cape Biodiversity Spatial Plan (WCBSP) (CapeNature, 2017), both properties overlap protected areas (Figure 7). Remainder of Erf 1886 is part of the Wittebrug Nature Reserve (a CapeNature Reserve), while Erf 1887 falls within the Matroosberg Mountain Catchment Protected Area (both statutory protected areas). However, the bulk of the pipeline will be aboveground and the impact temporary and short term, with little direct impact on fynbos vegetation itself (Refer to Heading 3.3 and 1.3). The proposed project have the potential to result in a much larger potential environmental impact (because of the much larger construction related impacts, associated with the pipeline been placed underground).

- Because of the aboveground placement, it is unlikely to have any significant impact on loss of vegetation type and associated habitat or loss of ecological processes (e.g., migration patterns, pollinators, river function etc.) or the loss of local biodiversity and threatened plant species. As a result, the impact on the critical biodiversity areas is considered of **low sensitivity**.

WATER COURSES AND WETLANDS

The inlet works is located within the Tierhokskloof River, and some small upgrades might have to be done at this inlet work. All the watercourses are considered of high ecological importance and minimising the impact on these streams and rivers should be the main non-negotiable of this project.

- Although the potential impact is considered relatively low to negligent, special recommendations were maide towards the protection of these features.

MAIN CONCLUSION

According to the **NEMA EIA Sensitivity** scan for the site generated on 2022/09/22 by Mr. Bernard de Witt of EnviroAfrica (the EAP) the Terrestrial Biodiversity Theme Sensitivity is **VERY HIGH SENSITIVE** because of it being located within a statutory conservation area and the potential impact on several vulnerable or endangered fauna species (Refer to Table 3).

The Terrestrial biodiversity assessment (Table 10) aims to take all the discussion within this document into account .

According, Table 10 the main impacts associated with the proposed development will be:

- The potential medium impact on water courses and intact riparian vegetation within a reserve;
- The potential medium impact on landuse and cover within a reserve;
- The potential medium impact on vegetation within a reserve;
- The potential medium impact on conservation bodies within a reserve;

Table 10 gives the cumulative impact before mitigation as **medium.** But with the proposed aboveground construction method and the proposed mitigation actions it can be **reduced to Low Significance**.

It is considered highly unlikely that the development will contribute significantly to any of the following:

- Significant loss of vegetation type and associated habitat.
- Loss of ecological processes (e.g., migration patterns, pollinators, river function etc.) due to construction and operational activities.
- Loss of local biodiversity and threatened plant species.
- Loss of ecosystem connectivity.

As a result, the Terrestrial Biodiversity Theme Sensitivity for the proposed project should be **LOW**.

WITH THE AVAILABLE INFORMATION IT IS RECOMMENDED THAT THE PROJECT BE APPROVED.

DETAILS OF THE AUTHOR

This is a specialist report compiled by Peet Botes from PB Consult.

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INDEPENDENCE & CONDITIONS

PB Consult is an independent entity with no interest in the activity other than fair remuneration for services rendered. Remunerations for services are not linked to approval by decision making authorities and the company have no interest in secondary or downstream development because of the authorization of this project. There are no circumstances that compromise the objectivity of this report. The findings, results, observations and recommendations given in this report are based on the author's best scientific and professional knowledge and available information. The author reserves the right to modify aspects of this report, including the recommendations if new information become available which may have a significant impact on the findings of this report.

RELEVANT QUALIFICATIONS & EXPERIENCE OF THE AUTHOR

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

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

During 2010 he joined EnviroAfrica 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:

5 May 2023

Date:

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ABBREVIATIONS

BAR	Basic Assessment Report
CBA	Critical biodiversity area (in terms of the 2017 City of Cape Town Biodiversity Network)
DENC	Department of Environment and Nature Conservation
EA	Environmental Authorization (Record of Decision)
EAP	Environmental assessment practitioner
ECO	Environmental Control Officer
EIA	Environmental impact assessment
EMP	Environmental Management Plan or Program
EMS	Environmental management system
EN	Endangered
ESA	Ecological support area (in terms of the 2017 City of Cape Town Biodiversity Network)
LT	Least Threatened
NEMA	National Environmental Management Act, 1998 (Act no. 107 of 1998)
VU	Vulnerable

1. INTRODUCTION

Wolseley is a small town in the upper Breede River Valley of the Western Cape Province. Bulk water for the town is extracted from the Tierhokskloof River (a tributary to the Breede River). The Tierhokskloof is about 8 km east of town within the Michells Pass, which connects Wolseley with Ceres. Water is abstracted through an inlet structure in the Tierhokskloof River from where it gravitates within a pipeline to the Witbrug water treatment works (WTW). The pipeline is about 2.42 km in length and had been constructed around 1953 (>70 years ago). The integrity of the pipeline had been compromised over time and it is in urgent need of replacement.

ETL Consulting Engineers had been appointed to investigate and make recommends for the upgrading of the existing bulk water gravity supply line (which is likely to include minor updates to the Tierhokskloof inlet structure as well). The replacement pipeline will be located parallel with the existing pipeline (since the existing pipeline must remain fully operational during the construction period). Like the original pipeline the first ± 1.8 km of the pipeline (in the rocky mountain section) will be above ground, while the remaining ± 700 m will be below ground (in the valley bottom near the Witbrug WTW). The construction of the pipeline above ground in the rocky mountain section will minimise direct impact significantly.

According to the 2018 Vegetation map of South Africa (Mucina & Rutherford, 2006), the proposed pipeline upgrade is likely to impact on three vegetation types. It will have a relatively localised impact on Fynbos Riparian Vegetation near the Tierhokskloof intake, while most of the 1.8 km above ground pipeline will impact on North Hex Sandstone Fynbos in excellent condition. In the valley bottom the last 700m of the pipeline is likely to impact on Fynbos Riparian Vegetation associated with Breede Alluvium Fynbos.

The kloof through which the Breede River runs (from Ceres to Wolseley) and the mouth of the Tierhokskloof, as well as the lower parts of the mountains in this kloof used to be heavily infested by alien invasive species, most notably Blackwattle (*Acacia mearnsii*), Port Jackson (*Acacia saligna*) and *Eucalyptus* species. During the last 10 – 15 years the river systems and mountains were cleared of alien vegetation through a huge alien eradication program. As a result, the natural riparian vegetation is starting to re-establish itself along the Breede River. The Mountain vegetation and the riparian vegetation within the Tierhokskloof are still in pristine condition. A large portion of the pipeline falls within the Wittebrug Nature Reserve, while the whole pipeline is within the Matroosberg Mountain Catchment area (both statutory protected areas).

The DEA Screening tool report, identified various areas of potential environmental sensitivity, of which the following will be discussed in this report:

- The relative Animal species theme sensitivity is considered of **high sensitivity**;
- The relative Plant species theme sensitivity is considered of **medium sensitivity**;
- The relative Terrestrial Biodiversity theme sensitivity is considered of **very high sensitivity**.

The relative Aquatic theme (very high sensitivity), Archaeological and cultural heritage theme (low sensitivity) and Palaeontology theme (high sensitivity) are not discussed in this report.

1.1. LEGISLATION GOVERNING THIS REPORT

ETL Consulting Engineers was appointed to evaluate and design a feasible replacement pipeline for the project. EnviroAfrica was appointed to facilitate the NEMA EIA application for the proposed project. PB Consult was appointed by EnviroAfrica to conduct a botanical and terrestrial biodiversity scan of the proposed footprint area.

This is a 'specialist report', compiled in terms of:

- The National Environmental Management Act, Act. 107 of 1998 (NEMA);
- The "Protocol for the Specialist Assessment and Minimum report content requirements for environmental impacts on terrestrial biodiversity" in terms of Sections 24(5)(a) and (h) and 44 of the NEMA (Government Notice No. 320 of 20 March 2020).
- The National Environmental Management: Biodiversity Act, Act 10 of 2004, which allows for the conservation of endangered ecosystems and restriction of activities according to the status of the ecosystem;
- The National Forest Act, Act 84 of 1998, which provide a list of protected trees species in SA.

1.2. TERMS OF REFERENCE

The terms of reference for this appointment were to:

- Evaluate the proposed site(s) to determine whether any significant botanical or other terrestrial biodiversity features will be impacted because 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 terrestrial biodiversity 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.

1.3. ACTIVITY DESCRIPTION

The project entails the replacement and upgrade of the existing bulk water supply line for the town of Wolseley, between the intake in the Tierhokskloof River to the water treatment works near Witbrug (about 6km east of Wolseley). Water is extracted trough an intake structure within the Tierhokskloof River (a subsidiary to the Breede River), from where it is piped (gravity feed) for about 2.42 km to the Witbrug water treatment works (WTW). Like the existing pipeline the new pipeline will be located above ground for about the first 1.8 km from the inlet works along the rocky mountain slopes. The last about 700 m will be placed underground (in the valley bottom, next to the Breede River) towards the Witbrug WTW. The new pipeline will be a 300mmØ to 350mmØ steel pipeline with shut off valves at the inlet and outlet and approximately 14 air valves and 7 scour valves in between. The preferred pipe material will be Ductile Iron/Class K8 (above ground) and HDPE (underground). Minor upgrading at the Tierhokskloof inlet might also take place.

Firstly, it is important to understand that in terms of environmental impact, there is a major difference between placing the pipeline above ground and placing the pipeline underground.

1.3.1. PLACING THE PIPELINE UNDERGROUND

Both construction methods will result in a temporary impact. However, placing pipeline underground will significantly larger impact as it will result in a much larger construction corridor. The construction footprint typically entails the removal of topsoil in a 5 – 15m wide construction corridor in order to allow the placement of the topsoil to one side, access for construction vehicles and having a footprint in which to store the excavated spoil. In this construction corridor all vegetation must be removed and the soils will have been disturbed (which is likely to result in mass germination of alien invasive species in this disturbed area – because of the historical seed store still available in the topsoil). Once the pipeline has been installed excess rock and spoil from the pipeline trench will also have to be removed or re-used.

1.3.2. PLACING THE PIPELINE ABOVEGROUND

Placing the pipeline aboveground will not require a construction corridor, only require some form of access. In this report it is assumed that the existing access track (which is currently about 0.5 m wide) will be used for access and that the new pipeline will be carried in by hand or small construction vehicle. It is also assumed that the footpath will have to be widened slightly to a width of 1 – 1.5m wide to allow ease of access (taking note that in some places it will be physically impossible to widen the footpath, because of the rocky nature of some of these areas).

Secondly, when placing the pipeline aboveground it will rest on pedestals, which mean that the physical disturbance footprint can be reduced to the location of the pedestals and the narrow access route. To a large degree the vegetation in-between these pedestals will not have to be removed (apart from trimming some of the sturdier shrubs or small trees.

2. STUDY AREA & APPROACH

2.1. LOCATION & LAYOUT

Wolseley is a small town in the upper Breede River Valley, at the foot of the Mosterhoeks- and Witzenberg Mountains. The waterworks is located about 6 km east of Wolseley, just east of the White Bridge (Witbrug) over the Breede River, and just at the entrance to the Michells Pass connecting Wolseley to Ceres(Figure 1).

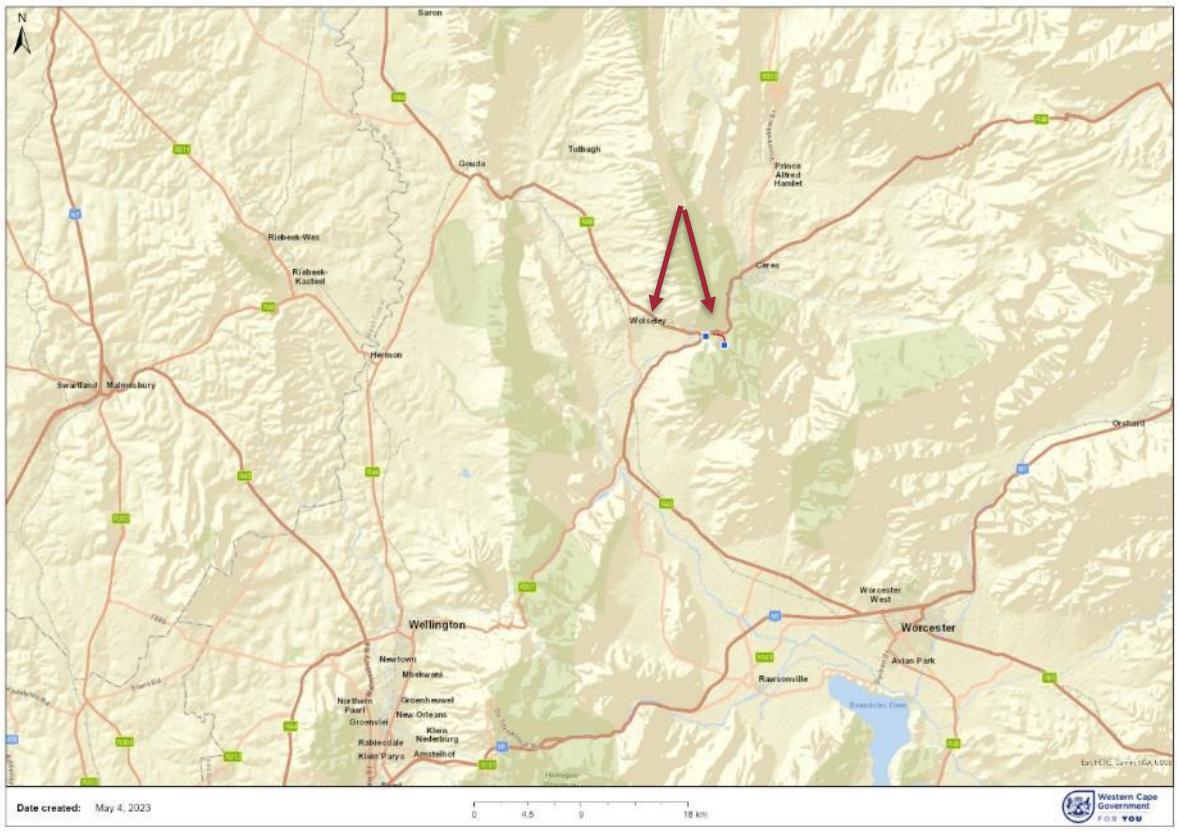

Figure 1: A map showing the location of Wolseley in relation to Worcester and Ceres and the location of the pipeline.

The Witbrug WTW is located next to the Breede River, just east of the bridge itself, while Tierhokskloof is about 1.4 km further east of Witbrug within the Michells Pass (Refer to Figure 1 and Figure 2). Wolseley falls within the Witzenberg Municipality of the Western Cape. The pipeline overlap two properties namely the remainder of Erf nr. 1886 and Erf 1887 (Ceres), both of which are part of statutory conservation areas.

Table 1: The location of the Witbrug WTW and the Tierhokskloof Inlet Structure

Description	Property	LOCATION
Tierhokskloof Inlet	Erf 1887	33°25'45.24"S 19°17'0.22"E
Witbrug WTW	Rem. Erf 1886	33°25'20.11"S 19°15'59.86"E

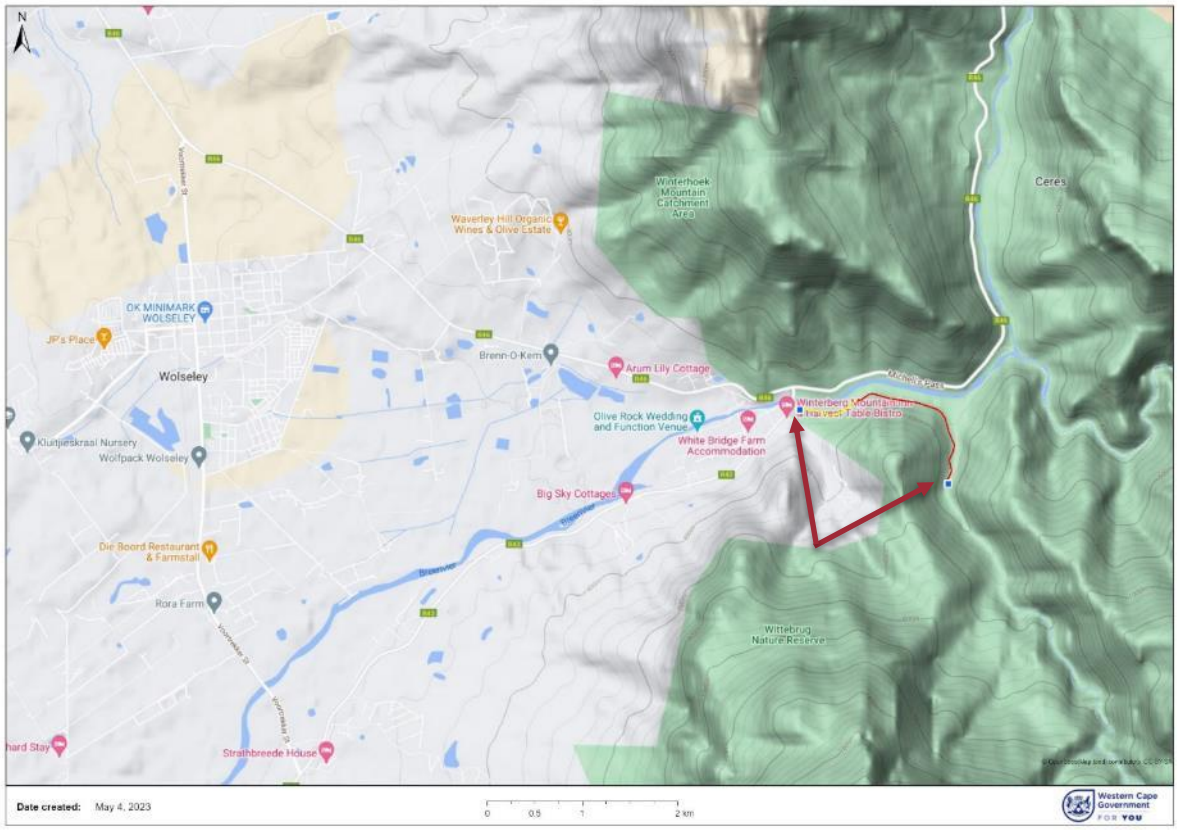

Figure 2: A map showing the location of the pipeline (Red & Yellow) to the east of Wolseley.

Figure 3: A google image showing the pipeline route: Yellow = underground section; Red = aboveground section.

2.2. CLIMATE

The study area falls within the upper regions of the Breede River Valley, which is a relatively broad and flat valley for the Western Cape Province. It falls within a Mediterranean Climate, receiving most of its rainfall during the winter months (May to September). Towards the north rainfall can reach upwards of 1 000mm per year. Summers can be very hot, due to its inland location, averaging 30°C from December to March, but can peak at near 40°C (being blocked from the cooling oceanic breezes). Winters are often colder than seaward regions (like the Overberg). Snow is a regular occurrence on the surrounding mountains but does not fall in the valley itself. Frost might occur occasionally. Spring and Autumn are transitional periods of variable rainfall and mild temperatures with occasional light snow on the highest peaks.

2.3. TOPOGRAPHY & SOILS

The pipeline route will follow the lower contours of the mountains through which both the Tierhokskloof and Breede River drains. According to the ENPAT soils map (CapeFarmMapper) the geology can be described as mainly quartzitic and feldspathic sandstone of the Peninsula Formation and the Nardouw Subgroup, Table Mountain Group, with shale and diamictite of the Cederberg and Pakhuis Formations on the crests. Soils are miscellaneous, very rocky with little or no soils (Figure 4).

Figure 4: Broad soils classification (ENPAT) encountered within the study area (CapeFarmMapper).

2.4. APPROACH & METHODOLOGY

The first step of the study was to conduct a desktop study of the study area and its immediate surroundings. Spatial information from online databases such as SANBI BGIS and Google Earth were used to evaluate the site in terms of vegetation, obvious differences in landscape (e.g., variations in soil type, rocky outcrops etc.) or vegetation densities , which might indicate differences in plant community or species composition, critical biodiversity areas and other terrestrial biodiversity features as identified in the DEA screening tool. This information was used to prepare a study area map, which is used as a reference during the physical site visit.

Plant species lists (of the expected plant species for this vegetation type) were prepared and species of special significance were flagged (for the site visit).

Figure 5: Google overview, showing the study area and the routes walked during the site visit.

A one-day site was performed on the 20th of February 2023. The site assessment survey was conducted by driving onto the site and then walking the route while assessing vegetation status. Vegetation sampling was done, by using a modified approach, based on the Braun-Blanquet vegetation survey method (Werger, 1974). During the site visit terrestrial features- and plants of specific significance was, marked, and photographed (Figure 5). A hand-held Garmin GPSMAP 62s was used to track the sampling route and for recording waypoints of locations of specific importance, while taking survey notes, and photographic records. The author endeavoured to identify and locate all significant biodiversity features, including special plant species and or specific soil conditions which might indicate special botanical features (e.g., rocky outcrops or heuweltjies) and watercourses.

2.4.1. ASSUMPTIONS AND UNCERTAINTIES

The findings are based on a one-day site visit (not long-term repetitive sampling), which means that it is likely that some plant species might have been missed (not visible or in flower). The timing of the site visit was reasonable as the veld was mature (and the purpose of the site visit was more to evaluate the status of the veld than to do a full botanical assessment). Most of the plants were still in seed and some were still in flower. The Breede River and the mouth of the Tierhokskloof used to be heavily infested with dense stands of alien invasive species and evidence of it can still be seen. However, the riparian vegetation is slowly reclaiming its original status and will go on to do so if the alien eradication program is maintained. Perennial plants were identifiable and a good understanding of the status of the vegetation and plant species in the study areas were obtained. Confidence in the findings is relatively high. There should be no limiting factors which could significantly alter the outcome of this study. It is unlikely that a full botanical assessment will result in any additional findings that would have a significant impact on the outcome.

3. DESKTOP ASSESSMENT

3.1. BROAD-SCALE VEGETATION EXPECTED

According to the South African vegetation map (2018) (Mucina & Rutherford, 2006), most of the pipeline route will impact on **North Hex Sandstone Fynbos** (along the mountain slopes). The intake structure will have a localised impact on **Fynbos Riparian Vegetation** while the last 300 m of the pipeline will overlap **Fynbos Riparian Vegetation** associated with **Breede Alluvium Fynbos** (Figure 6). Mucina & Rutherford (2006) describe North Hex Sandstone Fynbos as occurring on steep and gentle north facing slopes of these mountains. The vegetation is dominated by restios, often with a proteoid overstory, while asteraceous fynbos can be found on the lower slopes.

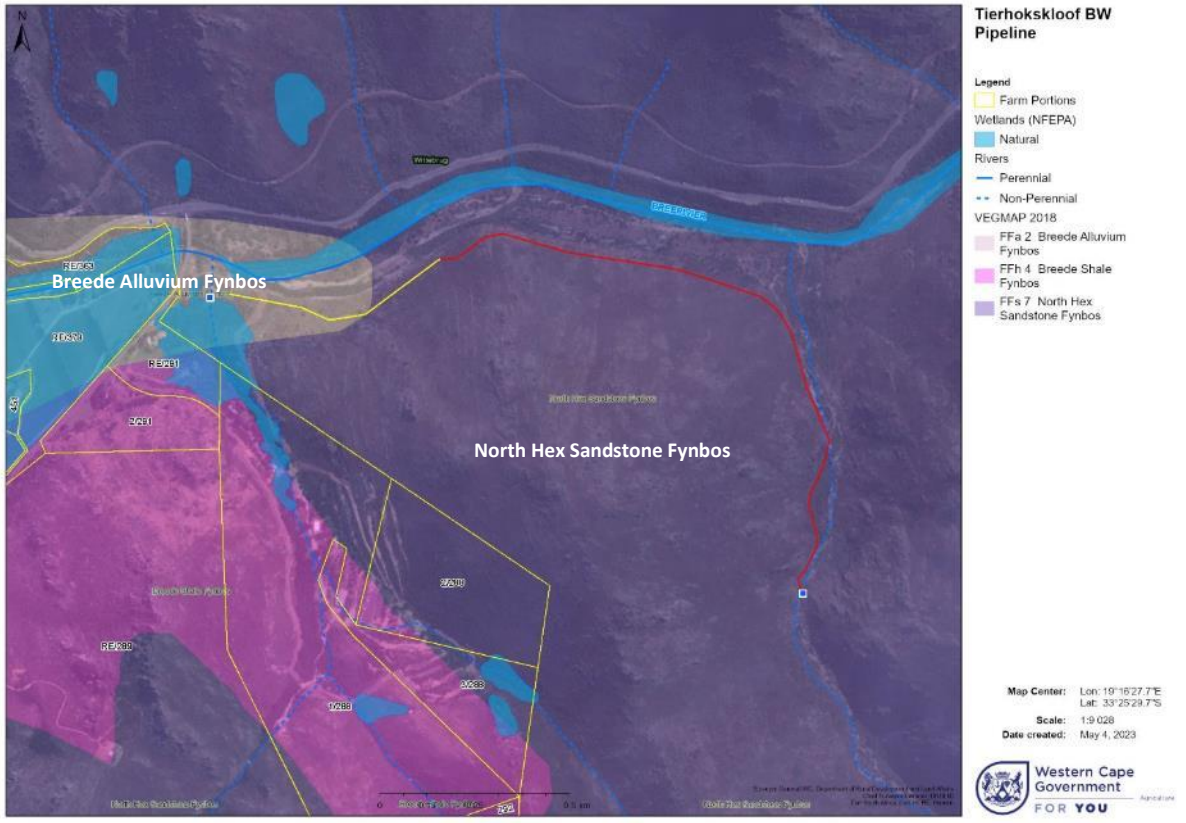

Figure 6: Vegetation map of South Africa (2018), showing the expected vegetation type within the study area (CapeFarmMapper)

According to the "*Revised List of ecosystems that are threatened and in need of protection*" (GN 47526 of 18 November 2022), promulgated in terms of the National Environmental Management Biodiversity Act, Act 10 of 2004, neither North Hex Sandstone Fynbos or Fynbos Riparian Vegetation are considered vulnerable or endangered. **Breede Alluvium Fynbos**, on the other hand, is considered **Endangered** because of high rates of habitat loss in the past 28 years, placing the ecosystem type at risk of collapse.

North Hex Sandstone Fynbos is listed as Least Concern with only 6% transformed, mostly due to cultivation, and very low erosion and well protected.

3.2. ECOLOGICAL DRIVERS & FUNCTIONING

Both vegetation types are part of the Cape Floral Kingdom (CFK) which is located at the southern tip of Africa. The Cape Floral Kingdom (CFK) has been described as one of the wonders of the world. It covers an area of 87 892 km^2 but hosts approximately 9 000 plant species of which 70% are endemic (does not occur anywhere else in the world). So special is this vegetation that the CFK has been designated as one of the earth's six plant kingdoms, putting it on par with the Boreal Forest Kingdom which covers 50 million square kilometres (Cowling & Richardson 1995). It has also been listed as one of 25 internationally recognized biodiversity hotspots. The CFR is one of the richest parts of the world in terms of floristic diversity and the degree of endemism is among the highest in the world. The CFK is also an Endemic Bird Area and levels of endemism are exceptionally high in freshwater ecosystems – many Cape Rivers show almost complete turn-over in species assemblages from one system to the next (Cowling & Richardson 1995).

Fire is integral to the persistence of fynbos ecosystems, occurring naturally during the hot, dry summer or early autumn. Edaphic conditions, especially in terms of nutrient status, soil depth and the availability of water determine the species composition of communities and the occurrence of rare species. In most fynbos types, but specifically in Alluvial Fynbos, localised soil moisture gradients are important drivers of diversity (e.g., seasonal wetlands and seeps). Due to edaphic and other factors, Alluvial Fynbos is usually surrounded by other vegetation types, most commonly Mountain Fynbos on the upper slopes and renosterveld below. Many Alluvial Fynbos occur in alluvial fans where the mountain rivers open out on to the flats or on old floodplains with meandering braided streams such as the upper Breede River (De Villiers *et. al.*, 2005).

Alien invasive species represents a key threat in fynbos systems, where they outcompete indigenous plant species for space, nutrients and light. The enhanced biomass increases the intensity and temperature of fires which, in turn, can destroy indigenous seed banks and change the physical structure and composition of soils. Fynbos is particularly vulnerable to the spread of alien invasive species after physical disturbance and unseasonal or too frequent fires (De Villiers *et. al.*, 2005).

3.3. CRITICAL BIODIVERSITY AREAS & ECOLOGICAL CORRIDORS

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

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

- **Critical biodiversity areas (CBA's)** are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of

species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses.

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

Figure 7: WCBSP CBA map (2017) showing the study area and associated critical biodiversity areas (CapeFarmMapper)

According to the 2017 Western Cape Biodiversity Spatial Plan (WCBSP) (CapeNature, 2017), both properties overlap protected areas (Figure 7). Remainder of Erf 1886 is part of the Wittebrug Nature Reserve (a CapeNature Reserve), while Erf 1887 falls within the Matroosberg Mountain Catchment Protected Area (both statutory protected areas).

4. BOTANICAL SCAN

The upper parts of the Breede River, including the Michells Pass kloof (between Ceres and Wolseley), the mouth of the Tierhokskloof, as well as the lower parts of the mountains in this kloof used to be heavily infested by alien invasive species, most notably Blackwattle (*Acacia mearnsii*), Port Jackson (*Acacia saligna*) and *Eucalyptus* species. During the last 10 – 15 years the river systems and mountains were systematically cleared through a huge (and very successful) alien eradication program. As a result, the natural riparian vegetation is starting to re-establish itself along the Breede River, although the effect of having been invaded by dense stands of alien vegetation can still be seen. The mountain fynbos and the riparian vegetation within the Tierhokskloof are still in pristine condition (not yet getting stagnant), improving as one go higher op the Tierhokskloof.

For ease of description (because of differences in vegetation type and condition) the vegetation will be discussed under the following three headings (Refer to Figure 8).

1. The vegetation encountered at the inlet structure and immediate surroundings within Tierhokskloof (Green area in Figure 8);
2. The vegetation encountered along the lower slopes of the mountain (where the pipeline will be located aboveground) (red in Figure 8); and
3. The vegetation in the area near the Witbrug WTW (where the pipeline will be placed underground) (turquoise area in Figure 8).

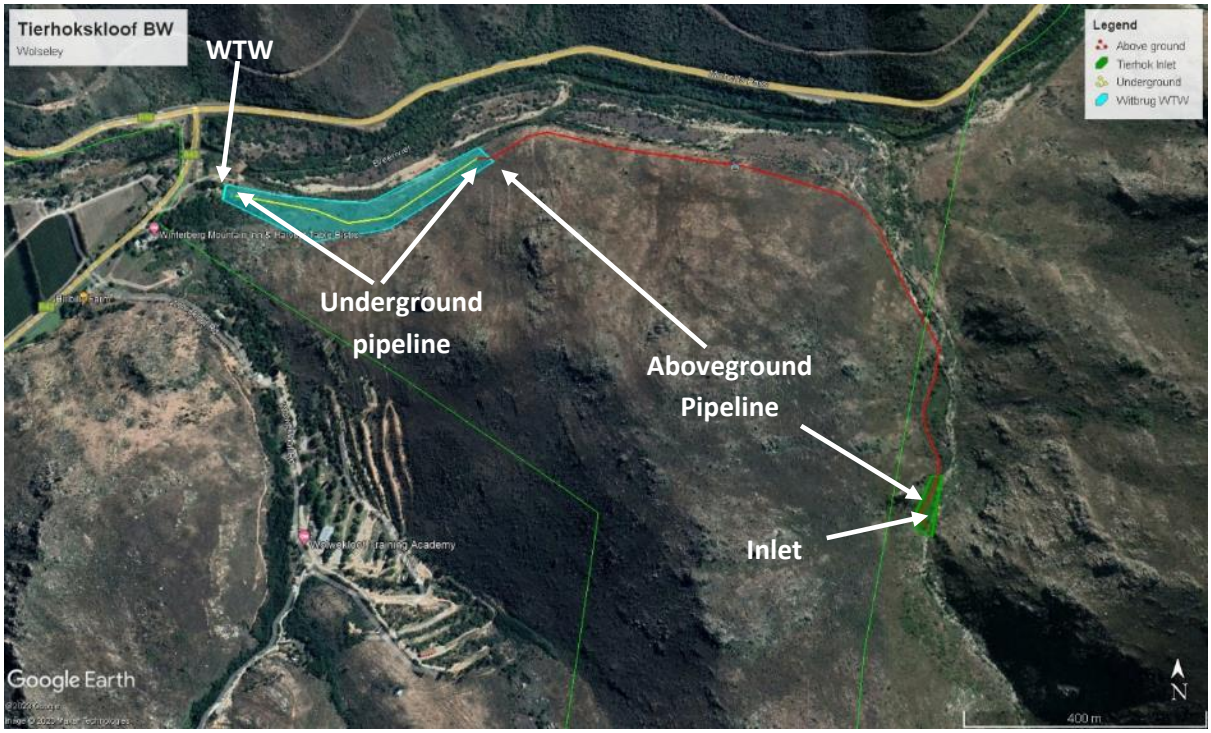

Figure 8: Google image showing the areas discussed underneath (Inlet = green, Mountain area = red, Outlet WTW = blue).

4.1. VEGETATION STATUS AT THE INLET STRUCTURE

The inlet structure is relatively small and had been constructed as a weir within the Tierhokskloof River. The natural riparian vegetation in the vicinity of this weir are in pristine riparian condition (as is the case with most of the riparian vegetation in this kloof) (marked in green in Figure 8). The Tierhokskloof River is in a relatively narrow kloof with a very rocky bottom. The riparian vegetation is open to close medium shrubland (not prone to larger trees) (Photo 1 & Photo 2). Near the weir several medium to larger trees were observed, including *Metrosideros angustifolia*, *Searsia angustifolia* (korentebos), *Heeria argentia*, *Dodonaea viscosa, Kiggelaria africana* and *Euclea racemosa* as well as grasses such as the riverbed grass, *Pennisetum macrourum*. In drier areas away from the river, bracken fern, *Pteridium aquilinum,* was observed, while large patches of *Stoebe plumosa* (slangbos), dominated open areas in between these shrubs, often alternated by patches of *Searsia angustifolia*.

Photo 1: The Tierhokskloof River, looking from the inlet weir upstream into the kloof. Note the low riparian vegetation and the rocky bottom.

Photo 2: Looking downstream onto the inlet weir, which was placed in a narrow spot within the river.

To the west of the weir, going downstream for about 50 – 60 m, a sandy open riverbank was encountered (Photo 3). Here, the vegetation was dominated by dense stands of *Stoebe plumosa* mixed with *Pteridium aquilinum* (bracken fern). *Dodonaea viscosa* fringed along the edges, and several other fynbos species was mixed in between, including *Cliffortia* cf. *strobilifera* (the cone river Cape rose), the straggly herb, *Othonna quinquedentata, Dolichothrix ericoides* and *Metalasia densa*.

Photo 3: Looking down the Tierhokskloof from the weir (which is located to the back and right of picture). Note the dense stands of *Stoebe plumosa,* alternated by *Dodonaea* and bracken fern.

If done responsibly, the construction/replacement of the pipeline is unlikely to lead to any significant long-term impacts. Short-term impacts are expected, but the veld should be able to re-establish itself. Minor upgrades to the weir itself are also unlikely to result in long term impacts if concrete/cement mixing is done away from the watercourse and on an impregnable layer. The open *Stoebe plumosa* dominated area should be used for the laydown area, but the footprint area must be managed with care and disturbances kept to a minimum.

4.2. VEGETATION STATUS – LOWER SLOPES OF THE MOUNTAIN

From the inlet works in the Tierhokskloof the pipeline roughly follows the 330/320 contour along the side of the mountain towards the mouth of the Tierhokskloof, where it turns west, and slowly drops to 320/310 contour until it reaches the existing entrance road as it nears the Witbrug WTW (the red line in Figure 8).

For most of this way (apart from near the inlet works – the green area marked in Figure 8) the route is well away from the river systems on the lower slopes of the mountain. The vegetation itself can be described as an open (to closed) graminoid dominated mountain fynbos in pristine condition, varying slightly in age (because of various fire cycles), but being mostly mature veld not yet stagnant. In places the route skirts through the lower distribution of range of *Protea nitida* stands. The veld was normally dominated by dense undergrowth of an array of restioid species mixed with grasses (Photo 6 – 11).

Deeper in the Tierhokskloof (nearer to the inlet works), larger trees such as *Heeria argentia*, *Brachylaena neriifolia, Brabejum stellatifolium, Olea europaea*, *Euclea racemosa* and *Kiggelaria africana* were encountered along the route or near vicinity of the route (Photo 4 – 5). One or two small individuals of *Podocarpus latifolius* was also observed near or within the riparian zone, but they were not within the potential footprint areas. Because of the construction method (above ground – Refer to paragraph 1.3.2) very few of these individuals would have to severely impacted, although a number might have to be trimmed.

Smaller trees like *Colpoon compressum, Diospyros glabra*, *Diospyros whyteana* and *Myrsine africana* were also observed in the slightly dryer areas as one moves out of the kloof. Other plants observed, include shrubs and herbs such as *Aspalathus* cf. *rugosa, Cliffortia* cf. *strobilifera* (cone river Caperose), *Dicerothamnus rhinocerotis* (renosterbos), the straggly *Dolichothrix ericoides, Eriocephalus africanus, Euryops abrotanifolius, Erica* cf. *abietina* subsp*. aurantiaca, Erica* cf*. multumbellifera, Hippia*

frutescens, Muraltia cf. heisteria, Othonna quinquedentata, Pelargonium species *Stoebe plumosa, Searsia glauca, Searsia lucida, Searsia tomentosa* and *Paranomus candicans.* Interesting enough, apart from the species mentioned, no other Proteaceae species (e.g., *Leucadendron* or *Leucospermum*) were observed in the vicinity of the proposed footprint, although the mountain itself is still expected to support the full array of North Hex Sandstone Fynbos species (it being located within a Conservation area and having been managed as a Nature Reserve).

Photo 4: One of the narrow rocky areas (looking from the north to south into the Tierhokskloof) in the Tierhokskloof, downstream of the inlet structure. Note the larger trees e.g., *Heeria* and *Brabejum*, towards the river (to the left of picture). Some of these trees might have to be trimmed.

Photo 5: Another of the narrow rocky area, slightly further north (downstream from Picture 3) where the pipeline will have to be placed (most likely to the left of the existing pipeline).

Photo 6: Looking downstream (south – north) and the typical vegetation encountered along the pipeline route. *Metalasia* in the foreground mixed with *Dodonaea* and *Cliffortia* towards the middle. In the background *Protea nitida* can be seen along the lower mountain slopes.

Photo 7: The typical vegetation encountered along the pipeline route, almost at the mouth of the Tierhokskloof. *Protea nitida* almost right next to the pipeline route in the background.

Photo 8: Typical vegetation encountered along the pipeline route at the mouth of the Tierhokskloof.

Photo 9: Typical vegetation encountered as the route turns west towards the WTW. The Breede River to the left of the photo.

Since the pipeline will be placed aboveground on pedestals, the proposed construction (replacement) of the new pipeline is unlikely to lead to any significant long-term impacts, as long as the existing maintenance track (even if slightly enlarged) is used for access. It was noted that this track had become overgrown and does not seem to have been maintained for the last couple of years. It is foreseen that this track will have to be cleared and potentially slightly widen in places to allow for

reasonable access. However, if the work on this tract is done responsibly with good environmental oversight and the footprint is minimised (no unnecessary vegetation clearing) the impact should be minimal and far less than if the pipeline was to be placed underground.

Photo 10: Typical vegetation encountered along the mountain slopes towards the WTW, with the Breede River on the right. The tree along the route, most likely *Euclea racemosa* or *Heeria argentia*.

Photo 11: Typical vegetation encountered along the last section of the pipeline route along the lower slopes of the mountain, just before it descends to the valley bottom towards the WTW (the Witbrug could be seen in the background).

4.3. VEGETATION STATUS – WITBRUG WTW

The last section (about 700 m) will be placed underground. In this area the pipeline will be placed underground, within, or next to the old access road (that used to run almost to the entrance of the Tierhokskloof) in the flat valley bottom near the WTW. The valley bottom (in this area) as well as the Breede River riparian zone and lower slopes of the mountains used to be overgrown by dense stands of alien vegetation (dominated by *Acacia mearnsii*, *A. saligna* and to a lesser degree *Eucalyptus* species). Through a huge alien eradication program, the whole of the upper Breede River (within the Michells Pass kloof and lower down towards the Breede River Valley) had been cleared of alien vegetation the past 10 – 15 years.

4.3.1. BREEDE RIVER RIPARIAN ZONE (NOT AFFECTED)

The riparian vegetation along the Breede River is starting to recover nicely and indigenous vegetation and trees are slowly re-establishing itself. Within the riparian zone various indigenous plants were observed, including trees like *Euclea racemosa*, *Olea, europaea*, various *Searsia* species, *Diospyros whyteana, Heeria argentia*, *Maytenus* oleoides and even two *Podocarpus latifolius* individuals as well

as shrubs and restioids like *Cliffortia* cf. *strobilifera, Cannomois virgata* (besemriet) and river grass, *Pennisetum macrourum*. Slightly away from the riparian zone (between the riparian zone and the mountain fynbos, but upstream from the turquoise area in Figure 8) the removal of the dense stands of alien invasive plants had resulted in a disturbed version of fynbos species, slowly reclaiming the veld, but still with large open areas in between. Several indigenous species, such as *Diospyros glabra*, *Colpoon compressum*, *Calopsis viminea Othonna quinquedentata, Euryops abrotanifolius*, *Hippia frutescens, Athanasia trifurcata*, *Helichrysum* cf. *altigenum, Aspalathus* cf. *rugosa Stoebe plumosa* and the grass *Hyparrhenia hirta* were observed. However, this area will not be impacted by the proposed pipeline replacement project.

4.3.2. THE UNDERGROUND PIPELINE ROUTE

The area that will be impacted by the placement of the underground pipeline is in the open valley bottom near Witbrug, adjacent and to the south of the Breede River, towards the mountain side of the old twee-spoor access road of this open valley bottom. According to the SA vegetation map some of this area would have supported **Breede Alluvium Fynbos** (an endangered vegetation type). Breede Alluvium Fynbos is described by Mucina & Rutherford (2006) as "*open emergent tall proteoids in a moderately tall shrub matrix with a graminoid understory. Asteraceous and proteoid fynbos are dominant, with localised restioid fynbos and ericaceous fynbos*".

Photo 12: The old twee-spoor access road that used to led almost up to the Tierhokskloof River, (looking from east to west downriver towards the WTW). The blue line indicate the proposed pipeline route.

Photo 13: Slightly further downstream, showing the proposed location of the underground pipeline. Note the disturbed grassy ground cover.

In this case the area that will be impacted clearly does not support any remaining Breede Alluvium

Fynbos. Whether this is because of past disturbances or because of the dense stands of invasive alien species that used to grow in this area is unsure. During the site visit it was clear that the proteoid, restioid and even fynbos component expected in Breede Alluvium Fynbos had been replaced by a low grass layer, dominated by *Cynodon dactylon* on the slightly higher and drier areas. As one moves closer to the riparian zone *Hyparrhenia hirta* is commonly found within the grassy bottom layer, while *Pennisetum macrourum* (riverbed grass) forms dense patches within the lower wetland areas associated with the Breede River itself and it is more likely to be disturbed version of **Fynbos Riparian Vegetation.**

Photo 14: Dense stands of *Pennisetum macrourum* encountered in the lower valley towards the Breede River. The pipeline is proposed to run to the left of picture.

Photo 15: The WTW is located on a small rocky outcrop near Witbrug. The photo shows the disturbed footprint area where pipelines had to be replaced (as it goes up this rocky outcrop).

Photo 16: A picture of the WTW on top of the rocky outcrop.

The underground section of the pipeline will impact on disturbed veld that has been reduced to a grassy pasture like vegetation type. Apart from a few hardy species (e.g., *Diospyros glabra*) not even remnant Breede Alluvium Fynbos species were observed. The impact will be located almost entirely within an area already disturbed and is unlikely to have any significant impact on loss of vegetation type and associated habitat or loss of ecological processes (e.g., migration patterns, pollinators, river function etc.) or the loss of local biodiversity and threatened plant species. Since the construction impact will be temporary of nature it is also unlikely to result in loss of connectivity.

4.4. FLORA ENCOUNTERED

Table 2 gives a list of the plant species encountered during this study. It is important to note that the species list is based on a one-day site visit, and the focus was on the evaluation of the vegetation status more than a full botanical assessment. However, the author took care to look for potential significant species (e.g., protected- and rare or endangered species) that might be located within this vegetation type. No red-listed plant was observed, but one species protected in terms of the National Forest Act, Act 84 of 1998 (NFA) was observed.

Table 2: List of plant species observed within the proposed development footprint.

NO.	SPECIES NAME	FAMILY	STATUS	LOCATION
1.	*Anthospermum aethiopicum*	RUBIACEAE	LC	A relatively large herb growing in disturbed areas.
2.	*Aspalathus* cf. *rugosa*	FABACEAE	LC	Medium large shrub rarely observed – lower slopes.
3.	*Athanasia trifurcata*	ASTERACEAE	LC	Large herb found in disturbed upper riparian areas.
4.	*Brabejum stellatifolium*	PROTEACEAE	LC	Medium large within the riparian zone.
5.	*Brachylaena neriifolia*	ASTERACEAE	LC	Occasionally within the riparian zone.
6.	*Calopsis viminea*	RESTIONACEA	LC	Lower slopes near Breede
7.	*Cannomois virgata*	RESTIONACEA	LC	Large reed, within riparian zone.
8.	*Cliffortia cf. strobilifera*	ROSACEAE	LC	A large straggly shrub encountered in the kloof.
9.	*Cliffortia ilicifolia*	ROSACEAE	LC	Medium large prickly shrub
10.	*Colpoon compressum*	SANTALACEAE	LC	Lower slopes of the Mountain
11.	*Dicerothamnus rhinocerotis (=Elytropappus)*	ASTERACEAE	LC	Medium large shrub observed along lower slopes.
12.	*Diospyros glabra*	EBENACEAE	LC	Large shrub/small tree, associated with fynbos and river edge
13.	*Diospyros whyteana*	EBEJACEAE	LC	A small tree encountered on the lower disturbed slopes.
14.	*Dodonaea viscosa*	SAPINDACEAE	LC	Medium small tree, commonly observed on lower slopes.
15.	*Dolichothrix ericoides*	ASTERACEAE	LC	Medium loose shrub occasionally observed on lower slopes.
16.	*Dolichothrix ericoides*	ASTERACEAE	LC	A large open shrub occasionally observed.
17.	*Erica* cf. *abietina subsp. aurantiaca*	ERICACEAE	LC	A medium large shrub on the lower slopes of the mountain
18.	*Erica* cf. *coccinea* (no flowers)	ERICACEAE	LC	Large shrub, occasionally on the lower slopes of the mountain

NO.	SPECIES NAME	FAMILY	STATUS	LOCATION
19.	*Erica* cf. *multumbellifera*	ERICACEAE	LC	A medium low shrub on the lower slopes of the mountain
20.	*Eriocephalus africanus*	ASTERACEAE	LC	Medium shrub occasionally on the lower slopes.
21.	*Euclea racemosa*	EBENACEAE	LC	Medium to large tree, lower slopes & riparian zone
22.	*Euryops abrotanifolius*	ASTERACEAE	LC	A densely leavy shrub on the lower slopes of the mountain
23.	*Heeria argentia*	ANACARDACEAE	LC	Medium large tree, along the lower mountain slopes.
24.	*Helichrysum* cf. *altigenum*	ATERACEAE	LC	Small prostrate herb, occasionally observed.
25.	*Hippia frutescens*	ASTERACEAE	LC	Medium large open shrub occasionally observed.
26.	*Hyparrhenia hirta*	POACEAE	LC	A tall grass growing on the lower disturbed slopes.
27.	*Kiggelaria africana*	ACHARIACEAE	LC	Small tree within riparian zone.
28.	*Maytenus oleoides*	CELASTRACEAE	LC	Medium tree encountered near the Breede River.
29.	*Metalasia densa*	ASTERACEAE	LC	Medium to tall shrub, occasionally observed along the lower slopes.
30.	*Metrosideros angustifolia*	MYRTACEAE	LC	Medium large tree occasionally observed in riparian zone.
31.	*Muraltia* cf. *heisteria*	POLYGALACEAE	LC	Rarely observed along the mountain slopes.
32.	*Myrsine africana*	MYRSINACEAE	LC	Small tree/shrub growing underneath larger trees.
33.	*Olea europaea*	OLEACEAE	LC	Large tree, occasionally observed near the water courses.
34.	*Othonna quinquedentata*	ASTEARACEAE	LC	An erect shrub on the lower slopes of the Fynbos
35.	*Paranomus candicans*	PROTEACEAE	LC	Medium shrub occasionally observed on the mountain.
36.	*Pelargonium* species	GERANIACEAE		A small low growing shrub rarely observed along the footpath.
37.	*Pennisetum macrourum*	POACEAE	LC	Riverbed grass
38.	*Phylica spicata*	RHAMNACEAE	LC	A large shrub only observed near the Breede River.
39.	*Podocarpus latifolius*	PODOCARPACEAE	LC NFA Protected species	Observed within the riparian zone of the rivers.
40.	*Pteridium aquilinum*	PTERIDOPPHYTA	LC	Bracken fern in drier riparian vegetation,
41.	*Searsia angustifolia*	ANACARDACEAE	LC	Medium tree, often in dense patches within the riparian zone.
42.	*Searsia glauca*	ANACARDACEAE	LC	Medium to large shrub occasionally observed on lower slopes.
43.	*Searsia lucida*	ANACARDACEAE	LC	Small tree occasionally observed near riparian zone.
44.	*Searsia tomentosa*	ANACARDACEAE	LC	Medium shrub, rarely observed between riparian and lower slopes
45.	*Stoebe plumosa*	ASTERACEAE	LC	Large reed, lower slopes of mountain.

4.5. THREATENED AND PROTECTED PLANT SPECIES

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

Red list of South African plant species: The Red List of South African Plants online provides up to date information on the national conservation status of South Africa's indigenous plants (SANBI, 2020).

- No red-listed species was observed during the study.

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 species protected in terms of NEM: BA was observed.

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).

- One species protected in terms of the NFA was observed, namely ***Podocarpus latifolius***. However, none of the individuals observed were near the footprint area, and it is considered unlikely that any of the individuals will be impacted.

4.6. PLANT SPECIES THEME SENSITIVITY

According to the NEMA EIA Sensitivity scan for the site generated on 2022/09/22 by Mr. Bernard de Witt of EnviroAfrica (the EAP) the plant species theme for this project is considered of medium sensitivity.

Even though the proposed project is located within a statutory reserve, the findings of this study suggest that the plant species should be of low sensitivity, since no red-listed species was observed, only one protected species was observed (which is unlikely to be impacted). In addition, the construction disturbance will be temporary of nature, the scale of the impact significantly reduced because the pipeline will for the most part be located aboveground. The underground sections will be in an area already disturbed. Lastly the proposed replacement is unlikely to have any significant

impact on loss of vegetation type and associated habitat or loss of ecological processes (e.g., migration patterns, pollinators, river function etc.) or the loss of local biodiversity and threatened plant species. Since the construction impact will be temporary of nature it is also unlikely to result in loss of connectivity.

5. FAUNA AND AVI-FAUNA

No formal fauna or avi-fauna screening was done as part of this study, but observations were made during the site visit. A large portion of the pipeline falls within the Wittebrug Nature Reserve, while the whole pipeline is within the Matroosberg Mountain Catchment area (both statutory protected areas). However, the construction impact will be temporary of nature and is located within an existing disturbance footprint (it will replace the existing pipeline) but might have to be placed next to the existing pipeline as water supply must be maintained even during the construction period. The construction period will be short term (about 6 months, according to the engineering report).

According to the **NEMA EIA Sensitivity** scan for the site generated on 2022/09/22 by Mr. Bernard de Witt of EnviroAfrica (the EAP) the:

- Animal Species Theme Sensitivity is **HIGH SENSITIVE** because of the potential presence of bird species and insect species, discussed under Heading 5.4;
- Terrestrial Biodiversity Theme Sensitivity is **VERY HIGH SENSITIVE** because of the potential impact on CBA and ESA areas. The CBA is discussed under Heading 3.3.

5.1. MAMMALS

The construction of the pipeline is located within a statutory conserved area. According to the Protected Area Management Plan for the Hexriver Complex (CapeNature, 2021) it has confirmed distribution records for 24 mammal species with rodents (seven species), even-toed ungulates (seven species) and carnivores (four species) dominating the mammal fauna. Other mammal taxa present include two bat species, one shrew, one hare, one odd-toed ungulate and a single primate species. The only threatened species present is the Cape leopard, *Panthera pardus*, which is listed as Vulnerable. Three Near-Threatened taxa are also present, namely the grey rhebuck, *Pelea capreolus*, the laminate vlei rat, *Otomys laminatus* and the Cape clawless otter, *Aonyx capensis*.

During the site visit the only physical evidence of mammal species were the calls and barks of the Chacma baboon and droppings of Rock Hyrax (Dassie) and Cape otter.

5.2. REPTILES

The Hexriver Complex should have a relatively rich reptile fauna but only six reptile species have been recorded to date. The geometric tortoise (*Psammobates geometricus*) is known from several localities in the Ceres and Tulbagh regions, but the Hexriver Complex itself, does not have any known suitable habitat for this species. The occurrence of geometric tortoise populations in the Hexriver Complex is unlikely but should always be borne in mind when conducting surveys. The conservation of reptiles in

the Hexriver Complex relies on the effective control of invasive alien woody plant species, appropriate fire return intervals and preventing too much (>25 %) of the reserve burning in any one fire event (CapeNature, 2021)

5.3. AVI-FAUNA

According to the Protected Area Management Plan for the Hexriver Complex (CapeNature, 2021) the number of bird species recorded for the Hexriver Complex is low (105 species), which are typical of mountain fynbos habitat. The reserve complex is not important in terms of threatened species with only two species of conservation concern recorded. The Verreaux's Eagle, *Aquila verreauxii* was recorded from four of the nature reserves (Wittebrug, Ben-Etive, Fonteintjiesberg and Bokkeriviere) at moderate reporting rates (Taylor et al. 2015). Although listed regionally as Least Concern the Ground Woodpecker is listed globally as Near Threatened and was therefore included in the list of threatened species. So far the woodpecker was only recorded once in the Wittebrug Nature Reserve.

5.4. ANIMAL SPECIES THEME SENSITIVITY

The animal species theme sensitivity is considered **high sensitive** because the proposed site falls within the potential distribution range of the following species (Refer to Table 3).

Table 3: Fauna species listed in the DEA Screening report (Appendix 2)

SENSITIVITY	NAME	DISCUSSION
High	Aves – *Aquila verreauxii* Verreaux's Eagle	The Verreaux's Eagle is considered regionally Vulnerable, because of suspected population size reduction of 30% over three generations (Taylor, 2015). The Eagle is found in association with Fynbos, Grassland, Savannah, Nama-Karoo and Succulent Karoo. Within these biomes, it is mainly restricted to mountainous terrain (Davies and Allan 1997) because of its hunting and breeding biology. The distribution is closely linked to the presence of Rock Hyrax *Procavia capensis* (Gargett and Mundy 1990). The eagle has been observed in the Wittebrug Nature Reserve and Rock Hyrax droppings was also observed. It is thus likely that the bird may occur in these mountains. However, because of the temporary nature and the localised (in terms of the larger mountain reserve) impact of the project, it is highly unlikely that the project will have any significant impact on the hunting or breeding patters of these birds. With regards to this project the sensitivity rating should be **low sensitive**.
Medium	Aves *Circus maurus* Black Harrier	The Black harrier is one of southern Africa's rarest endemic raptors and is currently considered endangered. The black harrier's breading habitat is Fynbos and Renosterveld or low shrubland. The proposed project will impact on small portions of fynbos, but the impact will be short term, located within an already disturbed area and will be very localized (in

SENSITIVITY	NAME	DISCUSSION
		terms of the larger mountain reserve). It is considered highly unlikely that it will have any significant impact on the breeding or feeding patterns of these birds. With regards to the is project the sensitivity rating should be **low sensitive**.
Medium	Invertebrate – *Conocephalus peringueyi* Peringuey's Meadow Katydid	This species of grasshopper is only known from mountains in the Fynbos biome, South Africa and is considered Vulnerable, because its extent of occurrence and area of occupancy are relatively small and has only been recorded in six known locations. It is a mountain specialist and only occur at high elevations. The area and extent of its habitat are estimated to be in decline due to climate change and habitat destruction. The greatest threats to this species are habitat destruction due to livestock grazing and habitat shifts caused by climate change (Bazelet & Naskrecki, 2013). This species of grasshopper is mainly found at high elevations, while the pipeline route will be located along the lower slopes of the mountains. It is considered highly unlikely that this temporary impact away from its main habitat will have any significant impact on this species. With regards to the is project the sensitivity rating should be **low sensitive**.
Medium	Invertebrate – *Brinckiella aptera* Mute Winter Katydid	The Mute Winter Katydid (*Brinckiella aptera*) is considered Vulnerable because its extent of occurrence is relatively small and has only been recorded in four locations, and its habitat quality is estimated to be in decline. This species occurs within the Fynbos and Succulent Karoo biomes, both notable biodiversity hotspots and under anthropogenic stress (e.g., livestock grazing, cultivation with annual crops, and urban development). This katydid probably feeds on flowers and leaves of a very narrow range of host plants. It occurs primarily on low, herbaceous shrubs, where it feeds and stridulates at night, but can be found basking in the daytime on sunny days during the winter and early spring (a time when very few insects are active). Very unusually for the genus and for katydids in general, this species is the first in its subfamily to display a complete lack of stridulatory organs, raising interesting evolutionary questions regarding mate attraction and intraspecies communication (Naskrecki and Bazelet 2009). The greatest threat to this species is habitat destruction by cultivation with annual crops, over-grazing, urban development, or alien species invasion. Climate change is also likely to affect the distribution of the species host plants by altering rainfall patterns and ambient temperatures. At present it has not recorded within any protected areas. Although this species might occur within the lower fynbos of the footprint area, the construction method (being temporary and aboveground) in the fynbos section will significantly reduce any potential impact on this species.

SENSITIVITY	NAME	DISCUSSION
		With regards to the is project the sensitivity rating should be **low sensitive**.
Medium	Invertebrate – *Conocephalus vaginalis* Striped Restio Katydid	The Striped Restio Katydid (*Conocephalus vaginalis*) is considered Endangered because its extent of occurrence is relatively small (about 200 km^2) and it is only known from two locations in the Ceres Mountains of the Fynbos biome and its area of extent and quality of habitat are considered to be in decline. Most of its distribution range has already been transformed for fruit production. This species is particularly prone to climate change since it is small bodied, flightless, has a close association with Restionaceae, and is already distributed on high elevation mountain slopes. This combination of characters severely restricts the ability of the species to adapt or shift its distribution in response to changing environmental conditions. Males are territorial and only one adult male can be found in a single tuft of restios, regardless of the size of the tuft. Their diet is unknown, but it is likely that they feed on seeds and flowers of restios. Any process which threatens restios will also threaten the survival of this species (Naskrecki and Bazelet 2009). Although this species had only been recorded in the Ceres Mountains, it may occur in the adjacent Wolseley Mountains. However, the proposed aboveground construction method (being temporary and aboveground with minimum impact on fynbos species) will significantly reduce any potential impact on this species. With regards to the is project the sensitivity rating should be **low sensitive**.

6. IMPACT ASSESSMENT METHOD

The concept of environmental impact assessment in terms of the National Environmental Management Act, Act 107 of 1998 (NEMA) and the Environmental Impact Assessment (EIA) was developed to identify and evaluate the nature of potential impact to determine whether an activity is likely to cause significant environmental impact on the environment. The concept of significance is at the core of impact identification, evaluation and decision making, but despite this the concept of significance and the method used for determining significance remains largely undefined and open to interpretation (DEAT, 2002).

The objective of this study was to evaluate the remaining biodiversity of the study area to identify significant environmental features which might be impacted by of the proposed activity. 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.

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

6.1.1. CRITERIA USED

***Conservation value*:** Conservation value refers to the intrinsic value of an attribute (e.g., an ecosystem, a vegetation type, a natural feature or a species) or its relative importance towards the conservation of an ecosystem or species or even natural aesthetics. Conservation status is based on habitat function, its vulnerability to loss and fragmentation or its value in terms of the protection of habitat or species (Refer to Table 4 for categories used).

Likelihood refers to the probability of the specific impact occurring because of the proposed activity (Refer to Table 5, for categories used).

Duration refers to the length in time during which the activity is expected to impact on the environment (Refer to Table 6).

Extent refers to the spatial area that is likely to be impacted or over which the impact will have

influence, should it occur (Refer to Table 7).

Severity refers to the direct physical or biophysical impact of the activity on the surrounding environment should it occur (Refer to Table 8).

Table 4: Categories used for evaluating conservation status.

CONSERVATION VALUE	
Low (1)	The attribute is transformed, degraded not sensitive (e.g. Least threatened), with unlikely possibility of species loss.
Medium/low (2)	The attribute is in good condition but not sensitive (e.g. Least threatened), with unlikely possibility of species loss.
Medium (3)	The attribute is in good condition, considered vulnerable (threatened), or falls within an ecological support area or a critical biodiversity area, but with unlikely possibility of species loss.
Medium/high (4)	The attribute is considered endangered or, falls within an ecological support area or a critical biodiversity area, or provides core habitat for endemic or rare & endangered species.
High (5)	The attribute is considered critically endangered or is part of a proclaimed provincial or national protected area.

Table 5: Categories used for evaluating likelihood.

LIKELIHOOD	
Highly Unlikely (1)	Under normal circumstances it is almost certain that the impact will not occur.
Unlikely (2)	The possibility of the impact occurring is very low, but there is a small likelihood under normal circumstances.
Possible (3)	The likelihood of the impact occurring, under normal circumstances is 50/50, it may or it may not occur.
Probable (4)	It is very likely that the impact will occur under normal circumstances.
Certain (5)	The proposed activity is of such a nature that it is certain that the impact will occur under normal circumstances.

Table 6: Categories used for evaluating duration.

DURATION	
Short (1)	Impact is temporary and easily reversible through natural process or with mitigation. Rehabilitation time is expected to be short (1-2 years).
Medium/short (2)	Impact is temporary and reversible through natural process or with mitigation. Rehabilitation time is expected to be relative short (2-5 years).
Medium (3)	Impact is medium-term and reversible with mitigation but will last for some time after construction and may require ongoing mitigation. Rehabilitation time is expected to be longer (5-15 years).
Long (4)	Impact is long-term and reversible but only with long term mitigation. It will last for a long time after construction and is likely to require ongoing mitigation. Rehabilitation time is expected to be longer (15-50 years).
Permanent (5)	The impact is expected to be permanent.

Table 7: Categories used for evaluating extent.

EXTENT	
Site (1)	Under normal circumstances the impact will be contained within the construction footprint.
Property (2)	Under normal circumstances the impact might extent outside of the construction site (e.g., within a 2 km radius), but will not affect surrounding properties.
Surrounding properties (3)	Under normal circumstances the impact might extent outside of the property boundaries and will affect surrounding landowners or –users, but still within the local area (e.g., within a 50 km radius).
Regional (4)	Under normal circumstances the impact might extent to the surrounding region (e.g., within a 200 km radius), and will impact on landowners in the larger region (not only surrounding the site).
Provincial (5)	Under normal circumstances the effects of the impact might extent to a large geographical area (>200 km radius).

Table 8: Categories used for evaluating severity.

SEVERITY	
Low (1)	It is expected that the impact will have little or no affect (barely perceptible) on the integrity of the surrounding environment. Rehabilitation not needed or easily achieved.
Medium/low (2)	It is expected that the impact will have a perceptible impact on the surrounding environment, but it will maintain its function, even if slightly modified (overall integrity not compromised). Rehabilitation easily achieved.
Medium (3)	It is expected that the impact will have an impact on the surrounding environment, but it will maintain its function, even if moderately modified (overall integrity not compromised). Rehabilitation easily achieved.
Medium/high (4)	It is expected that the impact will have a severe impact on the surrounding environment. Functioning may be severely impaired and may temporarily cease. Rehabilitation will be needed to restore system integrity.
High (5)	It is expected that the impact will have a very severe to permanent impact on the surrounding environment. Functioning irreversibly impaired. Rehabilitation often impossible or unfeasible due to cost.

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 to allow the competent authority to make informed decisions. Specialist studies must advise the environmental assessment practitioner (EAP) on the significance of impacts in his field of specialty. To do this, the specialist must identify all potentially significant environmental impacts, predict the nature of the impact, and evaluate the significance of that impact should it occur.

Potential significant impacts are evaluated, using the method described above, to determine its potential significance. The potential significance is then described in terms of the categories given in Table 9. Mitigation options are evaluated, and comparison is then made (using the same method) of potential significance before mitigation and potential significance after mitigation (to advise the EAP).

Table 9: Categories used to describe significance rating (adjusted from DEAT, 2002)

SIGNIFICANCE	DESCRIPTION
Insignificant or Positive (4-22)	There is no impact, or the impact is insignificant in scale or magnitude because of low sensitivity to change or low intrinsic value of the site, or the impact may be positive.
Low (23-36)	An impact barely noticeable in scale or magnitude because of low sensitivity to change or low intrinsic value of the site or will be of very short-term or is unlikely to occur. Impact is unlikely to have any real effect and no or little mitigation is required.
Medium Low (37-45)	Impact is of a low order and therefore likely to have little real effect. Mitigation is easily achieved. Social, cultural, and economic activities can continue unchanged, or impacts may have medium to short term effects on the social and/or natural environment within site boundaries.
Medium (46-55)	Impact is real, but not substantial. Mitigation is both feasible and easily possible but may require modification of the project design or layout. Social, cultural, and economic activities of communities may be impacted, but can continue (albeit in a different form). These impacts will usually result in medium to long term effect on the social and/or natural environment, within site boundary.
Medium high (56-63)	Impact is real, substantial, and undesirable, but mitigation is feasible. Modification of the project design or layout may be required. Social, cultural, and economic activities may be impacted, but can continue (albeit in a different form). These impacts will usually result in medium to long-term effect on the social and/or natural environment, beyond site boundary within local area.
High (64-79)	An impact of high order. Mitigation is difficult, expensive, time-consuming or some combination of these. Social, cultural, and economic activities of communities are disrupted and may come to a halt. These impacts will usually result in long-term change to the social and/or natural environment, beyond site boundaries, regional or widespread.
Unacceptable (80-100)	An impact of the highest order possible. There is no possible mitigation that could offset the impact. Social, cultural, and economic activities of communities are disrupted to such an extent that these come to a halt. The impact will result in permanent change. Very often these impacts are un-mitigatable and usually result in very severe effects, beyond site boundaries, national or international.

7. SITE SENSITIVITY EVALUATION

The proposed project entails the replacement and upgrade of the about 2.42 km existing bulk water supply line for the town of Wolseley, between the intake in the Tierhokskloof River to the water treatment works near Witbrug. The new pipeline will be located above ground from the inlet along the lower mountain slopes for most of the way (about 1.8 km). The last section of the pipeline (about 700 m) in the valley bottom near Witbrug will be placed underground. Minor upgrading at the Tierhokskloof inlet might also take place. The new pipeline will follow the same route as the existing pipeline but will have to be located next to the old pipeline (since the old pipeline must remain in operation until the new pipeline are in operation).

Placing the pipeline aboveground will reduce the construction impact significantly since it will not require a construction corridor or any major of continuous excavations. The pipeline will rest on pedestals, which mean that the physical disturbance footprint can be reduced to the location of the pedestals and a narrow access route. To a large degree the vegetation in-between these pedestals will not have to be removed (apart from trimming some of the sturdier shrubs or small trees. The underground section of the pipeline is in an area covered by vegetation that has already been disturbed (although slowly recovering).

7.1. SITE SENSITIVITY SUMMARY

7.1.1. HABITAT CONDITIONS AND DIVERSITY

The inlet structure is relatively small and had been constructed as a weir within the Tierhokskloof River. The natural riparian vegetation (**Fynbos Riparian Vegetation)** in the vicinity of this weir are in pristine riparian condition (as is the case with most of the riparian vegetation in this kloof) (refer to Par. 4.1). From the inlet works in the Tierhokskloof the pipeline follows the lower slopes of the mountain (well away from the river) towards the Witbrug WTW. The mountain fynbos (North **Hex Sandstone Fynbos**) itself, is pristine condition, varying slightly in age (because of various fire cycles), but being mostly mature veld not yet stagnant. In places the route skirts through the lower distribution of range of *Protea nitida* stands (refer to Par. 4.2). The last section of the pipeline will be in the open valley bottom near Witbrug and will potentially overlap **Breede Alluvium Fynbos (**an endangered vegetation type). However, the vegetation encountered might represent a very disturbed version of Breede Alluvium Fynbos but is more likely to be disturbed **Fynbos Riparian Vegetation,** dominated by a low *Cynodon dactylon* grassy fields (on the slightly higher and drier areas), replaced by larger grass species and riverbed grass towards the Breede River itself.

7.1.2. LAND-USE

A large portion of the pipeline falls within the Wittebrug Nature Reserve, while the whole pipeline is within the Matroosberg Mountain Catchment area (both statutory protected areas).

- The development is of such a small scale in terms of the larger property on which it is located, that it is **highly unlikely to have any significant impact on the current land-use**.

7.1.3. VEGETATION

According to the "*Revised List of ecosystems that are threatened and in need of protection*" (GN 47526 of 18 November 2022), promulgated in terms of the National Environmental Management Biodiversity Act, Act 10 of 2004, neither North Hex Sandstone Fynbos or Fynbos Riparian Vegetation are considered vulnerable or endangered. North Hex Sandstone Fynbos is listed as Least Concern with only 6% transformed, mostly due to cultivation, and very low erosion and well protected. **Breede Alluvium Fynbos**, on the other hand, is considered **Endangered** because of high rates of habitat loss in the past 28 years, placing the ecosystem type at risk of collapse. However, the area in which the Breede River Alluvium Fynbos is expected has been disturbed and although it might represent a very disturbed version of Breede Alluvium Fynbos, it is more likely to be disturbed **Fynbos Riparian Vegetation,** dominated by a low *Cynodon dactylon* grassy fields (on the slightly higher and drier areas), replaced by larger grass species and riverbed grass towards the Breede River itself (Refer to Heading 3.1 & 4).

- In terms of vegetation, it is considered highly unlikely that the proposed development will contribute significantly to the loss of vegetation type or associated habitat.

7.1.4. THREATENED AND PROTECTED PLANT SPECIES

No red-data or NEM:BA protected plant species were observed within the proposed footprint. One species protected in terms of the NFA was observed, namely ***Podocarpus latifolius*** (refer to Heading 4.5), but they were all located within the riparian zones of the Breede River or Tierhokskloof River, away from the proposed footprint area.

- According to the DEA Screening tool report, the relative plant species theme sensitivity is considered of medium sensitivity. Even though the proposed project is located within a statutory reserve, the findings of this study suggest that the **plant species should be of low sensitivity**, since no red-listed species was observed, only one protected species was observed (which is unlikely to be impacted).

7.1.5. FAUNA AND AVI-FAUNA

During the site visit the only physical evidence of mammal species were the calls and barks of the Chacma baboon and droppings of Rock Hyrax (Dassie) and Cape otter. According to the Protected Area Management Plan for the Hexriver Complex (CapeNature, 2021) 24 mammal species has been recorded in the mountain complex, which includes seven rodent's species, seven even-toed ungulates, four carnivores two bat species, one shrew, one hare, one odd-toed ungulate and a single primate species. The only threatened species present is the Cape leopard, *Panthera pardus*, which is listed as Vulnerable. The Hexriver Complex should have a relatively rich reptile fauna but only six reptile species have been recorded to date. The number of bird species recorded for the Hexriver Complex is low (105 species), which are typical of mountain fynbos habitat. The reserve complex is not important in terms of threatened species with only two species of conservation concern recorded, namely the Verreaux's Eagle, *Aquila verreauxii* and the Ground Woodpecker (which is listed regionally as Least Concern but globally as Near Threatened and therefore included) (Refer to Heading 5.1 - 5.3). The animal species theme sensitivity is considered **high sensitive** because the proposed site overlaps the potential distribution range of two bird species (the vulnerable Verreaux's Eagle, the endangered Black Harrier) and three invertebrate (grasshopper) species, namely the Peringquey's Meadow

Katydid (vulnerable), the Mute Winter Katydid (vulnerable) and the Striped Restio Katydid (endangered).

- However, it is unlikely that the proposed project will pose any significant impact towards any of these species, as the bulk of the pipeline will be aboveground and the impact temporary and short term, with little direct impact on fynbos vegetation itself (Refer to Heading 5.4 & specifically Table 3). **With** regards **to this project the sensitivity rating should be low sensitive.**

7.1.6. CONSERVATION PRIORITY AREAS

According to the 2017 Western Cape Biodiversity Spatial Plan (WCBSP) (CapeNature, 2017), both properties overlap protected areas (Figure 7). Remainder of Erf 1886 is part of the Wittebrug Nature Reserve (a CapeNature Reserve), while Erf 1887 falls within the Matroosberg Mountain Catchment Protected Area (both statutory protected areas). However, the bulk of the pipeline will be aboveground and the impact temporary and short term, with little direct impact on fynbos vegetation itself (Refer to Heading 3.3 and 1.3). The proposed project have the potential to result in a much larger potential environmental impact (because of the much larger construction related impacts, associated with the pipeline been placed underground).

- Because of the aboveground placement, it is unlikely to have any significant impact on loss of vegetation type and associated habitat or loss of ecological processes (e.g., migration patterns, pollinators, river function etc.) or the loss of local biodiversity and threatened plant species. As a result, the impact on the critical biodiversity areas is considered of **low sensitivity**.

7.2. TERRESTRIAL BIODIVERSITY IMPACT ASSESSMENT

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

Table 10: Impact assessment associated with the proposed activity

Impact assessment								
Aspect	**Mitigation**	**CV**	**Lik**	**Dur**	**Ext**	**Sev**	**Significance**	Short discussion
Special habitats: Potential impact on special habitats (e.g. true quartz or "heuweltjies")	Without mitigation	5	1	3	1	2	35	The pipeline falls within a statutory conservation area and might have a slight impact on riparian vegetation.
	With mitigation	5	1	1	1	1	20	Placing the pipeline aboveground in the pristine vegetation types.
Watercourses & Wetlands: Potential impact on natural water resources and it's ecological support areas.	Without mitigation	5	4	3	1	2	50	Works at the Tierhokskloof inlet structure may result in additional impact on the riparian vegetation and streamflow.
	With mitigation	5	2	2	1	1	30	Ensure that the water course is not contaminated because of construction methods (e.g., concrete wastewater).
Landuse and cover: Potential impact	Without mitigation	5	4	3	1	2	50	The site falls within a statutory conservation area covered by pristine vegetation for the most part (apart from the area near the Witbrug WTW).

Impact assessment								
Aspect	**Mitigation**	**CV**	**Lik**	**Dur**	**Ext**	**Sev**	**Significance**	Short discussion
on socio-economic activities.	With mitigation	5	2	2	1	1	30	Place the pipeline aboveground within the pristine vegetation areas and ensure good environmental control during construction.
Vegetation status: Loss of vulnerable or endangered vegetation and associated habitat.	Without mitigation	5	4	3	1	2	50	The site falls within a statutory conservation area covered by pristine vegetation (Least Threatened), but may overlap disturbed endangered vegetation at the WTW.
	With mitigation	5	2	2	1	1	30	Place the pipeline aboveground within the pristine vegetation areas and ensure good environmental control during construction.
Conservation priority: Potential impact on protected areas, CBA's, ESA's or Centre's of Endemism.	Without mitigation	5	4	3	1	2	50	The site falls within a statutory conservation area covered by pristine vegetation (Least Threatened), but may overlap disturbed endangered vegetation at the WTW.
	With mitigation	5	2	2	1	1	30	Place the pipeline aboveground within the pristine vegetation areas and ensure good environmental control during construction.
Connectivity: Potential loss of ecological migration corridors.	Without mitigation	5	3	3	1	2	45	The site falls within a statutory conservation area covered by pristine vegetation (Least Threatened), but may overlap disturbed endangered vegetation at the WTW.
	With mitigation	5	1	2	1	1	25	Place the pipeline aboveground within the pristine vegetation areas and ensure good environmental control during construction.
Protected & endangered plant species: Potential impact on threatened or protected plant species.	Without mitigation	5	2	3	1	2	40	The unlikely impact on a species protected in terms of the NFA , namely *Podocarpus latifolius*.
	With mitigation	5	1	2	1	1	25	It is unlikely that this species will be impacted, but ensure good environmental control during construction.
Fauna: Potential impact on mammals, reptiles & amphibians.	Without mitigation	5	2	3	1	2	40	The unlikely, but potential impact on any of the three sensitive grasshopper species.
	With mitigation	5	1	2	1	1	25	Place the pipeline aboveground and minimise the impact on pristine vegetation.
Avi-fauna: Potential impact on threatened or protected bird species.	Without mitigation	5	2	3	1	1	35	The potential impact on any one of the two sensitive bird species.
	With mitigation	5	1	2	1	1	25	Place the pipeline aboveground and minimise the impact on pristine vegetation.
Cumulative impacts: Cumulative impact associated with proposed activity.	Without mitigation	5	4	3	1	2	50	Underground placement of the pipeline will let to a short term impact on pristine vegetation within a statutory conservation area.
	With mitigation	5	2	2	1	1	30	Search & Rescue NCNCA protected species as described in Table 3.
The "No-Go" option: Potential impact associated with the No-Go alternative.	Without mitigation	5	4	3	1	2	50	Because of the poor condition of the pipeline further pipeline failure is likely, which will continue to result in the replacement of sections of the pipeline (without any environmental control). The need for such maintenance will increase as the pipeline deteriorates.
	With mitigation							

According to the **NEMA EIA Sensitivity** scan for the site generated on 2022/09/22 by Mr. Bernard de Witt of EnviroAfrica (the EAP) the Terrestrial Biodiversity Theme Sensitivity is **VERY HIGH SENSITIVE** because of it being located within a statutory conservation area and the potential impact on several vulnerable or endangered fauna species (Refer to Table 3).

The Terrestrial biodiversity assessment (Table 10) aims to take all the discussion within this document into account .

According, Table 10 the main impacts associated with the proposed development will be:

- The potential medium impact on water courses and intact riparian vegetation within a reserve;
- The potential medium impact on landuse and cover within a reserve;
- The potential medium impact on vegetation within a reserve;
- The potential medium impact on conservation bodies within a reserve;

Table 10 gives the cumulative impact before mitigation as **medium.** But with the proposed aboveground construction method and the proposed mitigation actions it can be **reduced to Low Significance**.

It is considered highly unlikely that the development will contribute significantly to any of the following:

- Significant loss of vegetation type and associated habitat.
- Loss of ecological processes (e.g., migration patterns, pollinators, river function etc.) due to construction and operational activities.
- Loss of local biodiversity and threatened plant species.
- Loss of ecosystem connectivity.

As a result, the Terrestrial Biodiversity Theme Sensitivity for the proposed project should be **LOW**.

7.3. TERRESTRIAL BIODIVERSITY SENSITIVITY MAP

The site sensitivity map (Figure 9) describes aims to protect the river systems and associated riparian works, all of which should be considered no-go areas (apart from the works that need to be done at the inlet works within the Tierhokskloof inlet works). The recommendations give further guidelines and details towards the protection of the mountain areas.

Figure 9: Tierhokskloof Sensitivity map, shows the pipeline route in relation to sensitivity, which aims to protect the river systems and associated riparian vegetation.

8. RECOMMENDATIONS

The proposed pipeline upgrade falls within a statutory conservation area, but will, for the most part, overlap vegetation that is not considered vulnerable or endangered or areas already disturbed. However, both the Breede River and Tierhokskloof Rivers are considered of great ecological importance and because the site falls within a conservation area, impacts on any natural vegetation must be minimised (Refer to Figure 9).

8.1. GENERAL RECOMMENDATIONS

- All construction must be done in accordance with an approved construction and operational phase Environmental Management Plan (EMP), which must be developed by a suitably experienced Environmental Assessment Practitioner.
- A suitably qualified Environmental Control Officer must be appointed to monitor the construction phase in terms of the EMP and any other conditions pertaining to specialist studies.
- Before any work is done the footprint must be clearly demarcated. The demarcation must aim at minimum footprint and minimisation of disturbance.
- All alien invasive species within the footprint and or within 10 m of the footprint must be removed responsibly (a number of Blackwattle and Port Jackson were observed).
- Indiscriminate clearing of any area outside of these footprints may not be allowed.
- All employees and contractors must be sensitised to the fact that they are working within a Nature Reserve.
- All wildlife must be protected, and employees must be warned against disturbing, injuring or killing any wild animals.
- An integrated waste management approach must be implemented during construction.
    - Construction related general and hazardous waste may only be disposed of at approved waste disposal sites.
    - All rubble and rubbish should be collected and removed from the site to a Municipal approved waste disposal site.
- The aboveground section of the pipeline should be painted or coloured in such a way as to minimize its visibility within this natural landscape (it should not be visible from the Michells Pass).

Access and laydown areas

- Only the existing twee-spoor track, from the WTW towards up to the point where the pipeline starts to follow the old footpath, may be used for vehicle usage.
- Laydown areas should be located on already disturbed areas, which in special instances may include some of the open disturbed areas, next to the Breede River, near the mouth of the Tierhokskloof River.
- The existing footpath must be used for entrance to and from the inlet works up to the point where it meets the existing twee-spoor road (where the pipeline will be laid underground).
- The footpath may be cleared and slightly enlarged, up to the point of being a suitable access road for future maintenance works (this footpath was always used for access and maintenance purposes). By ensuring that this footpath is easily accessible, it will discourage any additional footpaths or access routes being established over time.

- Pipes must be transported onto the site by hand or by a small vehicle that will fit onto the footpath. The footpath may not be enlarged to allow normal vehicle access.

Cement or concrete mixing

- Cement and concrete mixing must be done on impenetrable material (e.g., lined with plastic) and no wastewater from these areas may be allowed within any of the watercourses or rivers.
- Rocks (for construction of the pedestals) should preferably be harvested from the footpath area (during the clearing of the footpath) or from the excavations when laying the underground pipeline section (near the WTW). The ECO must oversee and approve any other rock harvesting that might be needed.

8.2. SPECIFIC RECOMMENDATIONS: THE INLET WORKS:

The inlet works is in an area where the Tierhokskloof is relatively narrow. However, just west and downstream of the inlet works is an area that was most probably disturbed during the original construction period (Refer to Heading 4.1 & Photo 3). Within this area, a small area may be cleared (only if required) to allow for the works needed at the inlet works and for cement or concrete mixing for maintenance at the weir and the construction of the first section of pedestals. The following should be used as guidelines for the laydown area:

- The cleared area must be located within one of the existing open areas, as far away from the river as possible.
- The site must be as small as possible, and the footprint area must be approved by the ECO.
- Topsoil must be removed from the footprint area and stored for rehabilitation purposes.
- No concrete or cement mixing may be allowed directly on the soil (an impenetrable layer must be used to ensure that cement or concrete wastewater does not drain into the soils or towards the river.
- On completion of the works at the inlet, all construction related materials and waste must be removed and the site must be rehabilitated back to a similar condition as it was before construction started.
- Topsoil must be replaced to initiate and allow successional rehabilitation of the vegetation.

8.3. SPECIFIC RECOMMENDATIONS: THE UNDERGROUND SECTION OF THE PIPELINE

- The underground section of the pipeline should aim to be constructed as far away as possible from the Breede River, preferably south of the existing twee spoor track (or within the twee-spoor track).
- Topsoil must be removed from the construction footprint and stored separately.
- Spoil from the trenches must be removed from the site (it can be used as backfill or for building materials for the pedestals).
- On completion of the construction phase the footprint area must be reshaped and rehabilitated back to as similar condition as it was before construction commenced.
- Topsoil must be replaced to initiate and allow successful rehabilitation of the vegetation.

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APPENDIX 1: CURRICULUM VITAE – P.J.J. BOTES

Curriculum Vitae: Peet JJ Botes

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

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

BRIEF RESUME OF RELEVANT EXPERIENCE

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

2005-2010: Joined Enviroscientific, as an independent environmental consultant specializing in wastewater management, botanical and biodiversity assessments, developing environmental management plans and strategies, environmental control work as well as doing environmental compliance audits and was also responsible for helping develop the biodiversity part of the Farming for the Future audit system implemented by Woolworths. During his time with Enviroscientific he performed more than 400 biodiversity and environmental legal compliance audits.

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

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

LIST OF MOST RELEVANT BOTANICAL & BIODIVERSITY STUDIES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Botes, P. 2014(a): Brandvlei Bulk Water Supply: Proposed construction of a 51 km new bulk water supply pipeline (replacing the existing pipeline) from Romanskolk Reservoir to the Brandvlei Reservoir, Brandvlei (Northern Cape Province). A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required). 24 February 2014.

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

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

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

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

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

Botes, P. 2015(b): Steenkampspan proving ground. Proposed establishment of a high speed proving (& associated infrastructure) on the farm Steenkampspan (No. 419/6), Upington, ZF Mgcawu (Siyanda) District

Municipality, Northern Cape Province. Biodiversity and Botanical Scan of the proposed footprint. 20 February 2015.

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

Botes, P. 2016(a): OWK Raisin processing facility, Upington, Erf 151, Kenhardt, Northern Cape Province. A Botanical scan of the proposed footprint. 26 May 2016.

Botes, P. 2016(b): Onseepkans Agricultural development. The proposed development of ±250 ha of new agricultural land at Onseepkans, Northern Cape Province. Biodiversity and Botanical Scan. January 2016.

Botes, P. 2016(c): Henkries Mega-Agripark development. The proposed development of ±150 ha of high potential agricultural land at Henkries, Northern Cape Province. Biodiversity and Botanical Scan of the proposed footprint. 28 February 2016.

Botes, P. 2016(d): Proposed Namaqualand Regional Water Supply Scheme high priority bulk water supply infrastructure upgrades from Okiep to Concordia and Corolusberg. Biodiversity Assessment of the proposed footprint. March 2016.

Botes, P. 2017: The proposed new Namaqua N7 Truck Stop on Portion 62 of the Farm Biesjesfontein No. 218, Springbok, Northern Cape Province. Botanical scan of the proposed footprint. 10 July 2017.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

APPENDIX 2: DEA SCREENING REPORT