Botanical Impact Assessment

Proposed repairs of flood damage to the Camfersdrift River, George

21 October 2023

Author details

Specialist Details | Mark Berry	
Company Name	Mark Berry Environmental Consultants cc – T/A MB Botanical Surveys
Physical address	14 Alvin Crescent, Somerset West, 7140
Email Address	markberry@webafrica.org.za
Telephone	083 286-9470
Fax	086 759-1908
Highest Qualification	PhD in Botany
SACNASP Reg. No.	400073/98 (Ecological Science)
Area of Specialisation	Botanical surveys

Mark Berry is an independent botanical specialist with over 25 years of experience mainly in the Western Cape, but also in the adjacent provinces, Free State and KwaZulu-Natal. Mark is also experienced in undertaking/compiling Environmental Impact Assessments (EIA's), Environmental Management Programmes, environmental audits, land use surveys, etc. CV is available upon request.

Citation of report

Berry, M.G. 2023. Botanical Impact Assessment: Proposed repairs of flood damage to the Camfersdrift River, George. MB Botanical Surveys, Somerset West.

Declaration of Independence

I Mark Gerald Berry, as the appointed Specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that I:

- in terms of the general requirement to be independent:
  - **other than fair remuneration for work performed in terms of this application, have no business, financial, personal or other interest in the development proposal or application and that there are no circumstances that may compromise my objectivity**; or
  - am not independent, but another specialist (the "Review Specialist") that meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);
- in terms of the remainder of the general requirements for a specialist, have throughout this EIA process met all of the requirements;
- have disclosed to the applicant, the EAP, the Review EAP (if applicable), the Department and I&APs all material information that has or may have the potential to influence the decision of the Department or the objectivity of any report, plan or document prepared or to be prepared as part of the application; and
- am aware that a false declaration is an offence in terms of Regulation 48 of the EIA Regulations, 2014 (as amended).

Signature of the Specialist:	
Name of Company:	MB Botanical Surveys
Date:	21 October 2023

Table of Contents

1. Introduction

Proposed development and area assessed

The applicant (George Municipality) wishes to repair flood damage and upgrade stormwater infrastructure along a section of the Camfersdrift River inside George (**Figure 1-1**). The site, which is located in the northern part of George, follows the Camfersdrift River for about 1.3 km. A part of the study area is located inside Van Riebeeck Gardens, a public park.

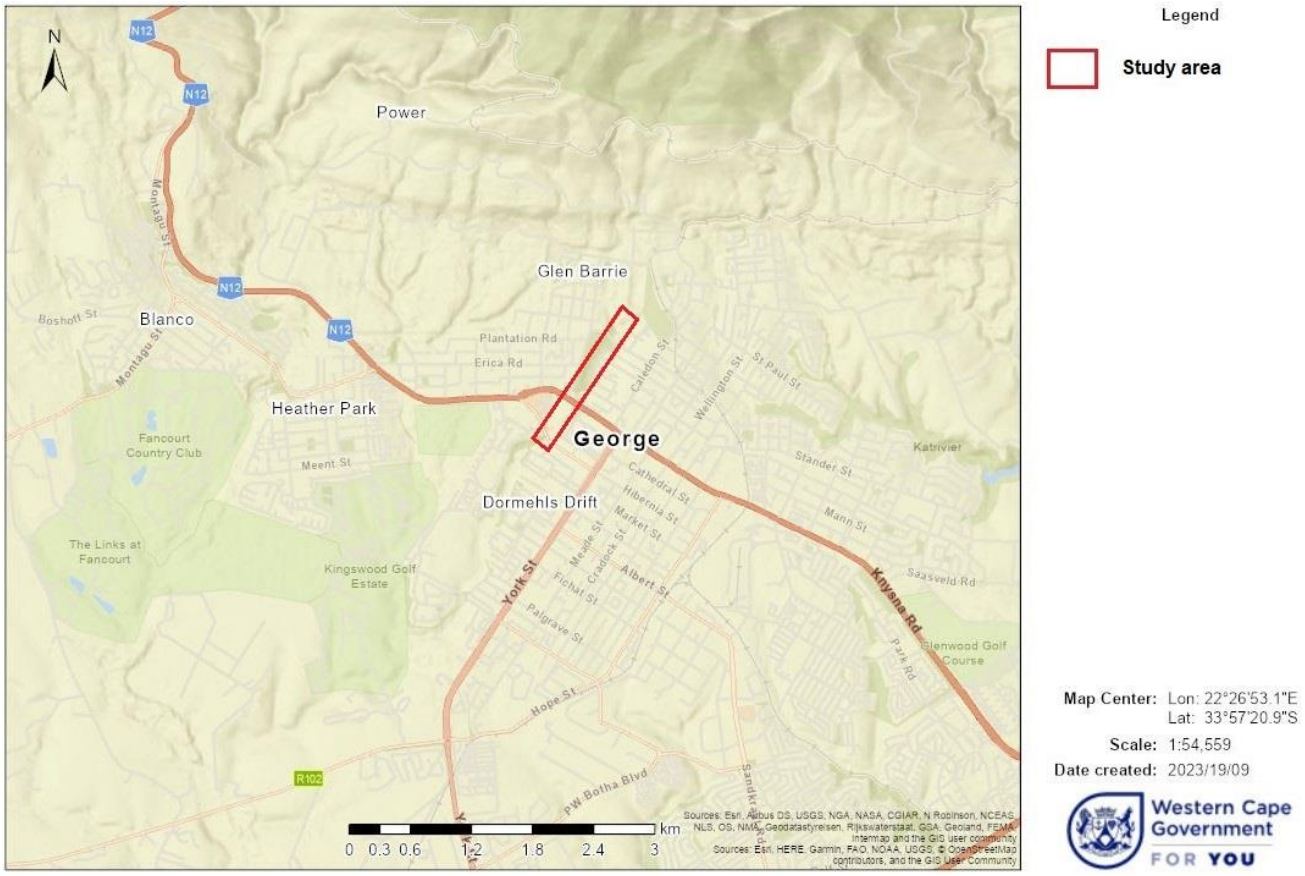

Figure 1-1: Location of study site inside George.

George Municipality has appointed Lukhozi Consulting Engineers (Pty) Ltd as their professional service provider for Project 28, Package 3 of the 2021 Municipal Disaster Recovery Grant (MDRG) projects for the flood damage repairs, rehabilitation and other mitigation measures in Van Riebeeck Gardens and Camphersdrift area with the focus along the Camfersdrift River from northeast of Camphersdrift Street down to just south of C.J. Langenhoven Road (**Figure 1-2**).

The general extent of the scope of works applicable to all areas include:

- Refurbish/replace gabion structures;
- Reinstatement of erosion protection structures;

- Rehabilitation of eroded areas and implementation of erosion protection structures;
- Stabilization of riverbanks and beds and implementation of erosion protection structures;
- Reinstatement of retaining walls;
- Reconstruction of stormwater pipes, outlets, headwalls, and associated erosion protection;
- Isolated reconstruction of road areas; and
- Implementation of new gabion / retaining wall structures / erosion protection structures.

Figure 1-2: Proposed layout.

According to the Screening Report, generated by the EAP (Sharples Environmental Services) on 25 July 2023, the site has been mapped as Medium sensitive in the plant species theme. With regards to the terrestrial biodiversity theme, it has been mapped as Very High sensitive. The Very High sensitivity is ascribed to the possible presence of, among other, threatened ecosystems, and the encroachment of the site onto the biodiversity network. As a result, MB Botanical Surveys was contracted to undertake a botanical survey of the site.

Terms of Reference

The terms of reference agreed upon for this botanical study include:

- Adhere to the EAP's terms of reference for the study;
- Identify and describe biodiversity patterns at a community and ecosystem level (main vegetation type, plant communities and threatened ecosystems), at species level (Species of Conservation Concern and protected species) and in terms of significant landscape features;
- Describe the sensitivity of the site and its immediate surroundings;
- Map or describe the presence of invasive alien plants;
- Review the relevant biodiversity plans compiled in terms of the National Environmental Management Biodiversity Act (Act 10 of 2004);
- Make recommendations with regards to the protection/management of biodiversity; and
- Adhere to the NEMA, CapeNature and SANBI protocols or guidelines for biodiversity assessments.

Limitations and Assumptions

The following limitations and assumptions apply to the study:

- Fieldwork was carried out in spring, considered to be a suitable time for many flowering species in the Southern Cape. However, plants that only flower at other times of the year (e.g. late spring to summer), such as certain bulbs (Iridaceae and Orchidaceae), may have been missed. The overall confidence in the completeness and accuracy of the botanical findings is however considered to be good.

Use of this report

This report reflects the professional judgment of its author(s). The information and recommendations presented in this report are specific to the project and site at hand and do not extend to future developments or neighbouring sites. Use of this report is therefore restricted.

2. Site Sensitivity Verification

The Department of Environmental Affairs online Environmental Screening Tool indicates that the plant species theme is of Medium sensitivity for the site. **Table 2-1** lists the threatened species and their sensitivity from the Screening Report. The Screening Report further indicates that the terrestrial biodiversity theme is of Very High sensitivity for the site. This rating is ascribed to the possible presence of a terrestrial critical biodiversity area (CBA1), a degraded critical biodiversity area (CBA2), an ecological support area (ESA), a

degraded ecological support area (ESA2), SWSA (SW) Outeniqua and several threatened ecosystems (i.e. Cape Lowland Alluvial Vegetation, Garden Route Granite Fynbos and Garden Route Shale Fynbos).

Table 2-1: Threatened plant species as listed in the Screening Report. The names of sensitive species are withheld.

Sensitivity	Feature(s)
Medium	*Leucospermum glabrum*
Medium	*Selago burchellii*
Medium	*Erica unicolor* ssp. *mutica*
Medium	Sensitive species 1081
Medium	Sensitive species 419
Medium	Sensitive species 1024
Medium	Sensitive species 980
Medium	Sensitive species 763

In circumstances where the *status quo* assessment proves the contrary to the above (i.e. where the site is deemed to be of Low sensitivity in respect of both themes, the GN320 of 2020 requires that a Terrestrial Biodiversity Compliance Statement is submitted as set out by the National Environmental Management Act (NEMA) (Act No. 107 of 1998) Regulations of 2020 (as amended). If the above is confirmed, then a biodiversity assessment will be required for development proposals.

3. Methodology

The methodology used in this terrestrial biodiversity assessment, including a desktop background assessment and one site visit, is outlined in the subsections below.

Desktop assessment

A brief review of online (e.g. Google Earth, iNaturalist.org, posa.sanbi.org and CapeFarmMapper) and desktop resources (available literature and reports) was undertaken to determine the nature of the site, the expected vegetation type(s), the presence of natural vegetation remnants and species of conservation concern (SCC), hydrological features, and the significance of the site in terms of biodiversity planning.

Site survey

A botanical survey of the site was undertaken on 28 September 2023 by the author. A qualitative assessment of the type and condition of affected vegetation on site, disturbances and presence of alien species, SCC and protected tree species was carried

out. The path walked during the survey is shown on **Figure 3-1**. Plant species not identified in the field, were collected and/or photographed and identified at the office and Compton (Kirstenbosch) Herbarium. A few of the identifications were confirmed on iNaturalist. The 2018 South African Vegetation Map and the latest floristic taxonomic literature and reference books were used for the purpose of this specialist study. Any plants classified as rare or endangered in the Red List of South African Plants online database[1] are highlighted. The assessment follows the relevant national guidelines/protocols for biodiversity assessments as listed in the Government Gazette No. 43110 on 20 March 2020.

Figure 3-1: Satellite photo showing the survey track on the site.

The following information was recorded during the site visit:

1. The condition of the vegetation. Is the vegetation either disturbed or degraded? A disturbed or degraded area could range from agricultural fields (fallow land), or areas previously disturbed by mining activities, to an area that has been severely eroded or degraded as a result of bad land management, mining or alien infestation.
2. Species diversity (alpha diversity). This refers to the numbers of different indigenous plant species occurring on site.
3. Species of Conservation Concern (SCC), endemics, as well as protected tree species occurring on site. This would include near threatened, rare, vulnerable,

[1] Threatened Species Programme | SANBI Red List of South African Plants

endangered or critically endangered species. SCC and protected tree species were mapped using Easy GPS v2.5 software on an iPhone. Accuracy is given as ±6 m.

4. Identification of the vegetation type(s) and communities (if discernible) on the site. This would include trying to establish the distribution of a vegetation type and whether or not it is vulnerable, endangered or critically endangered.
5. Connectivity with (or isolation from) nearby natural vegetation.

Data analysis

Site ecological importance (SEI) of the affected (receptor) area has been determined by applying the criteria described in the Species Environmental Assessment Guideline (SANBI, 2020). See **Annexure 1** for a description of the SEI methodology. The impact assessment methodology is described in **Annexure 2**.

4. Literature Study

A desktop literature review was undertaken during the biodiversity assessment using both online resources and existing maps and reports. A summary of the most relevant information to this assessment is presented below. Some of the information was ground truthed during the site surveys.

Location, topography & land use

The study site is located along a section of the Camfersdrift River inside George. Altitude ranges from 215 masl at the downstream (southern) end to 235 masl at the upstream (northern) end (**Figure 4-1**). Apart from an often deeply incised river channel, the terrain is gently sloped. Sections of the channel are severely eroded and considered unsafe. The site is flanked by open spaces (parkland), residential areas, a hospital, a commercial/office area and an electrical substation (**Figure 4-2**). The section of the study area between Camphersdrift Street and Davidson Road is located inside Van Riebeeck Gardens, a public park. The landscape is largely transformed for urban use.

Hydrology

The main hydrological feature on site is the Camfersdrift River, a perennial watercourse and tributary of the Gwaing River (**Figure 4-1**). According to Cape Farm Mapper, there is also a channelled valley-bottom wetland (NWM5) at the southern end of the site (downstream of C.J. Langenhoven Road). A part of the latter wetland immediately downstream from the site has been mapped as a National Freshwater Ecosystem Priority Area (NFEPA) wetland.

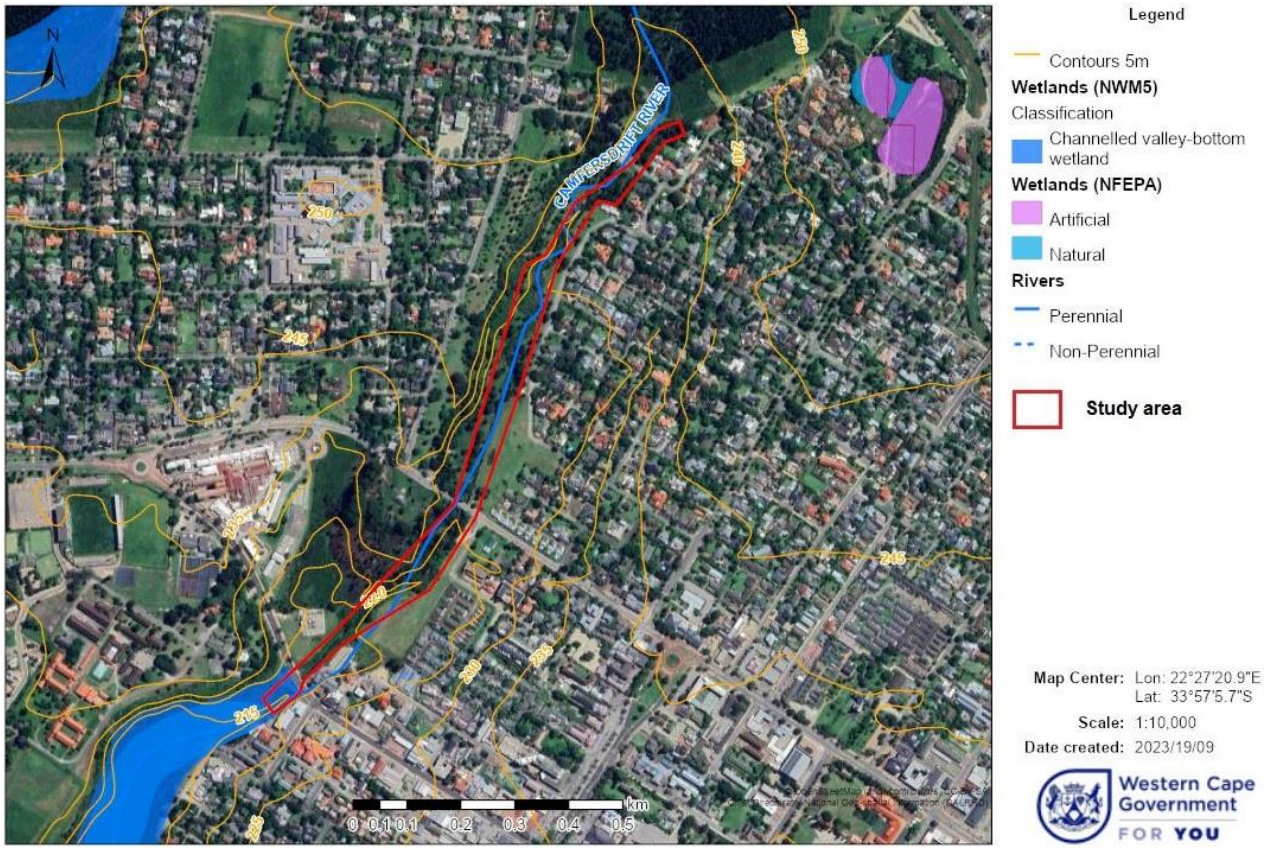

Figure 4-1: Combined topography and hydrology map.

Figure 4-2: Commercial area and fence of an electrical substation (righthand side) flanking the site just upstream of C.J. Langenhoven Road.

Climate

The mean annual rainfall for the site is 797 mm (as per Cape Farm Mapper climatic data for 1950 to 2000). The peak rainfall periods are the months of March (autumn) and October (spring), while the driest period is the winter months, i.e. bimodal rainfall regime. The study area lies in the transition zone between the winter and summer rainfall regions. Mean monthly maximum and minimum temperatures are 24.4°C and 6.6°C for January/February and July, respectively (as per Cape Farm Mapper data). The Köppen-Geiger climate classification for most of the George area is Cfb (temperate, no dry season, warm summer).

Geology

According to the 3322 Oudtshoorn 1:250 000 geological map, the site is underlain by Kaaimans Group sediments (Saasveld Member), comprising andalusite schist, mica schist and hornfels (**Figure 4-3**). The Saasveld Member is about 600 m thick (Toerien, 1979). It is of Namibian age and are of the oldest sediments found in the region. It typically supports shale fynbos in these parts.

Figure 4-3: Exposed Kaaimans Group sediments (schist!) inside the Camfersdrift River channel.

Biodiversity Planning Context

The study site is located in a fynbos environment on the Southern Cape coastal plain. This is confirmed by the presence of characteristic fynbos species such as *Erica scabriuscula, E. sparsa, Struthiola hirsuta* and *Elegia tectorum*. Being located inside an urban park, there is also a notable presence of introduced species such as *Afrocarpus falcatus, Podocarpus henkelii, Liquidambar styraciflua* and *Castanospermum australe*. The river itself is fringed by a narrow strip of riparian vegetation. According to the 2018 Vegetation Map of South Africa, the site is located inside Garden Route Shale Fynbos (**Figure 4-4**). The latter occurs in patches along the coastal foothills from northeast of Heidelberg in the Western Cape to Clarkson in the Eastern Cape (Mucina, 2006). Structurally, it is described as a tall, dense proteoid and ericaceous fynbos in wetter areas, and graminoid fynbos in the drier areas (Mucina, 2006).

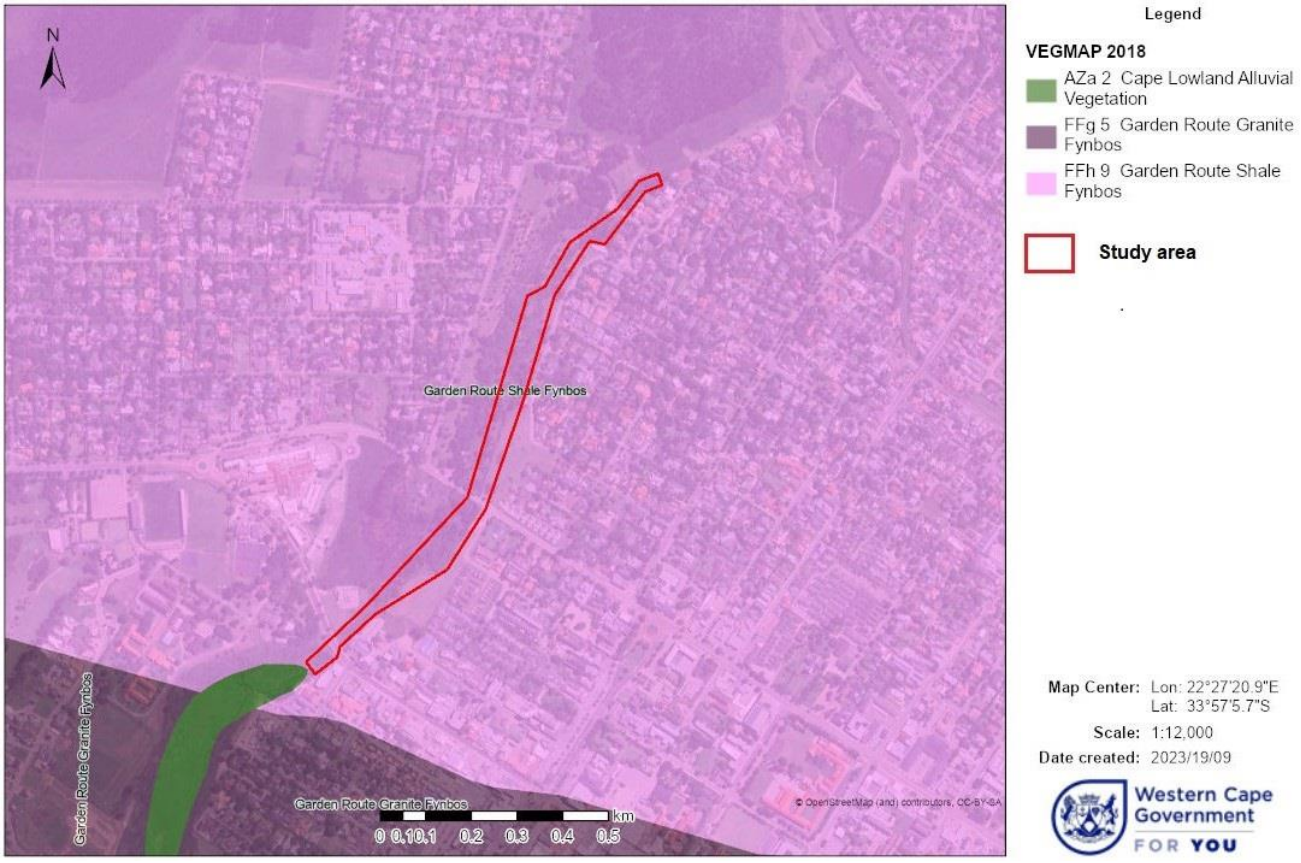

Figure 4-4: Extract of the 2018 SA Vegetation map.

Due to its transformed state and rate of transformation, Garden Route Shale Fynbos is currently listed as Endangered in the Revised National List of Threatened Ecosystems (DEA, 2022). Only 44% of its original habitat remains[2]. It has been transformed mainly for

[2] Ecosystem Detail - Biodiversity BGIS (sanbi.org)

cultivation (pastures) and pine plantations (Mucina, 2006). It is also considered to be poorly protected, with only 5.7% formally protected in the Garden Route National Park and Boosmansbos Wilderness Area (Mucina, 2006). Like all fynbos types, Garden Route Shale Fynbos is maintained by a regular fire regime. Unfortunately, landscape fragmentation is disrupting this 'maintenance' requirement, often leading to localised species loss and bush encroachment or alien infestation (pers. obs.). The high rates of habitat loss place the unit at risk of collapse.

The site falls inside the George biodiversity network (**Figure 4-5**). Being located alongside the Camfersdrift River, it includes aquatic critical biodiversity areas (CBA's), terrestrial CBA's, degraded critical biodiversity areas (CBA2), an ecological support area (ESA) and a degraded ecological support area (ESA2). The CBA's and ESA's are aligned with the Camfersdrift River and adjacent tracts of parkland, which act as an ecological corridor linking the Outeniqua Mountains (Witfontein Nature Reserve) with the coastline. Reasons for the importance of the mapped CBA's and ESA's include the presence of ecological processes (FEPA river corridor) and water resource protection (Gwaing and South Eastern Coastal Belt). The closest protected area is the Van Kervel Local Authority Nature Reserve, located less than 0.5 km away to the northeast of the site. The Witfontein Nature Reserve is located ±2 km further away to the north.

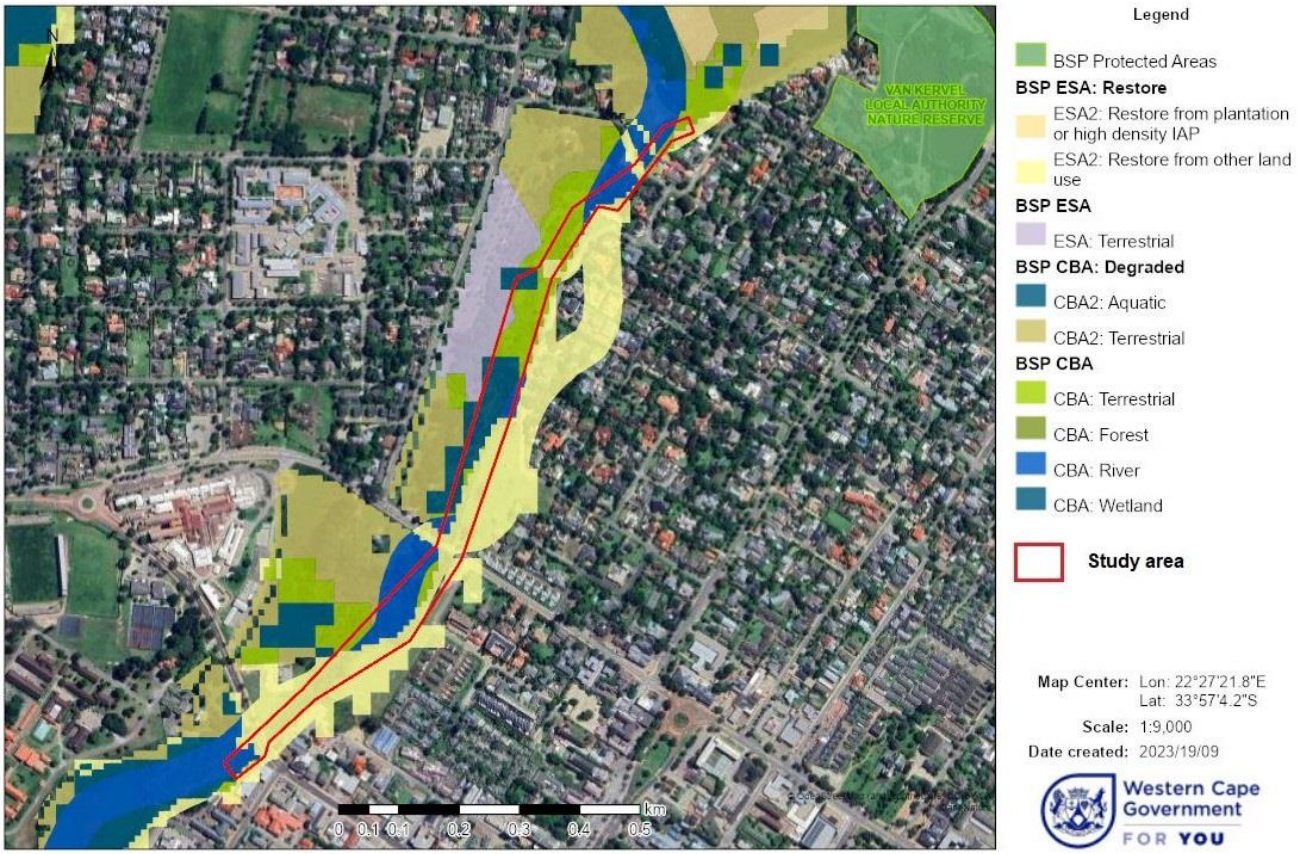

Figure 4-5: Extract of the Western Cape biodiversity network map.

CBA's are defined as areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure (Pool-Stanvliet, 2017). These sites are selected for meeting national targets for species, habitats and ecological processes (Pool-Stanvliet, 2017). Many of these areas support known occurrences of threatened plant species, and/or may be essential elements of designated ecological corridors. Loss of designated CBA's is therefore not recommended. ESA's, on the other hand, are supporting zones required to prevent the degradation of CBA's and Protected Areas. ESA's must be managed to minimize impact on ecological processes and ecological infrastructure functioning, especially soil and water-related services, and to allow for faunal movement.

5. Results

In order to fulfil in the requirements of the terrestrial biodiversity and plant species protocols, this section describes the vegetation (terrestrial biodiversity) and plant species encountered in two subsections. In the plant species subsection specific reference is made to species of conservation concern (SCC).

Terrestrial biodiversity (vegetation)

The vegetation on the banks of the Camferdrift River comprises mostly riparian vegetation with a few strips of fynbos mainly in the northern (upstream) section. The flatter areas away from the river comprise parkland (grassed areas with planted trees), degraded vacant areas and built-up areas. The section of the study area south (downstream) of Davidson Road is located outside Van Riebeeck Gardens and is noticeably more degraded by invasive aliens, urban encroachment, waste dumping, etc. Species diversity along this section is also very poor. A few overhead powerlines also run through the section south of C.J. Langenhoven Road.

Important species recorded in the riparian vegetation include *Cliffortia obcordata, Psoralea affinis, Cyathea cooperi, Rhodocoma gigantea, Typha capensis* and *Wachendorfia thyrsiflora*. The fynbos patches abutting the river are populated by typical fynbos species, such as *Erica scabriuscula, Penaea cneorum* and *Elegia tectorum*. Structurally, the fynbos can be described as a low to mid-high closed small-leaved shrubland following Campbell's classification (Campbell, 1981). Invasive species, such as *Eucalyptus* sp (gums), *Acacia melanoxylon* (blackwood), *Solanum mauritianum* (bugweed) and *Cenchrus clandestinus* (kikuyu), become more noticeable in the degraded areas outside Van Riebeeck Gardens.

The parkland area is covered by lawn and scattered planted trees, such as *Afrocarpus falcatus, Podocarpus henkelii, Castanospermum australe* and *Liquidambar styraciflua*. Disturbances noted (mainly outside Van Riebeeck Gardens) include alien infestation, squatting/vagrancy, waste dumping, urban encroachment and erosion of the riverbanks.

The botanical attributes of the site are presented in **Figure 5-1**. **Figures 5-2** to **5-7** illustrate the current state of the vegetation on site.

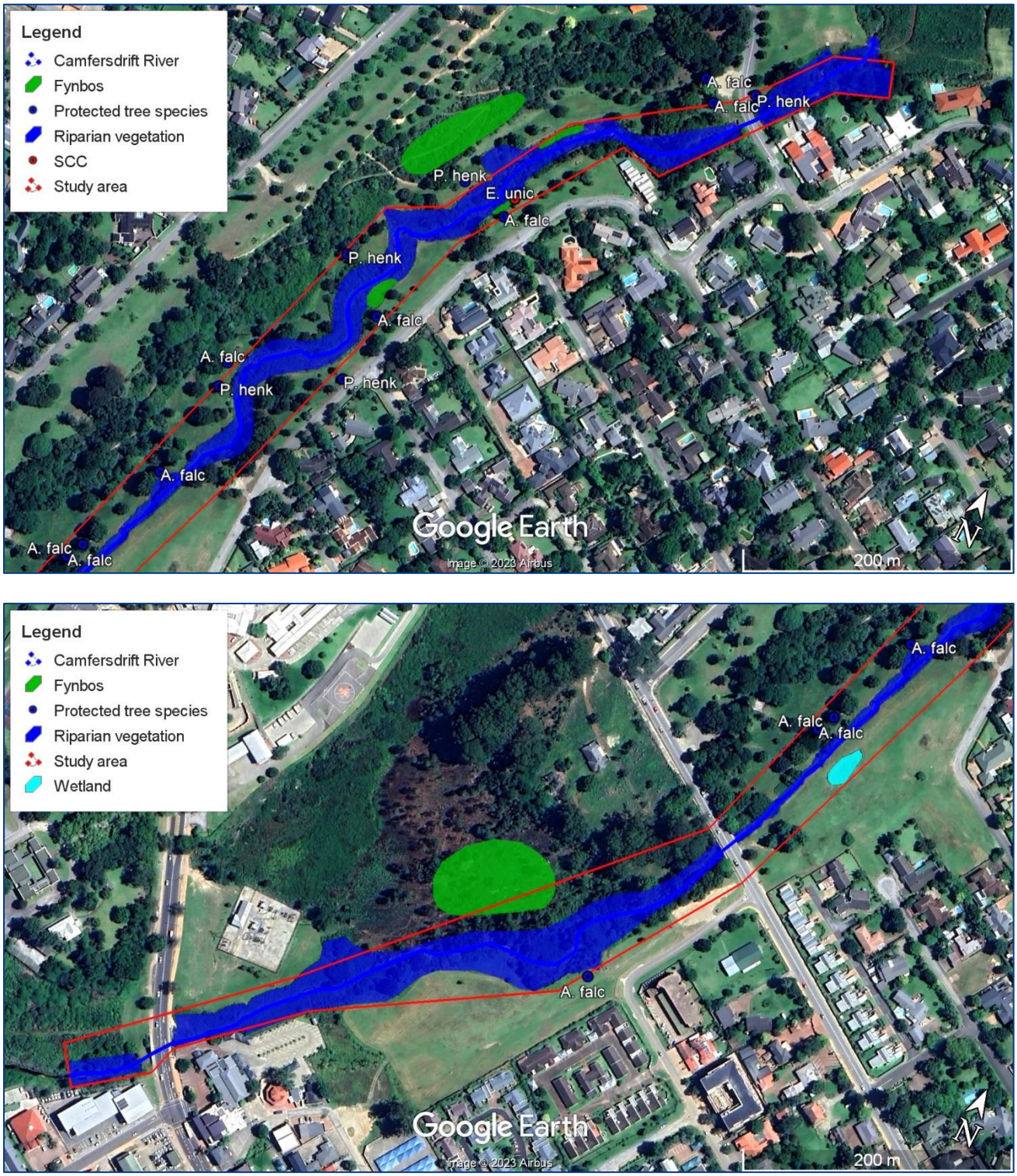

Figure 5-1: Botanical attributes of the site, with northern section on top and southern section below. The untoned areas comprise parkland or highly degraded/transformed areas.

Figure 5-2: Camfersdrift River inside Van Riebeeck Gardens, fringed by *Cliffortia obcordata* and *Wachendorfia thyrsiflora*.

Figure 5-3: Grassed area next to the Camfersdrift River, with a *Podocarpus henkelii* in the foreground.

Figure 5-4: Strip of fynbos on the embankment of the Camfersdrift River.

Figure 5-5: Eroded section of the Camfersdrift River inside Van Riebeeck Gardens.

Figure 5-6: Degraded section of the site (between Davidson Rd and C.J. Langenhoven Rd), covered by kikuyu, black wattle and bugweed.

Figure 5-7: Degraded southern end of site (south of C.J. Langenhoven Rd).

Figure 5-8: Degraded fynbos between Davidson Rd and C.J. Langenhoven Rd, infested with gums, black wattle and pines.

Plant species

The following indigenous shrub and tree species were recorded along the Camfersdrift River and in the fynbos patches, namely *Erica scabriuscula, E. unicolor* ssp. *georgensis, E. sparsa, Helichrysum petiolare, H. cymosum, H. foetidum, Senecio purpureus, S. ilicifolius, S. rigidus, Nidorella ivifolia, Osteospermum moniliferum, Pseudognaphalium undulatum, Ursinia cf anthemoides, Arctotheca prostrata, Delairea odorata, Struthiola hirsuta, Penaea cneorum, Virgilia divaricata, Podalyria buxifolia, Psoralea stachyera, P. affinis, Searsia chirindensis, S. tomentosa, Rapanea melanophloeos, Kiggelaria africana, Platylophus trifoliatus, Lampranthus multiradiatus* (garden escape), *Diospyros glabra, Halleria lucida, Clutia pulchella, Polygala virgata, Rubus pinnatus, Cliffortia obcordata* (dominant along river), *Pelargonium cordifolium, Commelina benghalensis* and *Pseudoselago outeniquensis*. *Afrocarpus falcatus, Podocarpus henkelii* and *Harpephyllum caffrum* were planted in the grassed areas.

Hemicryptophytes and bulbs recorded include *Pteridium aquilinum, Cyathea cooperi, Typha capensis* (in the waterbodies), *Isolepis prolifera, Cyperus thunbergii, Elegia tectorum, Rhodocoma gigantea, Zantedeschia aethiopica, Hypoxis sobolifera, Wachendorfia thyrsiflora* and *Watsonia* sp. (not in flower). *Helichrysum cymosum,*

Pelargonium cordifolium and *Pteridium aquilinum* are important taxa in Garden Route Shale Fynbos. **Figure 5-9** shows a few of the recorded indigenous species.

Figure 5-9: A few indigenous species recorded on site, with *Psoralea affinis* (top left), *Penaea cneorum* (top right), *Rhodocoma gigantea* (middle left), *Erica unicolor* ssp. *georgensis* (middle right), *Virgilia divaricata* (bottom left) and *Wachendorfia thyrsiflora* (bottom right).

Alien species are abundant, especially in the degraded areas outside Van Riebeeck Gardens, including *Acacia mearnsii* (black wattle, category 2), *A. melanoxylon* (blackwood, 2), *Pinus* sp. (pine), *Eucalyptus* sp. (gum), *Melaleuca viminalis* (bottlebrush),

Castanospermum australe (blackbean), *Liquidambar styraciflua* (American sweetgum), *Quercus* sp. (oak), *Melia azedarach* (syringa, 1b), *Solanum mauritianum* (bugweed, 1b), *Cirsium vulgare* (spear thistle, 1b), *Verbena bonariensis* (purple top, 1b), *Helminthotheca echioides* (bristly ox tongue), *Hypericum canariense* (Canary Island St. John's wort), *Vinca major* (greater periwinkle, 1b), *Arundo donax* (Spanish reed, 1b) and *Cenchrus clandestinus* (kikuyu, category 1b in protected areas) (**Figure 5-10**). As indicated above, the majority of these are Category 1b and 2 invaders. In terms of the National Environmental Management: Biodiversity Act (NEMBA) (Act 10 of 2004) Alien and Invasive Species List (2016), category 1b invasive species require compulsory control as part of an invasive species control programme. Also, the harbouring of category 2 species, such as black wattle and blackwood, is prohibited without a permit. Black wattle, which is indicative of past disturbances, is considered a serious threat to the environment and very difficult to control. The presence of the woody aliens also presents a fire risk.

Figure 5-10: A few indigenous species recorded on site, with *Hypericum canariense* (top left), *Vinca major* (top right), *Acacia melanoxylon* (bottom left) and *Cirsium vulgare* (bottom right).

Only one Species of Conservation Concern (SCC) and regional endemic was recorded, namely *Erica unicolor* ssp. *georgensis* (Rare). It seems to be restricted to the George area and mountain slopes to its north. All the other recorded species are widespread and common in the region. *Afrocarpus falcatus* (Outeniqua yellowwood) and *Podocarpus*

henkelii (Henkel's yellowwood) are protected tree species in terms of the National Forests Act (Act 84 of 1998). These trees were planted in Van Riebeeck Gardens and their removal will require a permit from the Department of Forestry.

Site Ecological Importance

In order to demonstrate the biodiversity sensitivity of the site, a site ecological importance (SEI) map was prepared (**Figure 5-11**). This map considers the biodiversity importance of the receptor area and its resilience to impacts. The receptor area is described as the affected habitat (riparian zone and fynbos in this instance), which may accommodate certain SCC. A Medium SEI value was allocated to the good quality riparian areas and fynbos, while the rest of the area, such as the parkland and highly degraded areas, scored a Very low value. A large portion of Van Riebeeck Gardens inside the study area is considered transformed from a biodiversity perspective. Please note that the hydrological importance of the Camfersdrift River was not considered in this evaluation. The main reasons for the Medium value areas are the threatened status of Garden Route Shale Fynbos, partial connectivity of the site with the biodiversity network, and the relatively small area(s) involved.

6. Potential Impacts

Terrestrial biodiversity (vegetation)

The affected area contains riparian vegetation and small areas of Garden Route Shale Fynbos. Parts of it are highly degraded, especially the section downstream from Van Riebeeck Gardens (Davidson Road). Garden Route Shale Fynbos is currently listed as Endangered. Due to the nature of the project, most of the construction work will take place inside the riparian zone in selected areas. It is, however, not possible to estimate the extent of vegetation clearing required at this point in time. Riparian vegetation has a fair resilience to disturbance and should recover relatively quickly if erosion is contained. The impact can be minimised by keeping the intact areas undisturbed and focusing only on the severely eroded areas.

As stated earlier, the site falls inside the biodiversity network. The mapped CBA's and ESA's are aligned with the Camfersdrift River and adjacent tracts of parkland. The affected area serves as a minor ecological corridor (FEPA river corridor) along which fauna can migrate through the area. Assuming that the disturbed areas will be rehabilitated after construction, the impact of the project on the functionality of the biodiversity network will only be temporary. There should also be no significant net loss of riverine habitat if a soft approach is adopted to repair the flood damage. **Table 6-1** summarises the impact on terrestrial biodiversity.

Figure 6-11: Site ecological importance (SEI) map, with northern section on top and southern section below.

Care must be exercised during the construction phase to ensure that the adjacent vegetation is not unnecessarily disturbed. As an indirect impact, soil disturbance caused by earthworks will provide ideal conditions for the establishment of alien invasive vegetation. The high presence of invasive aliens upstream and downstream from Van Riebeeck Gardens, such as black wattle, blackwood, gums and pines, will exacerbate this

impact. This can be partly mitigated by ongoing alien vegetation clearing in the area, a responsibility that will rest with the local authority. Woody aliens add to the fuel load and increase the risk of wildfires in the long term. Gums also 'sterilise' the soil underneath which may increase runoff and lead to erosion problems. As stated earlier, it is a legal requirement for the landowner to clear/control the invasive aliens on their land.

Table 6-1: Impact on terrestrial biodiversity.

Phase	Construction Phase	Operational Phase
Nature of impact(s)	- Temporary loss of riparian vegetation and Garden Route Shale Fynbos. - Impairment of the biodiversity network. Impact on ecosystem functioning. Impact will be temporary.	- Increased opportunity for alien infestation. - Erosion of the riverbanks due to poor rehabilitation and maintenance efforts.
Extent of impact	Local	Local
Duration	Medium term	Long term
Intensity	Medium	Low-medium
Probability of occurrence	High	High
Degree of reversibility	High	High
Irreplaceability of resource	Medium	Medium
Mitigatory potential	High	High
Significance before mitigation	Medium-low	Medium-low
Significance after mitigation	Low	Low
Mitigation		
• During the construction phase, fence off the construction areas. Restrict all construction activities, such as stockpiling, parking and cement mixing, to transformed areas away from the riparian and fynbos areas. The contractor(s) must be made aware of the sensitive surroundings. The riparian areas outside the footprints must be declared 'no-go' areas and not be disturbed in any way. • Pollutant substances brought onto site must be properly contained. Cement/concrete mixing must be contained on impervious and bunded surfaces. No cement mixing is allowed inside the riparian and fynbos areas. Cement water is highly alkaline and considered toxic. • Where needed, rehabilitate the disturbed surfaces after construction. Erosion prevention measures may be needed on steep riverbanks, such as logs or netting, to slow down runoff and potential erosion. Mulching and seeding with indigenous grass seed may also be needed. • Engage in alien clearing, focussing on invasive species such as black wattle, blackwood, gums and pines. These species are category 2 and 1b invaders that require compulsory control as part of an invasive species control programme. Their control will become a medium- to long-term maintenance requirement. • Allow at least 24 months for the monitoring of rehabilitation success and alien infestation post construction. It is recommended that a strip of at least 10 m wide around the construction areas also be monitored for aliens during the maintenance period.		

Plant species

The impact on plant species, including potential SCC and protected tree species, is also expected to be of medium-low significance, prior to mitigation. Only one SCC was recorded on site, namely *Erica unicolor* ssp. *georgensis* (Rare). Due to its location along a section of the Camfersdrift River unaffected by erosion, it should not be impacted by construction work. All the other recorded species are widespread and common in the region. Several protected tree species (*Afrocarpus falcatus* and *Podocarpus henkelii*) were recorded in the parkland areas adjacent to the Camfersdrift River. These were all planted and should not be in the way of construction work unless serious modifications of the riverbanks are considered. The removal of protected tree species requires a permit from the Department of Forestry.

The probability of SCC listed in the Screening Report to occur in the area is indicated in **Table 6-2**. Given their habitat preferences and known (iNaturalist and POSA) records, only *Selago burchellii* has a medium likelihood to occur on the site. However, a search and rescue of selected plant species, such as *Wachendorfia thyrsiflora* and *Watsonia* sp., is recommended. Search and rescued species can be used for the rehabilitation of the disturbed areas after construction. **Table 6-3** summarises the impact on plant species.

Table 6-2: Threatened plant species as listed in the Screening Report.

Sensitivity	Feature(s)	Habitat & probability of presence
Medium	*Leucospermum glabrum* (EN)	Moist lower slopes of the Outeniqua and Tsitsikamma Mountains; **Low**
Medium	*Selago burchellii* (VU)	Coastal slopes and flats; **Medium**
Medium	*Erica unicolor* ssp. *mutica* (EN)	Hills and middle slopes; **Low**
Medium	Sensitive species 419 (VU)	Damp sandstone slopes; **Low**
Medium	Sensitive species 763 (VU)	Dry coastal renosterveld and fynbos; **Low-medium**
Medium	Sensitive species 980 (EN)	Clay flats and low slopes; **Low**
Medium	Sensitive species 1024 (EN)	Dry to moist stony slopes; **Low**
Medium	Sensitive species 1081 (EN)	Clay soils in renosterveld; **Low-medium**

The **cumulative botanical impact** of the project is expected to be equivalent to the impact on terrestrial biodiversity described above, i.e. the continued degradation of Garden Route Shale Fynbos and impairment of the biodiversity network as a result of construction activities. In this instance, the loss of biodiversity and resultant cumulative impact should be negligible with mitigation. There should be no net loss if the disturbed areas are rehabilitated, and all the areas cleared of vegetation restored. The clearing of aliens along the degraded sections of the Camfersdrift River should be a positive impact as it will provide an opportunity for the establishment of indigenous growth.

Table 6-3: Impact of the project on flora, potential SCC and protected tree species.

Phase	Construction Phase	Operational Phase
Nature of impact(s)	- Loss of indigenous flora, potential SCC and protected tree species.	- Alien infestation and resulting displacement of indigenous flora.
Extent of impact	Local	Local
Duration	Medium	Long term
Intensity	Medium	Low-medium
Probability of occurrence	High	Medium
Degree of reversibility	High	High
Irreplaceability of resource	Medium	Medium
Mitigatory potential	High	High
Significance before mitigation	Medium-low	Medium-low
Significance after mitigation	Low	Low
Mitigation		
• Search and rescue bulbs from the construction areas for replanting in the rehabilitated areas after construction. Topsoil, cuttings and seedbearing plant material can also be salvaged for this purpose. Geophytes should be removed along with some soil, placed in gel, bagged and then taken to a nursery for temporary storage or transplanted directly in the receiving area. Avoid using seed-bearing alien plant material for rehabilitation purposes. • Fence of non-invasive trees in the vicinity of the construction areas. These trees must be actively protected.		

7. Recommended Mitigation Measures

The following mitigation measures are required to ensure that the impact on terrestrial biodiversity and plant species is minimal:

- During the construction phase, fence off the construction areas. Restrict all construction activities, such as stockpiling, parking and cement mixing, to transformed areas away from the riparian and fynbos areas. The contractor(s) must be made aware of the sensitive surroundings. The riparian areas outside the footprints must be declared 'no-go' areas and not be disturbed in any way.
- Search and rescue bulbs from the construction areas for replanting in the rehabilitated areas after construction. Topsoil, cuttings and seedbearing plant material can also be salvaged for this purpose. Geophytes should be removed along with some soil, placed in gel, bagged and then taken to a nursery for temporary storage or transplanted directly in the receiving area. Avoid using seed-bearing alien plant material for rehabilitation purposes.

- Fence of non-invasive trees in the vicinity of the construction areas. These trees must be actively protected.
- Pollutant substances brought onto site must be properly contained. Cement/concrete mixing must be contained on impervious and bunded surfaces. No cement mixing is allowed inside the riparian and fynbos areas. Cement water is highly alkaline and considered toxic.
- Where needed, rehabilitate the disturbed surfaces after construction. Erosion prevention measures may be needed on steep riverbanks, such as logs or netting, to slow down runoff and potential erosion. Mulching and seeding with indigenous grass seed may also be needed.
- Engage in alien clearing, focussing on invasive species such as black wattle, blackwood, gums and pines. These species are category 2 and 1b invaders that require compulsory control as part of an invasive species control programme. Their control will become a medium- to long-term maintenance requirement.
- Allow at least 24 months for the monitoring of rehabilitation success and alien infestation post construction. It is recommended that a strip of at least 10 m wide around the construction areas also be monitored for aliens during the maintenance period.

8. Summary & Conclusion

This report presents the results from a desktop study, as well as a field survey conducted on 28 September 2023, to ascertain the terrestrial biodiversity and plant species constraints along a section of the Camfersdrift River inside George. The applicant (George Municipality) wishes to repair flood damage and upgrade stormwater infrastructure along a section of the river.

The vegetation on the banks of the Camferdrift River comprises mostly riparian vegetation with a few strips of Garden Route Shale Fynbos mainly in the northern section. Garden Route Shale Fynbos is currently listed as Endangered. The flatter areas away from the river comprise parkland, degraded vacant areas and built-up areas. The section of the study area south of Davidson Road is noticeably more degraded by invasive aliens, urban encroachment, waste dumping, etc. The site also falls inside the biodiversity network, with the Camfersdrift River serving as a minor ecological corridor.

Due to the nature of the project, most of the construction work will take place inside the riparian zone in selected areas. Riparian vegetation has a fair resilience to disturbance and should recover relatively quickly if erosion is contained. The impact can be minimised by keeping the intact areas undisturbed and focusing only on the severely eroded areas. Assuming that the disturbed areas will be rehabilitated after construction, the impact on the functionality of the biodiversity network will only be temporary. There should also be no significant net loss of riverine habitat if a soft approach is adopted to repair the flood

damage. Only one SCC was recorded on site, namely *Erica unicolor* ssp. *georgensis*. Due to its location along a section of the river unaffected by erosion, it should not be impacted by construction work. Several protected tree species were recorded in the parkland areas adjacent to the Camfersdrift River. These were all planted and should also not be in the way of construction work.

Given the nature of the project, there is a very good chance to minimise the impact so that there will be no significant net loss of terrestrial/riparian habitat. It is therefore recommended that the project be approved, but subject to the recommended mitigation measures.

References

Bromilow, C. 2010. Problem Plants and Alien Weeds of South Africa. Briza Publications, Pretoria.

Campbell, B.M., Cowling, R.M., Bond, W. & Kruger, F.J. 1981. Structural characterization of vegetation in the Fynbos Biome. *S. Afr. Nat. Sci. Prog. Report* No. 52.

DEA 2022. Revised National List of Ecosystems that are threatened and in need of protection. Government Gazette No. 47526. Government Printer, Pretoria.

Johnson, S. & Bytebier, B. 2015. Orchids of South Africa: A Field Guide. Struik Nature, Cape Town.

Manning, J. & Goldblatt, P. 2012. Plants of the Greater Cape Floristic Region 1: the Core Cape flora, Strelitzia 29. SANBI, Pretoria.

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

Pool-Stanvliet, R., Duffell-Canham, A., Pence, G. & Smart, R. 2017. The Western Cape Biodiversity Spatial Plan Handbook. CapeNature, Stellenbosch.

SANBI 2020. Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria. Version 3.1. 2022.

Toerien, D.K. 1979. The geology of the Oudtshoorn area. Geological Survey, Department of Mines, Pretoria.

Annexure 1: Site Ecological Importance

Site Ecological Importance (SEI) is considered to be a function of the biodiversity importance (BI) of the receptor (e.g. SCC, the vegetation community or habitat type present on site) and its resilience to impacts (receptor resilience or RR) as follows:

SEI = BI + RR

BI in turn is a function of conservation importance (CI) and the functional integrity (FI) of the receptor as follows:

BI = CI + FI

Conservation importance (CI) is evaluated in accordance with recognised established internationally principles and criteria for the determination of biodiversity-related value, including the IUCN Red List of Species, Red List of Ecosystems and key biodiversity areas. CI is defined here as: "The importance of a site for supporting biodiversity features of conservation concern present, e.g. populations of SCC (CR, EN, VU & NT), Rare species, range-restricted species, and areas of threatened ecosystem types, through mainly natural processes". Fulfilling criteria to evaluate CI do not rely on a single specific threshold for each of the above defining characteristics but can act in combination or in isolation, providing a more robust evaluation of CI (Table 1).

Table 1: Conservation importance (CI) criteria.

CI	Criteria
Very high	Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global EOO of <10 km^2. Any area of natural habitat of a CR ecosystem type or large area (>0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type.
High	Confirmed or highly likely occurrence of CR, EN and VU species that have a global EOO of >10 km^2. IUCN threatened species (CR, EN & VU) must be listed under any criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or <10 000 mature individuals remaining. Small area (>0.01% but <0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (>0.1%) of natural habitat of VU ecosystem type. Presence of Rare species.
Medium	Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN & VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. Any area of natural habitat of threatened ecosystem type with status of VU. Presence of range-restricted species.
Low	>50% of receptor contains natural habitat with potential to support SCC. No confirmed or highly likely populations of SCC.

CI	Criteria
	No confirmed or highly likely populations of range-restricted species. <50% of receptor contains natural habitat with limited potential to support SCC.
Very low	No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining.

Functional integrity (FI) of the receptor (e.g. the vegetation community or habitat type) is defined here as the receptors' current ability to maintain the structure and functions that define it, compared to its known or predicted state under ideal conditions. Ecological processes can be considered to be mostly intact and functional if the receptor area has low levels of current ecological disruptors, has good connectivity to other areas and is a relatively large area. As for CI, the fulfilling criteria to evaluate FI do not rely on a single specific threshold for each of the above defining characteristics but can act in combination or in isolation (Table 2).

Table 2: Functional integrity (FI) criteria.

FI	Criteria
Very high	Very large (>100 ha) intact area for any conservation status of ecosystem type or >5 ha for CR ecosystem types. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches. No or minimal current negative ecological impacts with no signs of major past disturbance (e.g. ploughing).
High	Large (>20 ha but <100 ha) intact area for any conservation status of ecosystem type or >10 ha for EN ecosystem types. Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts (e.g. few livestock utilising area) with no signs of major past disturbance (e.g. ploughing) and good rehabilitation potential.
Medium	Medium (>5 ha but <20 ha) semi-intact area for any conservation status of ecosystem type or >20 ha for VU ecosystem types. Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential.
Low	Small (>1 ha but <5 ha) area. Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential. Several minor and major current negative ecological impacts.
Very low	Very small (<1 ha) area.

FI	Criteria
	No habitat connectivity except for flora with wind-dispersed seeds. Several major current negative ecological impacts

Recalling that biodiversity importance (BI) is a function of conservation importance (CI) and the functional integrity (FI) of a receptor, BI can be derived from a simple matrix of CI and FI as follows:

Biodiversity importance		Conservation importance				
		Very high	High	Medium	Low	Very low
Functional integrity	Very high	Very high	Very high	High	Medium	Low
	High	Very high	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very low
	Low	Medium	Medium	Low	Low	Very low
	Very low	Medium	Low	Very low	Very low	Very low

Receptor resilience (RR) is defined here as: "The intrinsic capacity of the receptor to resist major damage from disturbance and/or to recover to its original state with limited or no human intervention." The fulfilling criteria to evaluate RR are based on the estimated recovery time required to restore an appreciable portion of functionality to the receptor (Table 3) and will require justification by the specialist.

Table 3: Receptor resilience (RR) criteria.

RR	Criteria
Very high	Habitat that can recover rapidly (<5 years) to restore >75% of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed.
High	Habitat that can recover relatively quickly (5-10 years) to restore >75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed.
Medium	Will recover slowly (>10 years) to restore >75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.
Low	Habitat that is unlikely to be able to recover fully after a relatively long period: >15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of

RR	Criteria
	remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed.
Very low	Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed.

Finally, after the successful evaluation of both BI and RR as described above, it is possible to evaluate the **site ecological importance (SEI)** from the final matrix as follows:

Site ecological importance		Biodiversity importance				
		Very high	High	Medium	Low	Very low
Receptor resilience	Very low	Very high	Very high	High	Medium	Low
	Low	Very high	Very high	High	Medium	Very low
	Medium	Very high	High	Medium	Low	Very low
	High	High	Medium	Low	Very low	Very low
	Very high	Medium	Low	Very low	Very low	Very low

Table 4: Guidelines for interpreting SEI in the context of the proposed development activities.

SEI	Interpretation in relation to proposed development activities
Very high	Avoidance mitigation - no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e. last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation - changes to project infrastructure design to limit the amount of habitat impacted; limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation - development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation - development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very low	Minimisation mitigation - development activities of medium to high impact acceptable and restoration activities may not be required.

Annexure 2: Impact Assessment Methodology

Each issue that is identified consists of components that on their own or in combination with each other give rise to potential impacts, either positive or negative, from the project onto the environment or from the environment onto the project. In the EIA the significance of the potential impacts is considered before and after identified mitigation is implemented, for direct, indirect, and cumulative impacts, in the short and long term.

A description of the nature of the impact, any specific legal requirements and the stage (construction/decommissioning or operation) were given. The following criteria will be used to evaluate the significance of each issue that was identified:

Nature: This is an appraisal of the type of effect the activity is likely to have on the affected environment. The description includes what is being affected and how. The nature of the impact will be classified as positive or negative, and direct or indirect.

- **Extent and location**: This indicates the spatial area that may be affected (**Table 1**).

Table 1: Geographical extent of impact

Rating	Extent	Description
1	Site	Impacted area is only at the site – the actual extent of the activity.
2	Local	Impacted area is limited to the site and its immediate surrounding area
3	Regional	Impacted area extends to the surrounding area, the immediate and the neighbouring properties.
4	Provincial	Impact considered of provincial importance
5	National	Impact considered of national importance – will affect entire country.

- **Duration**: This measures the lifetime of the impact (**Table 2**).

Table 2: Duration of Impact

Rating	Duration	Description
1	Short term	0–3 years, or length of construction period
2	Medium term	3–10 years
3	Long term	>10 years, or entire operational life of project.
4	Permanent – mitigated	Mitigation measures of natural process will reduce impact – impact will remain after operational life of project.
5	Permanent – No mitigation	No mitigation measures of natural process will reduce the impact after implementation – impact will remain after operational life of project.

- **Intensity/severity**: This is the degree to which the project affects or changes the environment; it includes a measure of the reversibility of impacts (**Table 3**).

Table 3: Intensity of Impact

Rating	Intensity	Description
1	Negligible	Change is slight, often not noticeable, natural functioning of environment not affected.
2	Low	Natural functioning of environment is minimally affected. Natural processes can be reversed to their original state.
3	Medium	Environment remarkably altered, still functions, if in modified way. Negative impacts cannot be fully reversed.
4	High	Natural functions and processes disturbed – potentially ceasing to function temporarily.
5	Very high	Natural functions and processes permanently cease, and valued, important, sensitive or vulnerable systems or communities are substantially affected. Negative impacts cannot be reversed.

- **Potential for irreplaceable loss of resources**: This is the degree to which the projectwill cause loss of resources that are irreplaceable (**Table 4**).

Table 4: Potential for irreplaceable loss of resources.

Rating	Potential for irreplaceable loss	Description
1	Low	No irreplaceable natural resources will be impacted.
3	Medium	Natural resources can be replaced, with effort.
5	High	There is no potential for replacing a particular vulnerable resource that will be impacted.

- **Probability**: This is the likelihood or the chances that the impact will occur (**Table 5**).

Table 5: Probability of Impact

Rating	Probability	Description
1	Improbable	Under normal conditions, no impacts expected.
2	Low	The probability of the impact to occur is low due to its design or historic experience.
3	Medium	There is a distinct probability of the impact occurring.
4	High	It is most likely that the impact will occur.
5	Definite	The impact will occur regardless of any prevention measures.

- **Confidence**: This is the level of knowledge or information available, the specialist had in his/her judgement (**Table 6**).

Table 6: Confidence in level of knowledge or information

Rating	Confidence	Description
	Low	Judgement based on intuition, not knowledge/information.
	Medium	Common sense and general knowledge inform decision.
	High	Scientific/proven information informs decision.

- **Consequence**: This is calculated as extent + duration + intensity + potential impact on irreplaceable resources.

- **Significance**: The significance will be rated by combining the consequence of the impact and the probability of occurrence (i.e. consequence x probability = significance). The maximum value which can be obtained is 100 significance points (**Table 7**).

Table 7: Significance of issues (based on parameters)

Rating	Significance	Description
1-14	Very low	No action required.
15-29	Low	Impacts are within the acceptable range.
30-44	Medium-low	Impacts are within the acceptable range but should be mitigated to lower significance levels wherever possible.
45-59	Medium-high	Impacts are important and require attention; mitigation is required to reduce the negative impacts to acceptable levels.
60-80	High	Impacts are of great importance, mitigation is crucial.
81-100	Very high	Impacts are unacceptable.

- **Cumulative Impacts**: This refers to the combined, incremental effects of the impact. The possible cumulative impacts will also be considered.