Botanical Assessment

Proposed upgrading of the Schaapkop sewer rising main in George

January 2024

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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. He is also experienced in undertaking/compiling Environmental Impact Assessments (EIA's), Environmental Management Programmes (EMPr's), Environmental Control Officer (ECO) duties, audits, land use surveys and due diligence investigations. CV is available upon request.

Citation of report

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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:	17 January 2024

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1. Introduction

Proposed development and area assessed

The applicant (George Local Municipality) wishes to upgrade the Schaapkop sewer rising main on remainder of Erf 464 and Erf 13486 in the George municipal area. The site is located directly west of Borcherds township in George (**Figure 1-1**). A ±180 m section of the existing 500 mm diameter rising main will be upgraded to a 800 mm Ø rising main (**Figure 1-2**). **Figures 1-3** and **1-4** present the latest layout of the proposed infrastructure. Further details of the project and options for the crossing of the Schaapkop River are presented in **Annexure 3**.

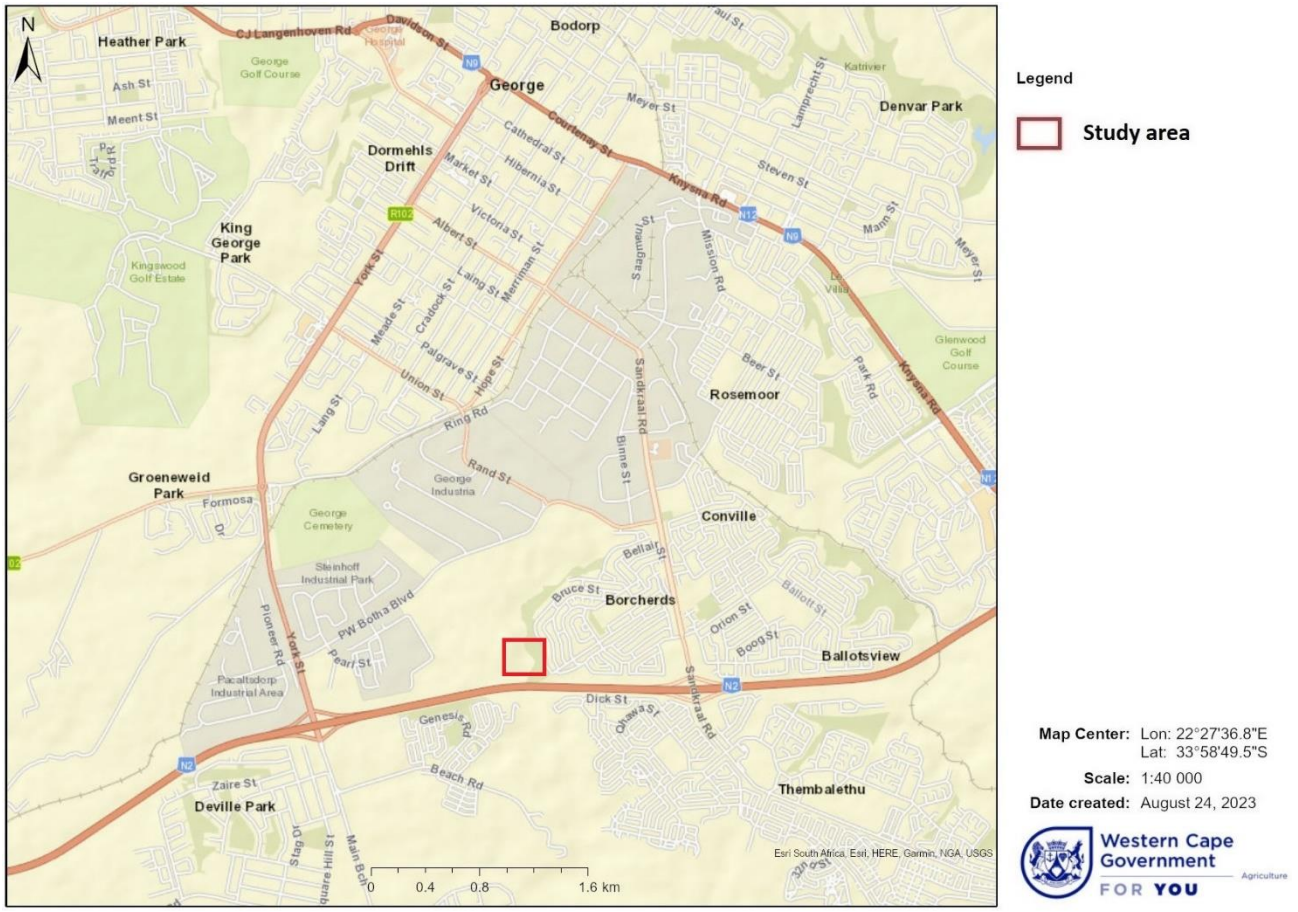

Figure 1-1: Location of the site on the southern side of George.

According to the Screening Report, generated by the EAP (Sharples Environmental Services) on 17 May 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 a threatened ecosystem and the encroachment of the site onto the biodiversity network and a strategic water source area. As a result, MB Botanical Surveys was contracted to undertake a botanical survey of the site.

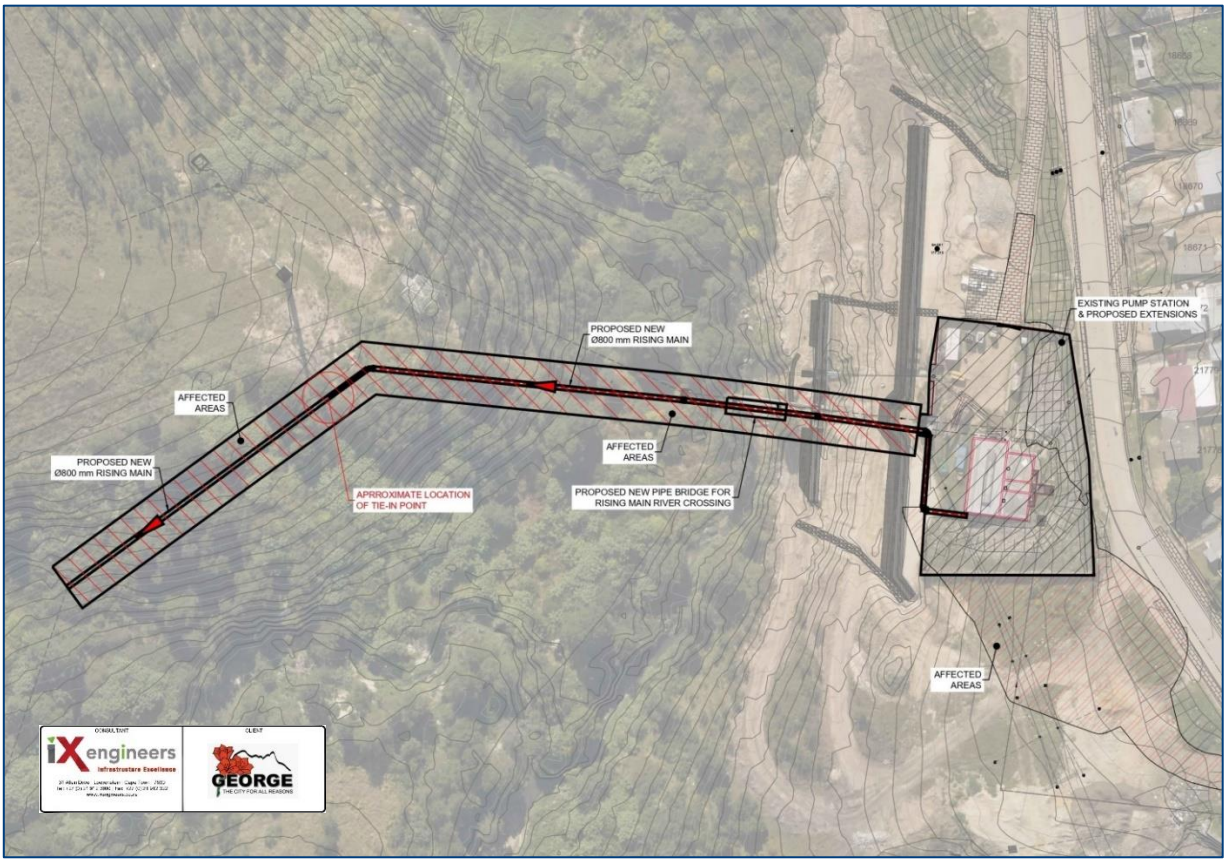

Figure 1-2: Proposed new sewer rising main and pump station infrastructure (old layout).

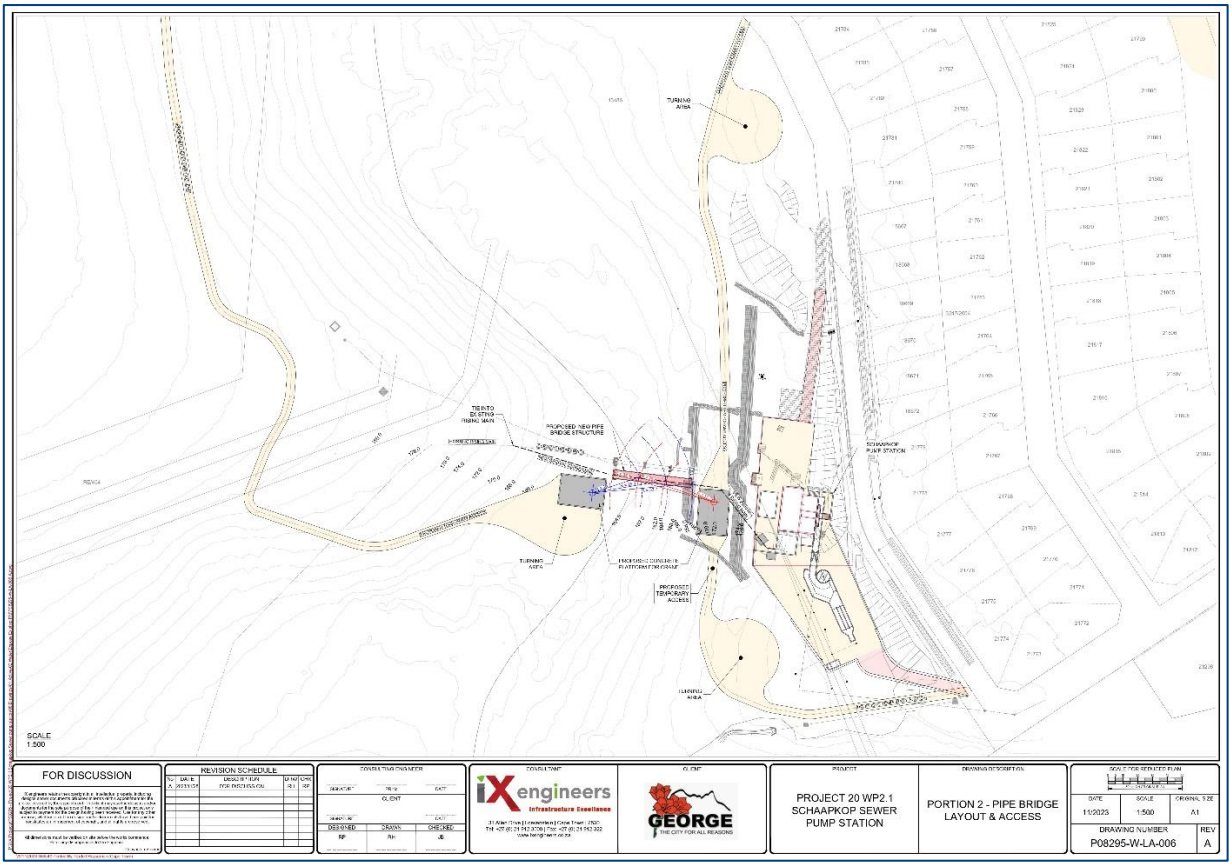

Figure 1-3: Proposed new sewer rising main and pump station infrastructure (new layout).

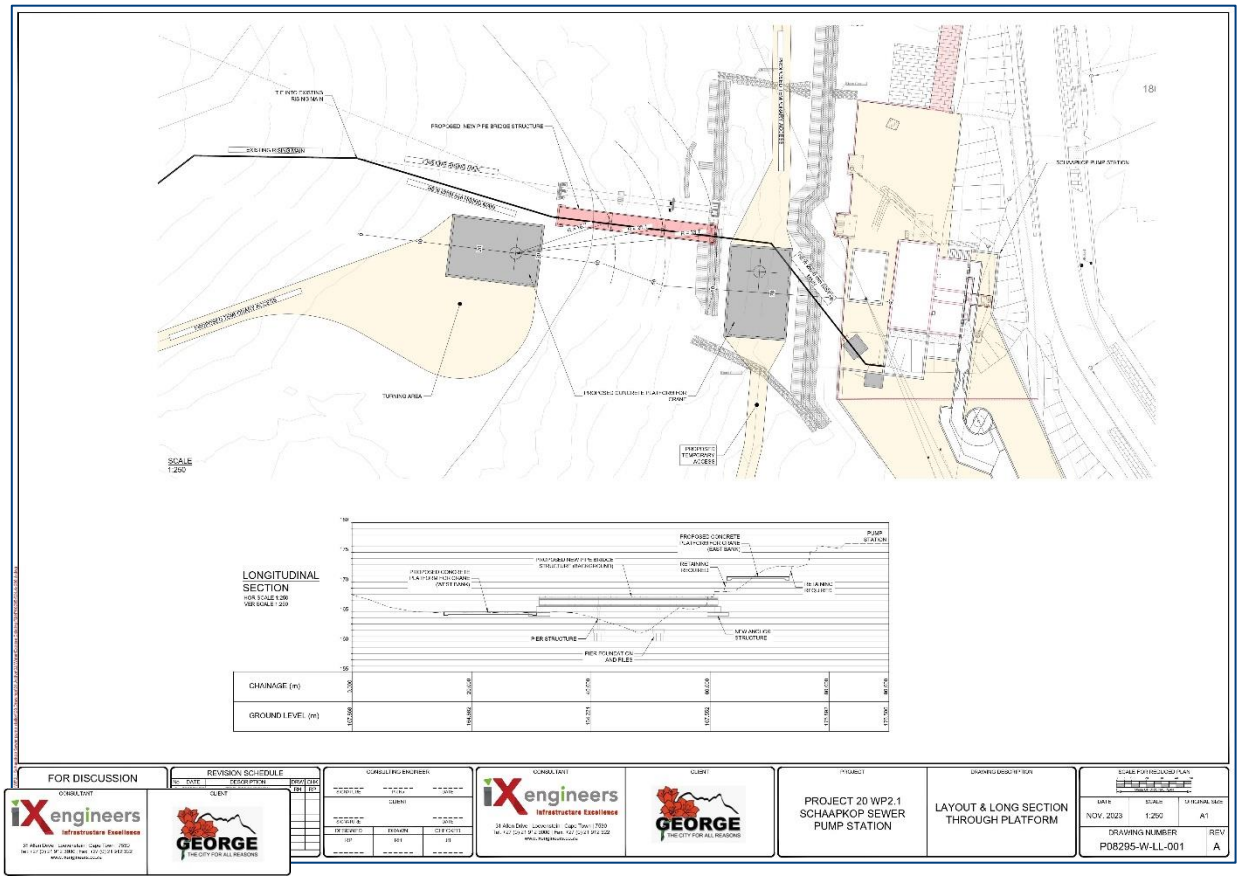

Figure 1-4: Close-up of proposed new sewer rising main and pump station infrastructure (new layout).

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, including a *status quo* assessment, followed by either a Compliance Statement or a Botanical Assessment Report, depending on the outcome of the *status quo* assessment;
- Identify and describe biodiversity patterns at a community and ecosystem level (main vegetation type, plant communities and threatened/vulnerable 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 and CapeNature guidelines/protocols for biodiversity assessments, as well as the EAP's terms of reference.

Limitations and Assumptions

The following limitations and assumptions apply to the study:

- Fieldwork was carried out late in the winter season, 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. 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.

Notwithstanding the above limitations, the specialist is of the opinion that the survey and findings are adequate to aid decision making.

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 degraded critical biodiversity area (CBA2), strategic water source areas and a critically endangered ecosystem (i.e. Garden Route Granite Fynbos).

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

Sensitivity	Feature(s)
Medium	*Lampranthus pauciflorus*
Medium	*Leucospermum glabrum*
Medium	Sensitive species 1024
Medium	Sensitive species 1032
Medium	*Euchaetis albertiniana*
Medium	Sensitive species 800
Medium	Sensitive species 500
Medium	*Diosma passerinoides*

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.

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 10 August 2023 by the author in the company of the EAP (John Sharples). 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**. The eastern end of the site (east of the Skaapkop River) was surveyed on 27 May 2023.

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.

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

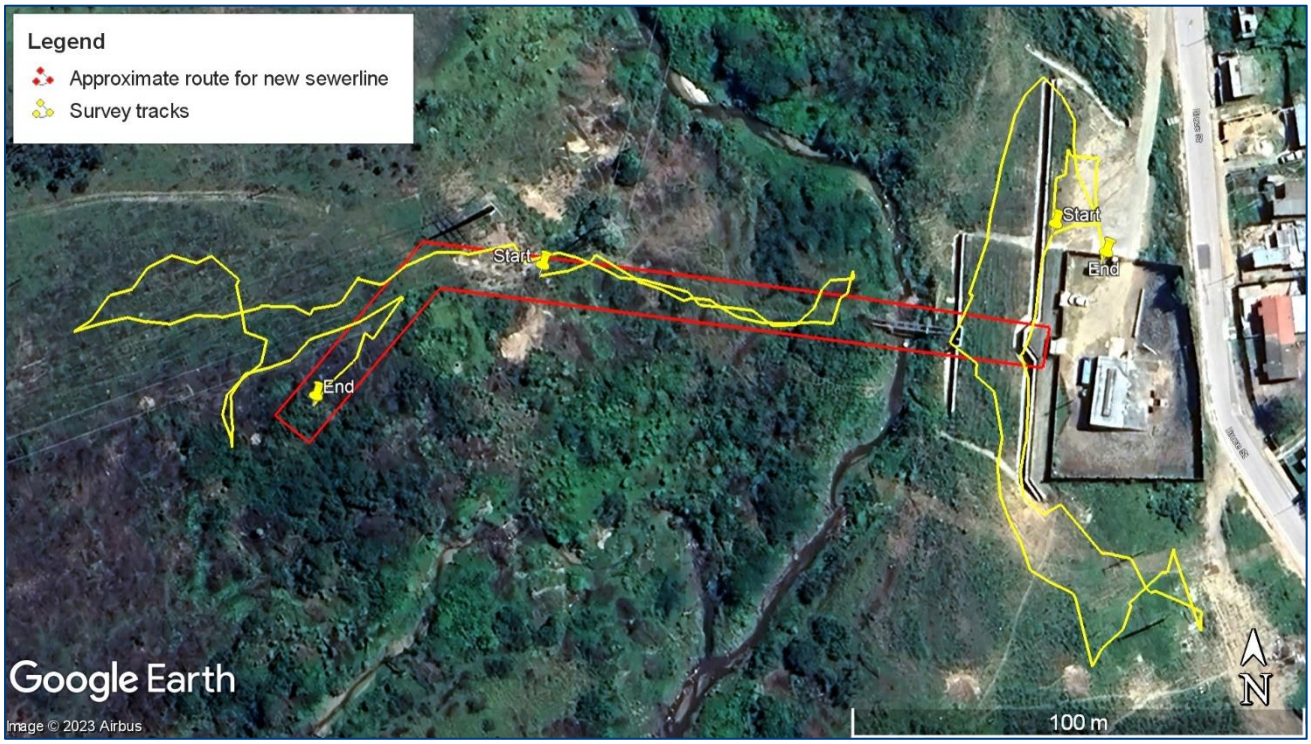

Figure 3-1: Satellite photo showing the survey tracks on site.

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 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, 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 ±4 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 compliance 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 survey.

Location, topography & land use

The pipeline route is located on a grassy, partly vegetated hill slope above the Skaapkop River, directly west of Borcherds township (**Figure 4-1**). The eastern end of the route crosses the Skaapkop River before connecting with the Schaapkop pump station. The general area can be described as moderately sloped. Apart from existing pipeline infrastructure and an Eskom powerline that encroaches the western end of route, the area along the pipeline route is vacant.

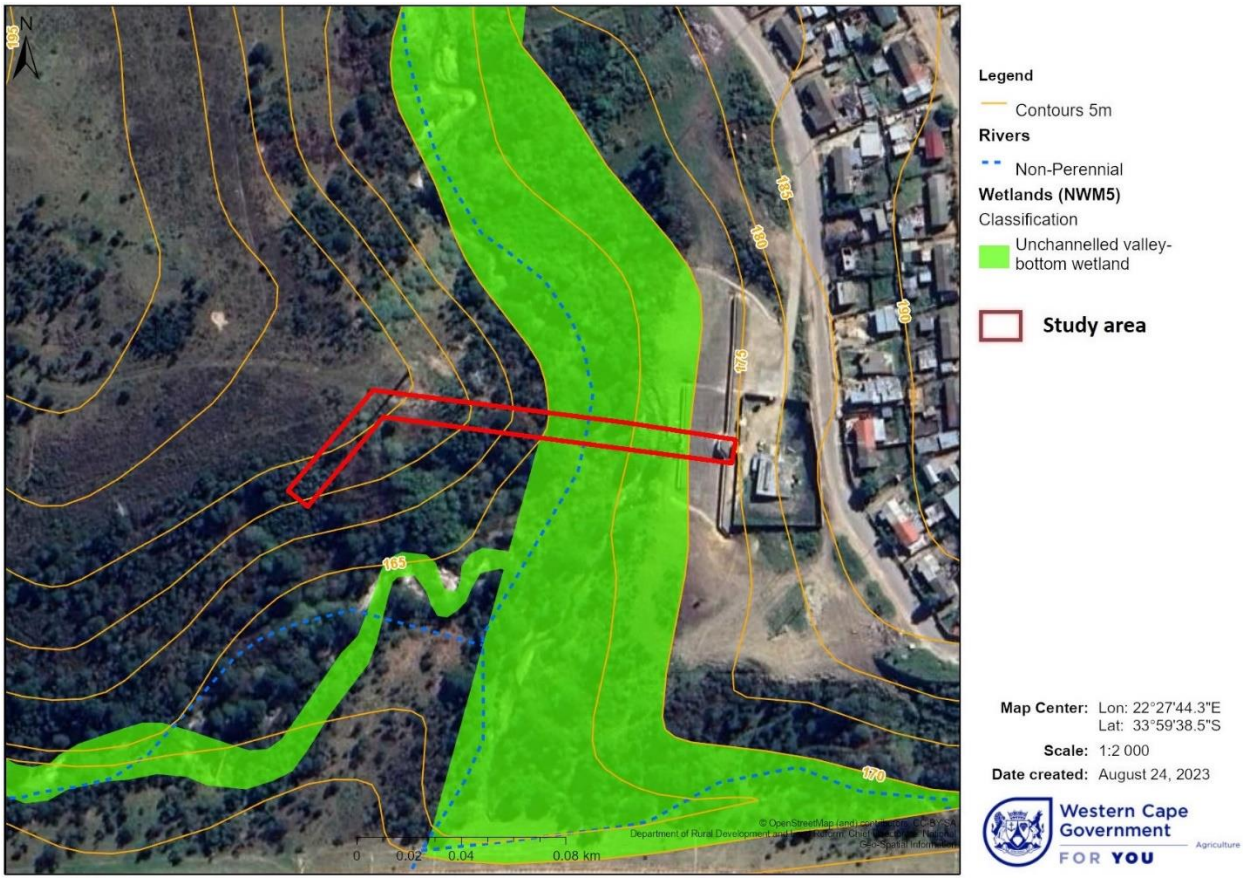

Figure 4-1: Combined topography and hydrology map.

Hydrology

The proposed sewer pipe crosses the Skaapkop River which is mapped as a non-perennial watercourse (**Figure 4-1**). Another notable feature is a mapped NWM5 (National Wetland Map 5) valley-bottom wetland associated with the Skaapkop River. The proposed river crossing has already been modified somewhat by plinths and other

concrete structures associated with an existing sewer line (**Figure 4-2**). Considerable alien infestation (bugweed and castor-oil plants) was also noted in the riverine area. The wetland and watercourses have been included in the biodiversity network.

Figure 4-2: Proposed river crossing (eastern end of proposed pipeline).

Climate

The mean annual rainfall for the area is 809 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 winter months of June and July are the driest, 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 24.0°C and 7.6°C for February and July, respectively (as per Cape Farm Mapper data). The Köppen-Geiger climate classification for the area is Cfb (temperate, no dry season, warm summer).

Geology

According to the 3322 Oudtshoorn 1:250 000 geological map, the pipeline route to the WWTW) parts of the site are underlain by Maalgaten Granite (George pluton), a pre-Cape intrusive rock formation. It comprises gneissic granite, granodiorite and albitite. Its age is estimated to be between 600 and 650 million years (Toerien, 1979). It produces deep,

prismacutanic- and pedocutanic-dominated soils typical of Db land types (Mucina, 2006). It typically supports granite fynbos and to a lesser extent Afrotemperate forest.

Biodiversity Planning Context

The study site is located in a typical fynbos environment on the Southern Cape coastal plain. The indigenous species recorded along the proposed pipeline route are typical fynbos species, such as *Erica sparsa, Bobartia aphylla* and *Leucadendron salignum*. The 2018 Vegetation Map of South Africa classifies the vegetation type found on site as Garden Route Granite Fynbos (**Figure 4-3**). This vegetation type occurs as three units from Botterberg (south of Robinson Pass) in the west to Hoogekraal Pass (west of Karatara) in the east. The site is situated in the largest block between Groot Brak and Wilderness. It is described as a dense proteoid and ericoid shrubby grassland[2]. In the west, most of the remnants are dominated by proteas (Mucina, 2006). Eastwards, graminoid and ericaceous fynbos are dominant on the flatter areas (Mucina, 2006).

Figure 4-3: Extract of the 2018 SA Vegetation map.

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

Due to its transformed state, Garden Route Granite Fynbos is currently listed as Critically Endangered in the Revised National List of Threatened Ecosystems (DEA, 2022), with only 37% left[3]. It has been transformed mainly for cultivation, pine plantations and urban development (Mucina, 2006). Remnants of Garden Route Granite Fynbos largely remain in isolated pockets on steeper slopes (Mucina, 2006). About 1% of it is conserved in the Garden Route National Park and few private nature reserves (Mucina, 2006). Its protection should therefore remain a priority in the coastal areas. Like all fynbos types, Garden Route Granite 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.). Fire is an important ecological driver in the Fynbos Biome and regular fires are needed for biodiversity maintenance and recruitment purposes.

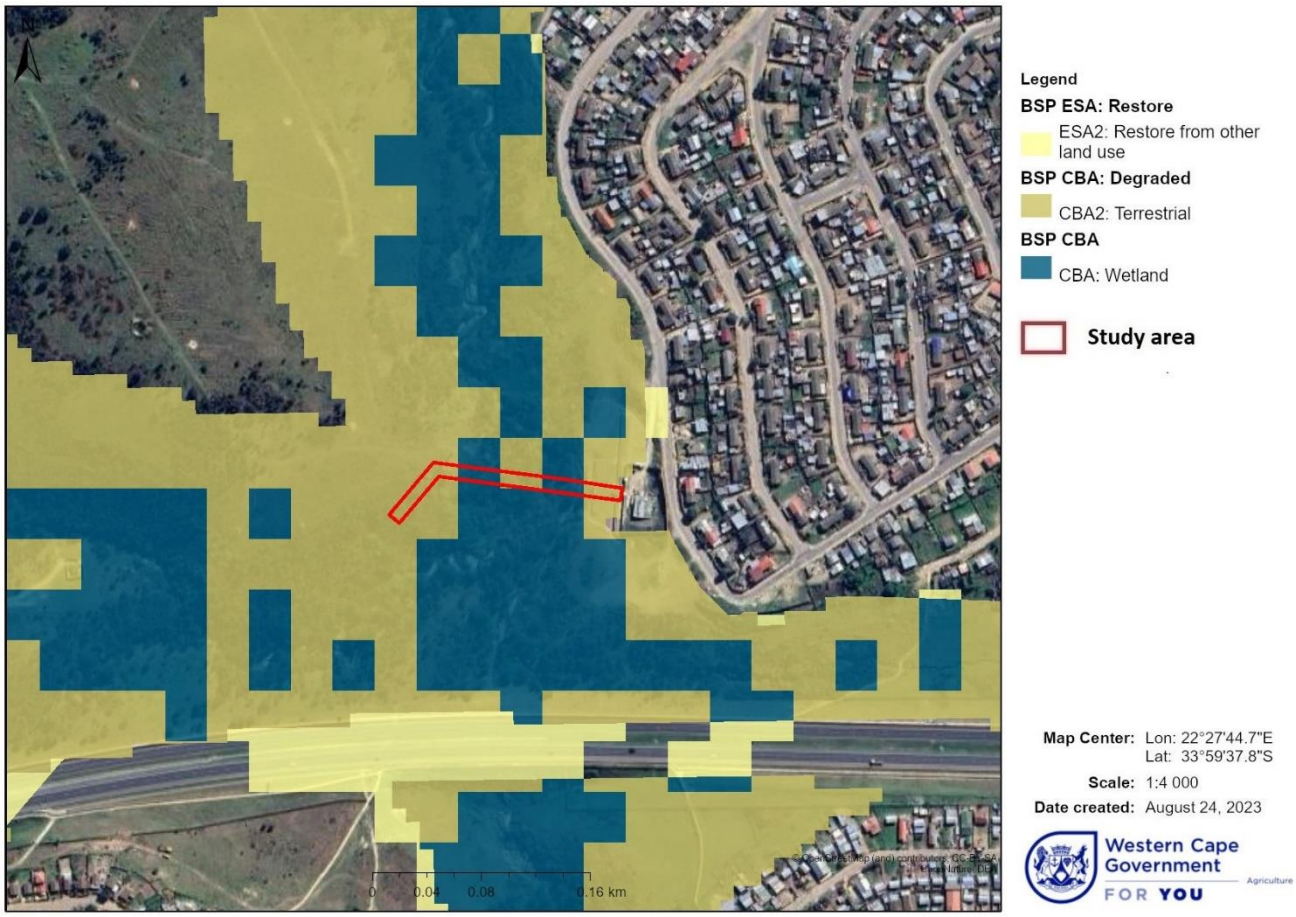

Figure 4-4: Extract of the Western Cape biodiversity network map.

The proposed pipeline falls inside the Western Cape biodiversity network (**Figure 4-4**). It runs through a mixture of aquatic critical biodiversity area (CBA) and degraded terrestrial

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

critical biodiversity area (CBA2). The degraded areas are recommended for rehabilitation. The aquatic CBA is aligned with the Skaapkop River, while the CBA2 corresponds with the adjacent vegetated slopes. The CBA corridor in which the project is located ends in the George industrial area a few kilometres away to the north. Reasons for the importance of the above mapped units include the presence of threatened vertebrate habitat (bontebok) and water resource protection (Kaaimans, Southern Coastal Belt and South-Eastern Coastal Belt). Interestingly, there is no mention of the possible presence of a threatened vegetation type, such as Garden Route Granite Fynbos. The closest protected area is the Katrivier Nature Reserve, located about 5 km northeast of the site.

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.

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 proposed sewer pipe is located in an area that was probably used for grazing in the past, but is now lying fallow (**Figure 5-1**). Fynbos elements are more prominent in the degraded fynbos areas. Elsewhere, only a few scattered fynbos species were noted here and there. One can distinguish between a grassier fynbos along the powerline servitude and a strip of shrubby fynbos below at the western end of the pipeline route (**Figures 5-2** & **5-3**). The grassiness can be ascribed to frequent bush-cutting during past agricultural use and probably also for safety reasons underneath the powerline. There is a high presence of invasive species, such as bugweed (*Solanum mauritianum*) and black wattle (*Acacia mearnsii*), especially in the highly degraded area (**Figures 5-4** & **5-5**). The vegetation can probably be best described as a low grassland or a degraded grassy fynbos where there is a significant fynbos component. Structurally, the shrubby fynbos can be described as a low to mid-high closed small-leaved shrubland following Campbell's classification.

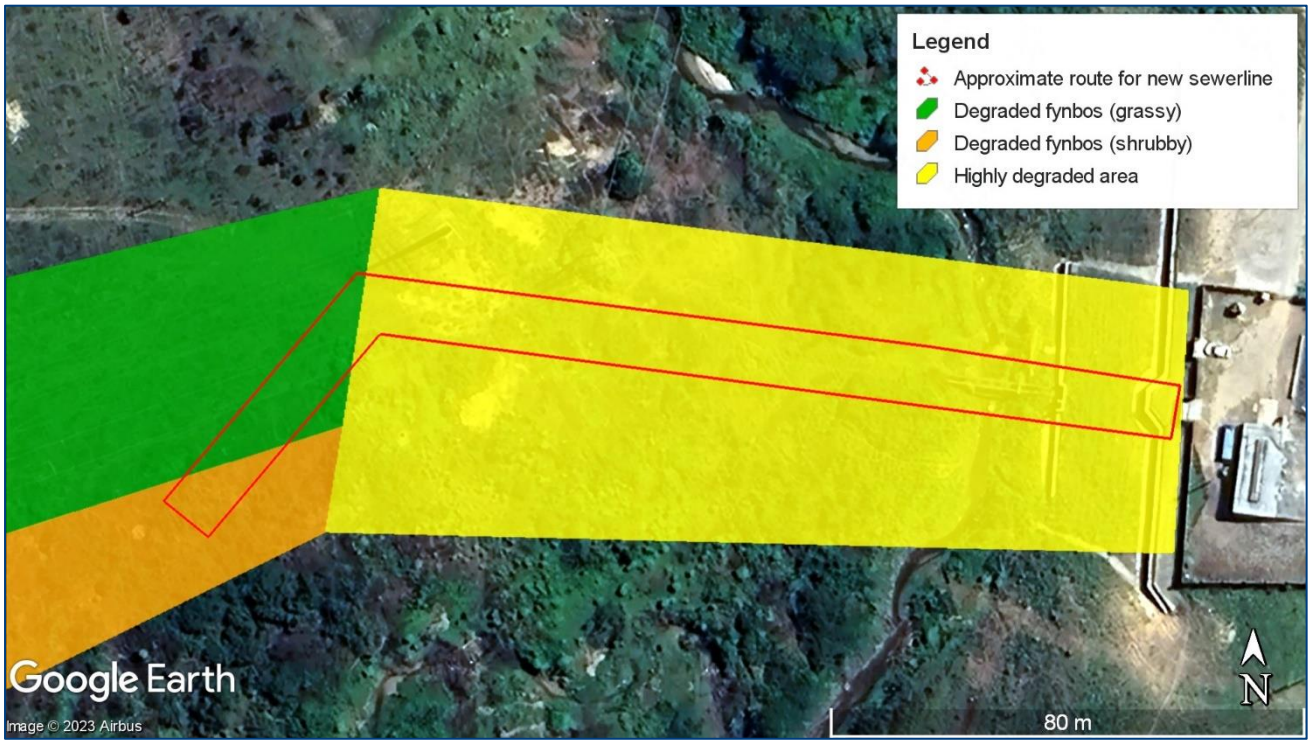

Figure 5-1: Botanical attributes of the proposed pipeline route.

Figure 5-2: Degraded grassy fynbos (grassland) at the highest point along pipeline route near the western end.

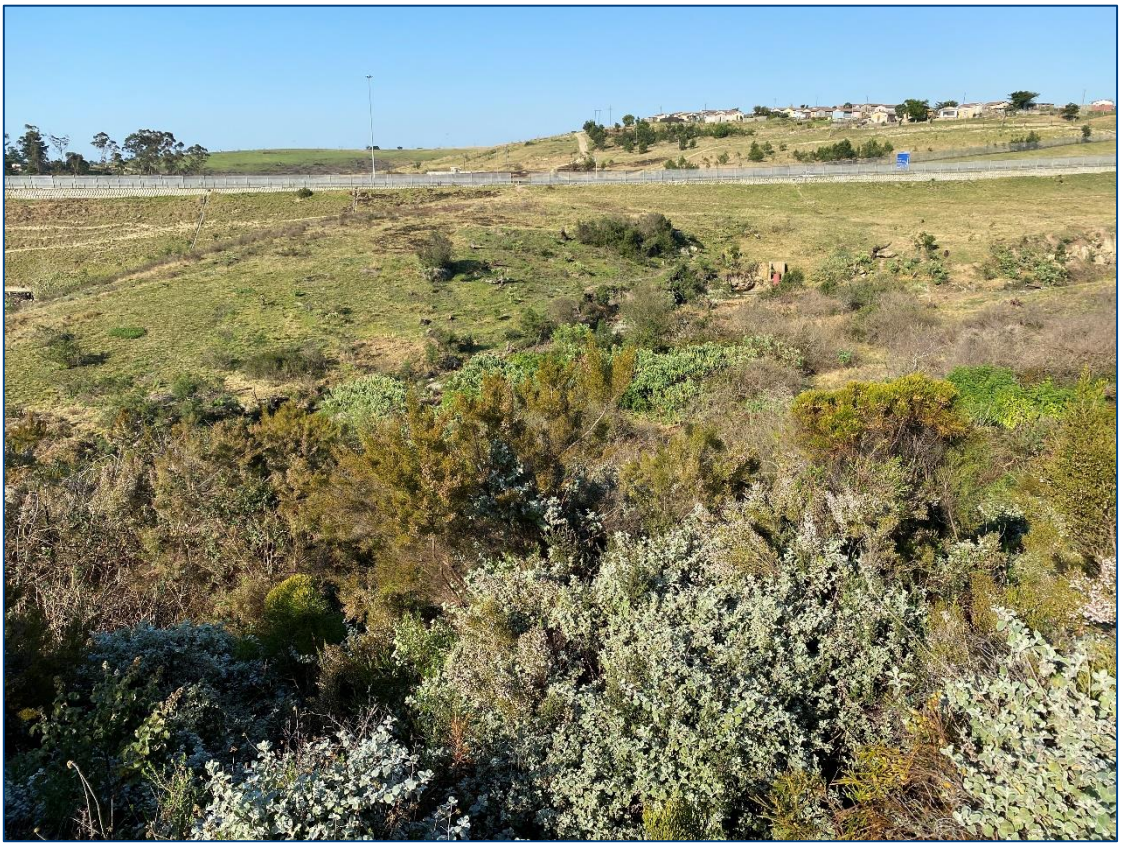

Figure 5-3: Strip of shrubby fynbos at the western end of pipeline route, dominated by *Helichrysum petiolare, Berzelia intermedia* and *Passerina montivaga*.

Figure 5-4: Middle section of the proposed pipeline route (red arrow).

Figure 5-5: Close-up view of the middle section of pipeline route, populated by grasses and bugweed.

Plant species

A fair number of indigenous shrub species were recorded, including *Leucadendron salignum, Erica sparsa, E. quadrangularis, E. scabriuscula, Berzelia intermedia, Athanasia dentata, Euryops chrysanthemoides, Metalasia acuta, Helichrysum foetidum, H. petiolare, H. patulum, H. anomalum, H. nudifolium, Ursinia discolor, Pseudognaphalium undulatum, Senecio ilicifolius, Nidorella ivifolia, Passerina montivaga, Gnidia setosa, Euclea crispa, Searsia rehmanniana* var. *glabrata, Gymnosporia buxiflolia, Ekebergia capensis, Carpobrotus edulis, Morella humilis, Gomphocarpus cf physocarpus, Clutia* sp, *Rubus pinnatus, Cliffortia odorata, Exomis microphylla* and *Selago corymbosa*. Only a few hemicryptophytes and geophytes were recorded, namely *Restio albotuberculatus, Hypoxis* sp, *Eriospermum* sp and *Bobartia aphylla*. *Carpobrotus edulis* is a useful soil binder. **Figure 5-6** shows a few of the recorded indigenous species.

All the recorded species are widespread and mostly common in the region. No regional endemics, SCC or protected tree species were recorded. There are only a few iNaturalist records of *Gnidia setosa* from the region[4], but this can probably be ascribed to under-

[4] Gnidia setosa · iNaturalist

sampling. Floristic association with Garden Route Granite Fynbos is poor with only one important taxon recorded, namely *Leucadendron salignum*. This can be ascribed to the degraded state of the site.

Figure 5-6: A few indigenous species recorded on site, with *Erica sparsa* (top left), *Ekebergia capensis* (top right), *Leucadendron salignum* (bottom left) and *Helichrysum nudifolium* (bottom right).

Invasive species recorded include *Acacia mearnsii* (black wattle, category 2), *Solanum mauritianum* (bugweed, 1b), *Cirsium vulgare* (spear thistle, 1b), *Ricinus communis* (castor-oil plant, 2) and *Datura stramonium* (common thorn apple, 1b). As indicated above, they are all 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 castor-oil plant, is prohibited without a permit. The presence of the woody aliens, especially black wattle, also present a fire risk.

Site Ecological Importance

In order to show the biodiversity sensitivity of the site, a site ecological importance (SEI) map was prepared (**Figure 5-7**). This map considers the biodiversity importance (BI) of

the receptor (affected) area and its resilience to impacts (RR). The BI, in turn, is a function of conservation importance (CI) and functional integrity (FI) of the receptor area. A low-medium SEI value for the degraded fynbos area means that suitable restoration measures should be considered after construction. No active restoration is needed for the highly degraded area, which has a very-low SEI value. Please note that this map ignores the hydrological value of the Skaapkop River, crossed by the proposed pipeline.

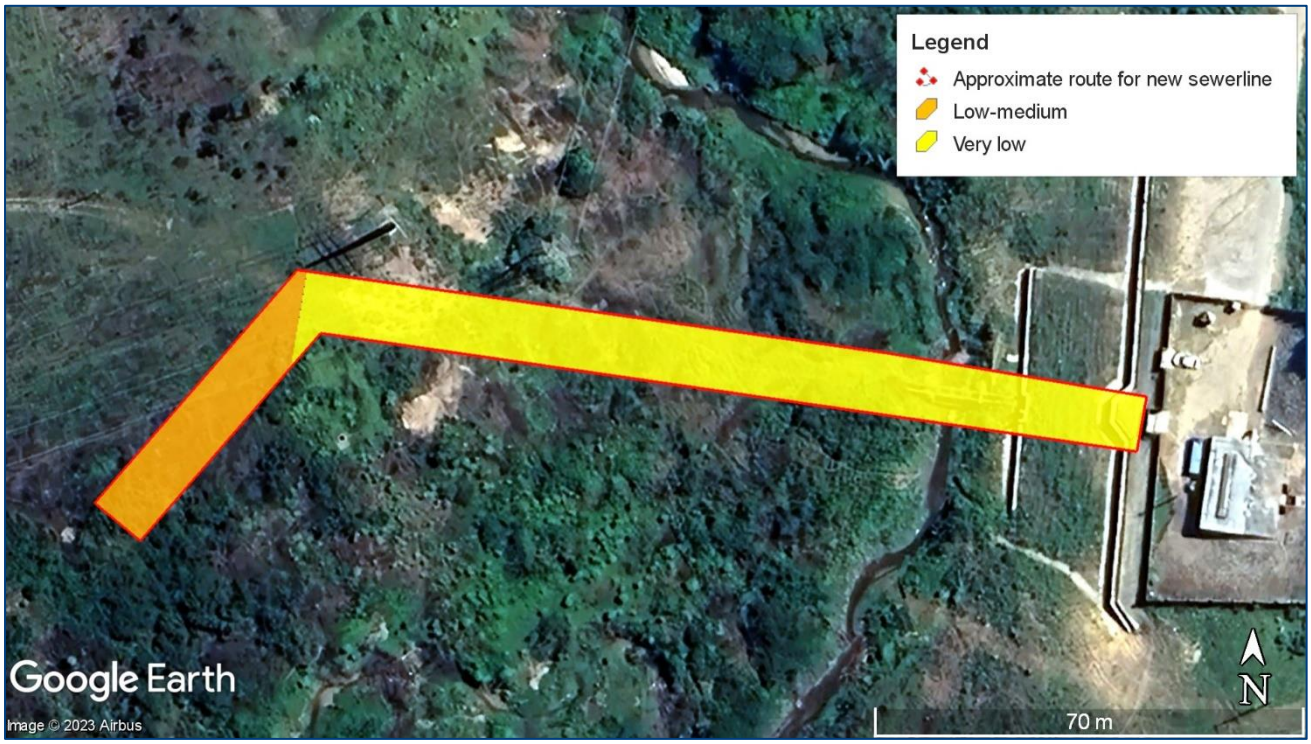

Figure 5-7: SEI map of the proposed pipeline route.

6. Potential Impacts

Terrestrial biodiversity (vegetation)

The affected vegetation type, albeit highly degraded, has been identified as Garden Route Granite Fynbos, which is currently listed as Critically Endangered. The impact will involve considerable earthworks (trenching) to install the pipeline during the construction phase. The length of the pipeline through degraded fynbos has been estimated at about 50 m. This translates to a 500-750 m^2 area that will be disturbed if construction work is confined to a 10-15 m wide strip. The rest of the route and area around the pump station are highly degraded with no noticeable presence of fynbos elements. The options for the river crossing as presented in **Annexure 3** present little difference in the impact on terrestrial biodiversity due to the disturbed/transformed state of the riverbanks. Option 3, which entails more construction work and infrastructure inside the riverbed will have the greatest disturbance footprint.

Care must be exercised to ensure that the adjacent vegetation is not unnecessarily disturbed. Given the linear nature of the project and the degraded state of the granite fynbos, the impact on terrestrial biodiversity is of medium-low concern, prior to mitigation. Past agricultural activities and alien (mainly black wattle and bugweed) infestation along a section of the route has contributed to its degraded state. However, the situation can be improved by alien clearing.

The proposed pipeline also passes through a mapped aquatic CBA and a CBA2, which form part of a minor biodiversity (CBA) corridor that extends along the Skaapkop River into the George industrial area. Apart from providing a backbone to the local biodiversity network, the corridor serves as an important passage along which fauna can migrate between the vegetation remnants. Due to the linear nature of the project, one can expect a temporary impact on the functionality of the biodiversity network. Areas disturbed during the construction phase can be rehabilitated and should recover fully. The residual impact will therefore be minimal. **Table 6-1** summarises the impact.

Table 6-1: Impact on terrestrial biodiversity.

Phase	**Construction Phase**	**Operational Phase**
Nature of impact(s)	- Disturbance of degraded fynbos (500-750 m^2). - Impact on the functionality of biodiversity network. Impact will be temporary. - Increased opportunity for alien infestation. - Erosion on the steeper slope due to poor rehabilitation efforts.	- Increased alien infestation.
Extent of impact	Construction footprint and immediate surroundings	Construction footprint and immediate surroundings
Duration	Short to medium term	Medium term
Intensity	Medium	Low
Probability of occurrence	High	High
Degree of reversibility	Medium-high	High
Irreplaceability of resource	Medium	Medium-low
Mitigatory potential	High	High
Significance before mitigation	Medium-low	Medium-low
Significance after mitigation	Low	Low
Mitigation		
• During the construction phase, demarcate/fence off the construction footprint. Restrict all construction activities, such as stockpiling, parking and cement mixing, to already disturbed areas		

away from natural vegetation. The contractor(s) must be made aware of the sensitive surroundings. The fynbos outside the footprint must be declared a 'no-go' area 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 vegetated areas. Cement water is highly alkaline and considered toxic.
- Remove topsoil and/or seedbearing indigenous plant material from the vegetated areas to be disturbed for use in the rehabilitation of disturbed areas after construction. Avoid using seed-bearing alien plant material for rehabilitation purposes.
- Rehabilitate/revegetate all the disturbed surfaces. Erosion prevention measures may be needed on the steep slopes, such as silt fences, logs or netting, to slow down runoff and potential erosion. Mulching and seeding with indigenous grass seed may also be needed. However, due to the linear nature of the project, it is expected that the disturbed areas will recover relatively quickly without the need for much intervention.
- Engage in alien clearing, focussing on invasive species such as black wattle and bugweed. 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-term maintenance requirement.
- Allow at least 24 months for the monitoring of rehabilitation success and alien infestation post construction.

The rehabilitation potential of the disturbed area should be good. Likely, all the species which originally occurred along the pipeline route will return, including any alien species present in the area. As an indirect impact, soil disturbance caused by earthworks will provide ideal conditions for the establishment of invasive alien species. The presence of black wattle and bugweed in the area will exacerbate this impact. Therefore, as an operational phase maintenance concern, keep the pipeline route and immediate adjacent area clear of invasive aliens during the maintenance period.

It is recommended that a strip of at least 10 m wide on both sides of the pipeline be monitored for aliens during the maintenance period. The aliens also add to the fuel load and increase the risk of wildfires in the long term. As stated earlier, it is a legal requirement for the landowner to clear/control the invasive aliens on their land.

Plant species

The impact on plant species, including SCC and protected tree species, is also expected to be of medium-low significance, prior to mitigation. Nearly all the recorded species are common and widespread in the region. No SCC or protected tree species were recorded on site. The only gap in the information provided above is the possible presence of more spring flowering bulbs, mainly in the Iridaceae and Orchidaceae families. 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) records of these species, only Sensitive species 800 has a low-medium likelihood to occur on the site. **Table 6-3** summarises the impact on flora and SCC.

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

Sensitivity	Feature(s)	Habitat & probability of presence
Medium	*Lampranthus pauciflorus* (EN)	Rocky coastal slopes; closest iNat records are from the coastline between Herold's Bay and Victoria Bay; **Low**
Medium	*Leucospermum glabrum* (EN)	Moist lower slopes of the Outeniqua and Tsitsikamma Mountains; **Low**
Medium	Sensitive species 1024 (EN)	Dry to moist stony slopes, no known records from the George area; **Low**
Medium	Sensitive species 1032 (VU)	Fixed dunes close to shoreline; **Low**
Medium	*Euchaetis albertiniana* (EN)	Coastal sands and limestone; taxonomic status questionable (pers. comm. J. Victor); **Low**
Medium	Sensitive species 500 (EN)	Recent sand; **Low**
Medium	Sensitive species 800 (VU)	Calcareous sands and limestone; closest iNat records are from Oubaai, 7.3 km away to the southwest; **Low-medium**
Medium	*Diosma passerinoides* (VU)	Silcrete slopes; closest known records are from northwest of Mossel Bay; **Low**

Table 6-3: Impact of the project on flora and SCC.

Phase	Construction Phase	Operational Phase
Nature of impact(s)	- Loss of indigenous flora and SCC	- Alien infestation and resulting displacement of indigenous flora
Extent of impact	Development footprint	Development footprint and immediate surroundings
Duration	Shorth to medium term	Medium term
Intensity	Medium	Low-medium
Probability of occurrence	High	High
Degree of reversibility	Medium-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 succulents and bulbs from the construction footprint for replanting in the disturbed areas after construction. Topsoil, cuttings and seedbearing plant material can also be salvaged for this purpose, especially cuttings from *Carpobrotus edulis*. 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. Ideally, bulbs should be salvaged during leaf fall, but before or after flowering.

The **cumulative botanical impact** of the project is expected to be equivalent to the impact on terrestrial biodiversity described above, i.e. the continued erosion of Garden Route Granite Fynbos and the biodiversity network as a result of construction activities. In this instance, the loss of biodiversity and resultant cumulative impact is considered small (acceptable) due to the already degraded state of the site, the linear nature of the project and the potential for rehabilitation. There should be no cumulative impact if rehabilitation is successful.

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, demarcate/fence off the construction footprint. Restrict all construction activities, such as stockpiling, parking and cement mixing, to already disturbed areas away from natural vegetation. The contractor(s) must be made aware of the sensitive surroundings. The fynbos outside the footprint must be declared a 'no-go' area and not be disturbed in any way.
- Search and rescue succulents and bulbs from the construction footprint for replanting in the disturbed areas after construction. Topsoil, cuttings and seedbearing plant material can also be salvaged for this purpose, especially cuttings from *Carpobrotus edulis*. 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. Ideally, bulbs should be salvaged during leaf fall, but before or after flowering.
- 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 vegetated areas. Cement water is highly alkaline and considered toxic.
- Remove topsoil and/or seedbearing indigenous plant material from the vegetated areas to be disturbed for use in the rehabilitation of disturbed areas after construction. Avoid using seed-bearing alien plant material for rehabilitation purposes.
- Rehabilitate/revegetate all the disturbed surfaces. Erosion prevention measures may be needed on the steep slopes, such as silt fences, logs or netting, to slow down runoff and potential erosion. Mulching and seeding with indigenous grass seed may also be needed. However, due to the linear nature of the project, it is expected that the disturbed areas will recover relatively quickly without the need for much intervention.

- Engage in alien clearing, focussing on invasive species such as black wattle and bugweed. 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-term maintenance requirement.
- Allow at least 24 months for the monitoring of rehabilitation success and alien infestation post construction.

8. Conclusion & Recommendation

This report presents the results from a desktop study, as well as a field survey conducted on 10 August 2023, to ascertain terrestrial biodiversity and plant species constraints and impacts associated with the proposed upgrading of the Schaapkop sewer rising main on remainder of Erf 464 and Erf 13486 in the George municipal area.

The affected vegetation type, albeit highly degraded, has been identified as Garden Route Granite Fynbos, which is currently listed as Critically Endangered. Given the linear nature of the project and the degraded state of the site, the impact on terrestrial biodiversity is of medium-low concern, prior to mitigation. The proposed pipeline also passes through an aquatic CBA and a CBA2, which form part of a minor biodiversity corridor that extends along the Skaapkop River into the George industrial area. One can expect a temporary impact on the functionality of the biodiversity network. Areas disturbed during the construction phase can be rehabilitated and should recover fully. Nearly all the recorded plant species are common and widespread in the region, with no SCC or protected tree species recorded.

It is therefore recommended that the project (as currently presented) be approved, but subject to the recommended mitigation measures. Option 2 for the crossing of the Schaapkop River is preferred as it will present the lowest risk of sewage spillage in the long term. It will also have a slightly smaller disturbance footprint than Option 3. Option 1 should be disregarded as it is prone to vandalism.

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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.

Annexure 3: Options for the upgrading of river crossing

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E-MAIL TRANSMISSION COVER MEMORANDUM
E-POS TRANSMISSIE DEKKINGS MEMORANDUM

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Cobus Louw	16.1.8.3 RBIG SCHAAPKOP: SCHAAPKOP SEWER RISING MAIN	
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Option 1 : Upgrading of current river crossing

Currently the Scaapkop river is bridged with a steel pipe acting as a pipe bridge and the pipe itself simultaneously. On the eastern riverbank a concrete anchor block exists. On the Western side the pipe gradually slopes into the escarpment.

Option 2 : Proposed river crossing

Currently the proposed route ±150m of the existing rising main of Ø500mm to be increased to Ø800mm pipeline is indicated as a bridge structure crossing the Schaapkop river for the river crossing section.

The pipeline will have a steady gradient towards the existing Ø800mm connection point of the existing pipeline. The proposed pipe bridge is a concrete u channel with the pipeline covered with removeable concrete cover slabs.

At both sides of the river a foundation structure will be erected to accommodate the pipe bridge.

Option 3 : Alternative river crossing, riverbed crossing:

Alternatively, the river crossing could be done via a pipeline following the riverbed profile. At both riverbanks an anchor block will be required as well as in the riverbed. Air valves will be installed at both riverbanks.

The advantages and the disadvantages of the 3 options:

Option 1 : Typical crossing as per existing structure

Advantages	Disadvantages
Cheapest option.	Highest potential of vandalism – leading to spillage in Schaapkop river.
Construction period shortest.	At least one anchor block at either of the two riverbanks.
Lowest potential of concrete spillage in Schaapkop river.	Visual impact.
	Potential of cement spillage in Schaapkop river during construction.

Option 2 : Typical crossing as per existing structure covered with concrete U-channel and cover slabs – Preferred option

Advantages	Disadvantages
Nothing to very little potential of vandalism.	Anchor block at each riverbank.
Second longest construction period.	Anchor block at both sides of the riverbank.
	Visual impact.
	Potential of cement spillage in Schaapkop river during construction.
	Construction period longer than Option 1.

Option 3 : Alternative river crossing, riverbed crossing:

Advantages	Disadvantages
Nothing to very little potential of vandalism.	Anchor block at each riverbank.
No visual impact.	Installation of air valves. Air valves are generally installed on pump discharge headers and at high points along force mains to prevent air pockets or vacuum conditions. Air and vacuum pockets can cause system surges, loss of efficiency and rapid corrosion of the pipe.
	Most expensive option.
	Longest construction period.
	Must work within a flowing watercourse
	Excavate within riverbed.
	Potential of cement spillage in Schaapkop river during construction.
	Potential of flood damage.

From an engineering point of view, we believe that an overhead river crossing is the best option in terms of cost and time. The possibility of vandalism causing raw sewage to end up in the Shaapkop River must be accommodated in the detailed design.

Access to and from the construction site

Access to the Eastern embankment will be from the existing sewage pumpstation position. On the Western side an existing “Jeep track (twee spoor)” does exist to service the sewage network. This “Jeep track” needs to be upgraded to a more permanent gravel road with the necessary stormwater control structures such as berms and grass block / gabion stormwater energy dissipating structures.

For any further queries do not hesitate to contact Cobus Louw at 072 4233 208.

Yours truly,

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