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# ENVIRONMENTAL MANAGEMENT PROGRAMME

**FOR THE**

## THE PROPOSED UPGRADING OF THE BULK SEWERAGE LINE FROM AMY SEARLE STREET / GREENHAVEN TO THE CRICKET FIELD SEWERAGE PUMPSTATION, ON ERVEN 4808, 4809, 4807, 770, 733, 83 AND REMAINDER OF FARM 4812, STREET PARCEL RE/131 AND STREET PARCEL RE/4893, GROOT BRAKRIVIER, MOSSEL BAY MUNICIPALITY, WESTERN CAPE PROVINCE.

APPLICATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998
(ACT NO. 107 OF 1998), AS AMENDED, AND THE ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS, 2014

**PREPARED FOR:** Mossel Bay Municipality
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**DATE:** 23 February 2026

**SES REF NO:** EMPR/ASP/GB/MBM/02/26

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## Appendix 4 of the EIA Regulations 2014 (as amended 2017).

This Environmental Management Programme has been drafted in accordance with Appendix 4 of the Environmental Impact Assessment Regulations 2014 (as amended 2017). The table below shows how the requirements of Appendix 4 have been included within this Environmental Management Programme.

| | |
|---|---|
| (1) An EMPr must comply with section 24N of the Act and include—<br>(a)details of–<br>(i)the EAP who prepared the EMPr; and<br>(ii)the expertise of that EAP to prepare an EMPr, including a curriculum vitae; | Appendix G- EAP CV |
| (b)a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description; | Section 4 – Description of the Activity |
| (c)a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers; | Section 4 - Description of the Activity |
| (d)a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including—<br>(i)planning and design;<br>(ii)pre-construction activities;<br>(iii)construction activities;<br>(iv)rehabilitation of the environment after construction and where applicable post closure; and<br>(v)where relevant, operation activities; | Section 9 - Environmental Impact Management: Planning and Design Phase<br>Section 10 - Environmental Impact Management: Pre-construction Phase<br>Section 11 - Environmental Impact Management : Construction Phase<br>Section 12 - Environmental Impact Management : Post Construction Rehabilitation Phase & Operational Phase |
| (f)a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to —<br>(i)avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;<br>(ii)comply with any prescribed environmental management standards or practices;<br>(iii)comply with any applicable provisions of the Act regarding closure, where applicable; and<br>(iv)comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable; | Section 9 - Environmental Impact Management: Planning and Design Phase<br>Section 10 - Environmental Impact Management: Pre-construction Phase<br>Section 11 - Environmental Impact Management: Construction Phase<br>Section 12 - Environmental Impact Management: Post Construction Rehabilitation Phase & Operational Phase |
| (g)the method of monitoring the implementation of the impact management actions contemplated in paragraph (f); | Section 15 - Roles and Responsibilities<br>Section 17 - Monitoring, Record Keeping and Reporting |
| (h)the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f); | Section 15 - Roles and Responsibilities<br>Section 17 - Monitoring, Record Keeping and Reporting |
| (i)an indication of the persons who will be responsible for the implementation of the impact management actions; | Section 9 - Environmental Impact Management: Planning and Design Phase<br>Section 10 - Environmental Impact Management: Pre-construction Phase<br>Section 11 - Environmental Impact Management: Construction Phase<br>Section 12 - Environmental Impact Management: Post Construction Rehabilitation Phase & Operational Phase<br>Section 15 - Roles and Responsibilities |
| (j)the time periods within which the impact management actions contemplated in paragraph (f) must be implemented; | Section 9 - Environmental Impact Management: Planning and Design Phase<br>Section 10 - Environmental Impact Management: Pre-construction Phase |

| | |
|---|---|
| | Section 11 - Environmental Impact Management: Construction Phase<br>Section 12 - Environmental Impact Management: Post Construction Rehabilitation Phase & Operational Phase |
| (k)the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f); | Section 15 - Roles and Responsibilities<br>Section 17 - Monitoring, Record Keeping and Reporting |
| (l)a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations; | Section 9 - Environmental Impact Management: Planning and Design Phase<br>Section 10 - Environmental Impact Management: Pre-construction Phase<br>Section 11 - Environmental Impact Management: Construction Phase<br>Section 12 - Environmental Impact Management: Post Construction Rehabilitation Phase & Operational Phase<br>Section 15 - Roles and Responsibilities<br>Section 17 - Monitoring, Record Keeping and Reporting |
| (m)an environmental awareness plan describing the manner in which—<br>(i)the applicant intends to inform his or her employees of any environmental risk which may result from their work; and<br>(ii)risks must be dealt with in order to avoid pollution or the degradation of the environment; and | Section 15 - Roles and Responsibilities |
| (n)any specific information that may be required by the competent authority. | tbd |

## DOCUMENT DETAILS

| | |
|---|---|
| **Project Ref. No:** | EMPR/ASP/GB/MBM/02/26 |
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**Sharples Environmental Services cc** (SES) has been actively engaged since 1998 in the fields of environmental planning, assessment and management. Clients include private, corporate and public enterprises on a variety of differing land use applications ranging from large-scale residential estates and resorts to golf courses, municipal service infrastructure installations and the planning of major arterials. The consultants have over 40+ years of combined experience and operate in the Southern, Eastern and Western Cape regions.

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# 1. Introduction

*Sharples Environmental Services cc (SES)* has been appointed *by the Mossel Bay Municipality,* to complete the Environmental Management Programme (EMPr) as part of the Basic Assessment Process for the proposed upgrading of the bulk sewerage line from Amy Searle Street / Greenhaven to the Cricket Field Sewerage Pumpstation, on Erven 4808, 4809, 4807, 770, 733, 83 and Remainder of Farm 4812, Street Parcel RE/131 and Street Parcel RE/4893, Groot Brakrivier, Mossel Bay Municipality, Western Cape.

The proposed upgrade will trigger listed activities in terms of the Amended Environmental Impact Assessment Regulations of 2014 (GN No. R.324 - 327 of 7 April 2017). Environmental Authorisation is therefore required from the competent authority (Western Cape Government: Department of Environmental Affairs and Development Planning) before construction can commence.

# 2. About this EMPr

This document is intended to serve as a guideline to be used by *the Mossel Bay Municipality* (as the Implementing Agent) and any person/s acting on behalf of the *Mossel Bay Municipality*, during the pre-construction, construction, post-construction, and rehabilitation phases of the proposed upgrade and development. This document provides measures that must (where practical and feasible) be implemented to ensure that any environmental degradation that may be associated with the development is avoided, or where such impacts cannot be avoided entirely, are minimised, and mitigated appropriately.

This EMPr has been prepared in accordance with the requirements of an EMPr as specified in the Amended Environmental Impact Assessment Regulations, 2014 (GN No. R. 326 of 7 April 2017), and with reference to the "Guidelines for Environmental Management Programmes" published by the Department of Environmental Affairs and Development Planning (2005).

It is important to note that the EMPr is not designed to manage the physical establishment of the upgrade and development *per se* but should rather be seen as a tool which can be used to manage the environmental impacts of the development.

The rehabilitation, mitigation, management, and monitoring measures prescribed in this EMPr must be seen as binding to the *Mossel Bay Municipality*, and any person acting on its behalf, including but not limited to agents, employees, associates, guests, or any person rendering a service to the development site.

### 2.1 Important caveat to the report

In the past, some developments have had a devastating impact on the environment even though they have had Environmental Management Programmes in place, while other developments have had a low impact even though no management plans have been compiled.

The Implementing Agent and the attitude of the construction team play an integral role in determining the impact that the development will have on the environment. The ECO (see Chapter 15) needs to ensure that all role-players are "on board" with regard to the constraints that the EMPr places on the development and construction team. The end result relies on cooperation and mutual respect and understanding of all parties involved.

## 3. How to use this document

It is essential that this EMPr be carefully studied, understood, implemented, and adhered to as far as reasonably possible, throughout all phases of the proposed development. The *Mossel Bay Municipality* must retain a copy of this EMPr, and another copy of this EMPr must be kept on site at all times during the pre-construction, construction, and post-construction rehabilitation phases of the development.

This EMPr must be included in all contracts compiled for contractors and subcontractors employed by the *Mossel Bay Municipality*, as this EMPr identifies and specifies the procedures to be followed by engineers and other contractors to ensure that the adverse impacts of construction activities are either avoided or reduced. *The Mossel Bay Municipality* and any appointed contractors must make adequate financial provision to implement the environmental management measures specified in this document.

This EMPr must be seen as a working document, which may be amended from time to time as needed, in order to accommodate changing circumstances on site or in the surrounding environment, or in order to accommodate requests/ conditions issued by the competent authority, the Department of Environmental Affairs & Development Planning. Amendments to this EMPr must first be approved by the competent authority, in writing.

## 4. Background and Location of the activity

### 4.1 Background and description

*Sharples Environmental Services cc* (SES) has been appointed by *the Mossel Bay Municipality,* to complete the Environmental Management Programme (EMPr) as part of the Basic Assessment Process for the proposed upgrading of the bulk sewerage line from Amy Searle Street / Greenhaven to the Cricket Field Sewerage Pumpstation, on Erven 4808, 4809, 4807, 770, 733, 83 and Remainder of Farm 4812, Street Parcel RE/131 and Street Parcel RE/4893, Groot Brakrivier, Mossel Bay Municipality, Western Cape.

The proposed development entails the installation of a sewage pipeline from the pump station south east of Long Street to the connection point located towards the north along Amy Searl Street. Please see the figures below for the proposed pipeline route and Site Development Plan (SDP). The pipe to be installed has a diameter of 300mm and the pipeline route will be approximately 1100m.




**Figure 1: Proposed pipeline route.**

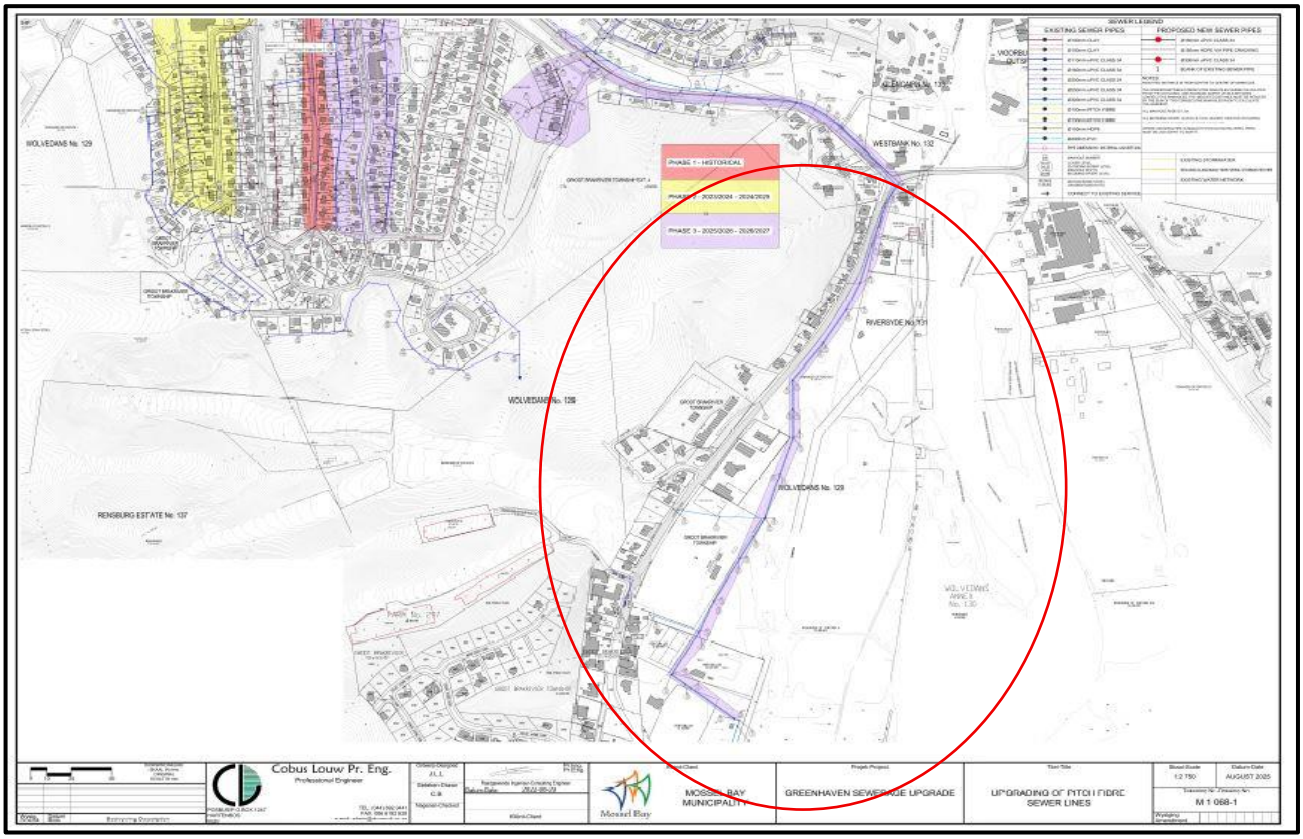



**Figure 2: SDP - Total layout.**

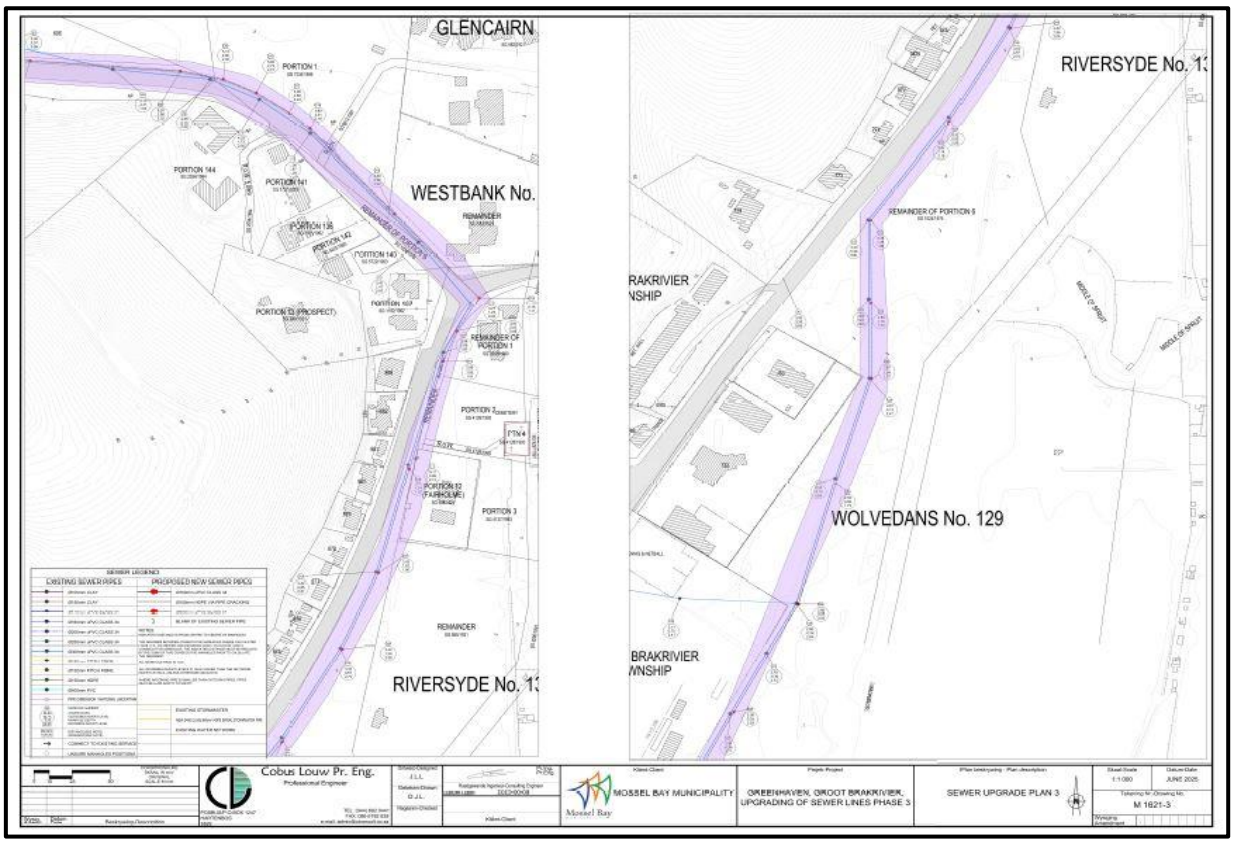



**Figure 3: SDP- Cross Section 3.**

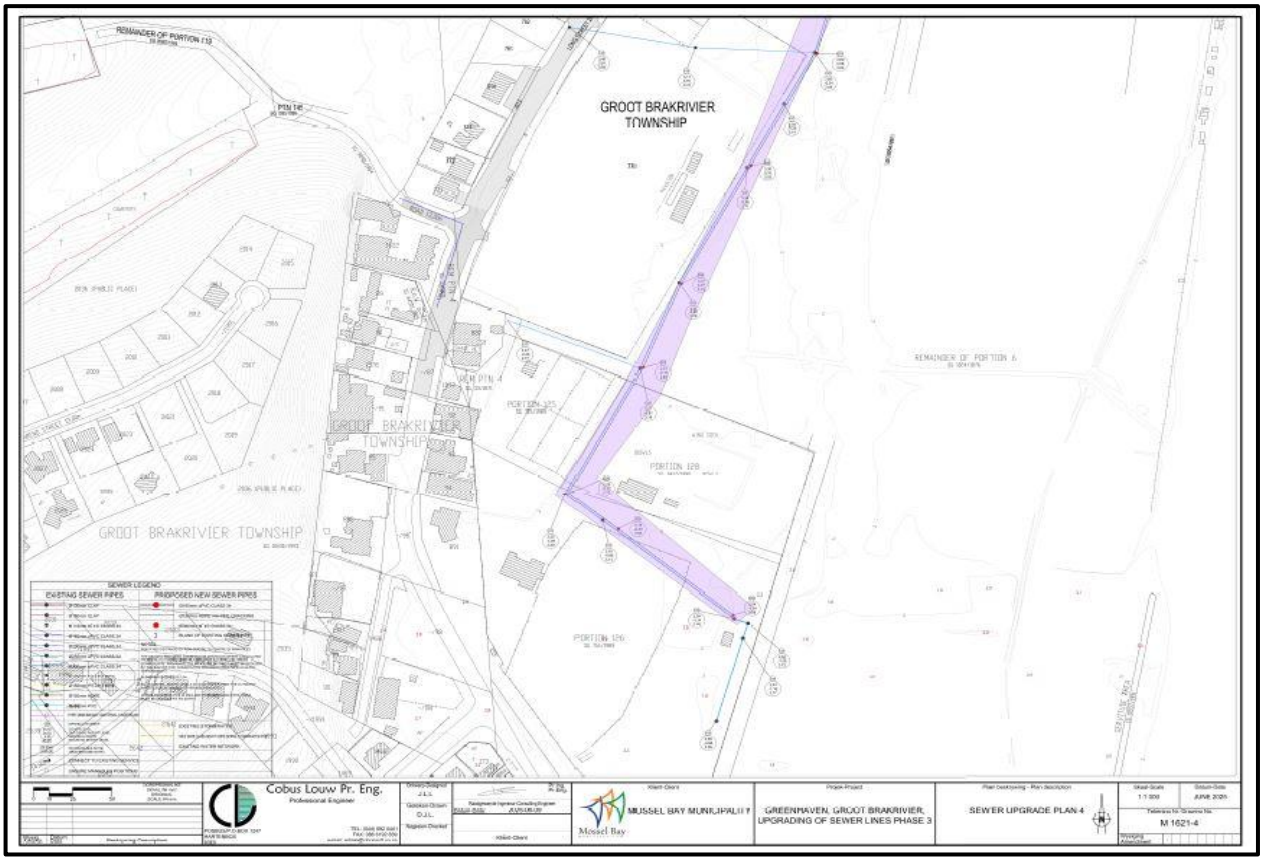



**Figure 4: SDP- Cross Section 4.**

The northern section of the pipeline, from Amy Searle Street (below Botha Street) to the Stasie Way intersection (from manhole D2-D14) does not trigger any Listed Activities in terms of NEMA, this section of the pipeline can also function on its own and does not require the other sections of the pipeline to be developed for it to be functional. There are also no National Water Act triggers for this section of the pipeline as confirmed by BOCMA. The upper section of the pipeline (Manhole D1) will however require a Water Use Licence Application, and this process is underway. The middle and southern section of the pipeline (from manhole D15 onwards) will trigger Listed Activities in terms of NEMA, and therefore this section will be applied for in this application.

**Table 1: Summary Table: Site and Erf Details**

| | |
|---|---|
| **Province** | Western Cape |
| **District Municipality** | Garden Route District Municipality |
| **Local Municipality** | Mossel Bay Municipality |
| **Ward number** | Ward 4 |
| **Erf name** | • Erf 4808<br>• Erf4809<br>• Erf 4807<br>• RE/4812<br>• Erf 770<br>• Erf 733<br>• Erf 83<br>• Street Parcel RE/131<br>• Street Parcel RE/4893 |

# 5. Legal Framework

## 5.1 Environmental Impact Assessment Regulations (2017)

The following listed activities, in terms of the amended Environmental Impact Assessment Regulations, 2017 (GN No. R. 324 – 327) will be triggered by the proposed development:

**Table 2: Listed activities in terms of the amended Environmental Impact Assessment Regulations (2017)**

| Activity No(s): | Provide the relevant **Basic Assessment Activity(ies)** as set out in **Listing Notice 1** |
|---|---|
| 12 | **The development of—**<br>(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or<br>**(ii) infrastructure or structures with a physical footprint of 100 square metres or more;**<br><br>where such development occurs—<br>(a) within a watercourse;<br>(b) in front of a development setback; or<br>**(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; —**<br><br>excluding—<br>(aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;<br>(bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;<br>(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;<br>(dd) where such development occurs within an urban area;<br>(ee) where such development occurs within existing roads, road reserves or railway line reserves; or<br>(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared. |
| 17 | **Development—**<br>(i) in the sea;<br>(ii) in an estuary;<br>(iii) within the littoral active zone;<br>(iv) in front of a development setback; or<br>**(v) if no development setback exists, within a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever is the greater;**<br><br>in respect of—<br>(a) fixed or floating jetties and slipways;<br>(b) tidal pools;<br>(c) embankments;<br>(d) rock revetments or stabilising structures including stabilising walls; or<br>**(e) infrastructure or structures with a development footprint of 50 square metres or more —**<br><br>but excluding— |

| | |
|---|---|
| | (aa) the development of infrastructure and structures within existing ports or harbours that will not increase the development footprint of the port or harbour;<br>(bb) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;<br>(cc) the development of temporary infrastructure or structures where such structures will be removed within 6 weeks of the commencement of development and where coral or indigenous vegetation will not be cleared; or<br>(dd) where such development occurs within an urban area. |
| 19 | **The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse**; but excluding where such infilling, depositing, dredging, excavation, removal or moving—<br>(a) will occur behind a development setback;<br>(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;<br>(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;<br>(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or<br>(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies. |
| 19A | **The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from—**<br>(i) the seashore;<br>**(ii) the littoral active zone, an estuary or a distance of 100 metres inland of the highwater mark of the sea or an estuary**, whichever distance is the greater; or<br>(iii) the sea; —<br><br>but excluding where such infilling, depositing , dredging, excavation, removal or moving—<br>(f) will occur behind a development setback;<br>(g) is for maintenance purposes undertaken in accordance with a maintenance management plan;<br>(h) falls within the ambit of activity 21 in this Notice, in which case that activity applies;<br>(i) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or<br>where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies. |
| Activity No(s): | Provide the relevant **Basic Assessment Activity(ies)** as set out in **Listing Notice 3** |
| 12 | **The clearance of an area of 300 square metres or more of indigenous vegetation** except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a<br>Maintenance management plan.<br><br>**i. Western Cape**<br>**i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;**<br>**ii. Within critical biodiversity areas identified in bioregional plans;**<br>**iii. Within the littoral active zone or 100 metres inland from high water mark of the sea or an estuarine functional zone**, whichever distance is the greater, excluding where such removal will occur behind the development setback line on erven in urban areas;<br>**iv. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning;** or<br>v. On land designated for protection or conservation purposes in an Environmental |

| | |
|---|---|
| | Management Framework adopted in the prescribed manner, or a Spatial Development Framework adopted by the MEC or Minister. |
| 14 | **The development of—**<br>(i) dams or weirs, where the dam or<br>weir, including infrastructure and water surface area exceeds 10 square metres; or<br>**(ii) infrastructure or structures with a Physical footprint of 10 square metres or more;**<br><br>**where such development occurs—**<br>**(a) within a watercourse;**<br>(b) in front of a development<br>setback; or<br>**(c) if no development setback has**<br>**been adopted, within 32metres of a watercourse, measured from the edge of a watercourse;**<br><br>excluding the development of infrastructure or structures within<br>existing ports or harbours that will not increase the development footprint of the port or harbour. |

### 5.2 Other applicable legislation

The *Mossel Bay Municipality,* is responsible for ensuring that all contractors, labourers and any other appointed person/entity acting on their behalf, remain compliant with the conditions of the received environmental authorisation and water-use authorisations, as well as the provisions of all other applicable legislation, including *inter alia*:

- National Environmental Management Act (NEMA) (Act No 107 of 1998, as amended);
- National Environmental Management Biodiversity Act (Act 10 of 2004);
- National Water Act (Act 36 of 1998)
- National Environmental Management: Waste Act (Act 59 of 2008);
- National Forest Act (Act No 84 of 1998);
- National Heritage Resources Act (Act No 25 of 1999);
- Occupational Health and Safety Act (Act 85 of 1993);

The above listed legislation have general applicability to most development applications, and it is the *Mossel Bay Municipality's* responsibility to ensure that all contractors and employees are aware of their obligations in terms of these Acts. This EMPr does not detract from any other legal requirements.

## 6. Scope of this EMPr

This EMPr describes the measures that must be implemented in order to avoid, minimise, manage and monitor the potential environmental impacts of the development, during all phases of the project life cycle, namely:

- Planning and Design Phase
- Pre-construction Phase
- Construction Phase
- Operational Phase

General environmental management measures that must be applied throughout the project lifecycle (as and where applicable) are described in Chapter 8. Additional management measures that must be

implemented to address specific impacts that may arise during each phase are provided in **Chapters 9-12** of this EMPr.

## 7. General Environmental Management

The following general management measures are intended to protect environmental resources from pollution and degradation during all phases of the project life cycle. These measures must be implemented as and where applicable, reasonable and practicable during the pre-construction, construction and post-construction and rehabilitation phases of the proposed development.

### 7.1 Site access and traffic management

Access to the routes will be obtained via existing dirt roads next to Long Street and Amy Searle Street.




**Figure 5: Access Roads.**

In general, all construction vehicles need to adhere to traffic laws. The speed of construction vehicles and other heavy vehicles must be strictly controlled to avoid dangerous conditions for other road users. As far as possible care must be taken to ensure that the local traffic flow pattern is not too significantly disrupted, and all vehicle operators therefore need to be educated in terms of "best-practice" operation to minimise unnecessary traffic congestion or dangers. Construction vehicles must therefore not unnecessarily obstruct the access point or traffic lanes used to access the site. Construction vehicles also need to consider the load carrying capacity of road surfaces and adhere to all other prescriptive regulations regarding the use of public roads by construction vehicles. Adequate signage that is both informative and cautionary to passing traffic (motorists and pedestrians) warning them of the construction activities. Signage would need to be clearly visible and need to include, among others, the following:

- Identifying working area as a construction site;

- Cautioning against relevant construction activities;
- Prohibiting access to construction site;
- Clearly specifying possible detour routes and / or delay periods;
- Possible indications of time frames attached to the construction activities, and;
- Listings of which contractors are working on the site.

Other mitigation measures include:

- ECO to do awareness training with the contractor and labourers before construction commences.
- Ensure appropriate behaviour of operators of construction vehicles.

**7.2 Site demarcation**

The following areas must be clearly demarcated on site during the pre-construction or construction phases of the development, as appropriate.

7.2.1 Construction working area

Prior to the commencement of any construction activities, the outer boundary of the development area must be surveyed and pegged. The demarcation boundary must be tight around the site, typically allowing a working area of no more than 2.5m around the development footprint or as small as feasibly possible. This demarcation boundary is to ensure that construction activities are restricted to only that area strictly required for the proposed development, and to prevent unnecessary disturbance of soil surfaces and vegetation outside of the development footprint.

7.2.2 No-go areas

Prior to the commencement of any construction activities, all No-Go areas, must be demarcated and must not be disturbed during the construction phase.

No-go areas must be off-limits to all construction workers, vehicles, and machinery during all phases of the development. No vegetation may be cleared from within the no-go areas, and no dumping of any material (waste, topsoil, subsoil etc.) may occur in these areas. Construction workers must be informed of the no-go areas, and if necessary appropriate signage and/or temporary fencing (e.g., droppers with danger tape) can be used to enforce the no-go areas. All areas outside of the development footprint of the site and a reasonable working are to undertake the upgrades, must be regarded as no-go. Existing access roads, disturbed areas, and areas that won't trigger listed activities are excluded from the no-go areas (i.e if the contractor comes to an agreement with nearby landowners to use disturbed areas for storage areas or site camps).

It is important to note that as per the Estuarine Assessment the width of the working area through Zone D (as indicated in Appendix G1 of the BAR) must be as narrow as possible and must be clearly demarcated. Estuarine habitat outside of this demarcated area must be considered as No-Go areas.

Please refer to the figure below for the Sensitivity Zones and the No-Go Map:




**Figure 6: Sensitivity Zones.**

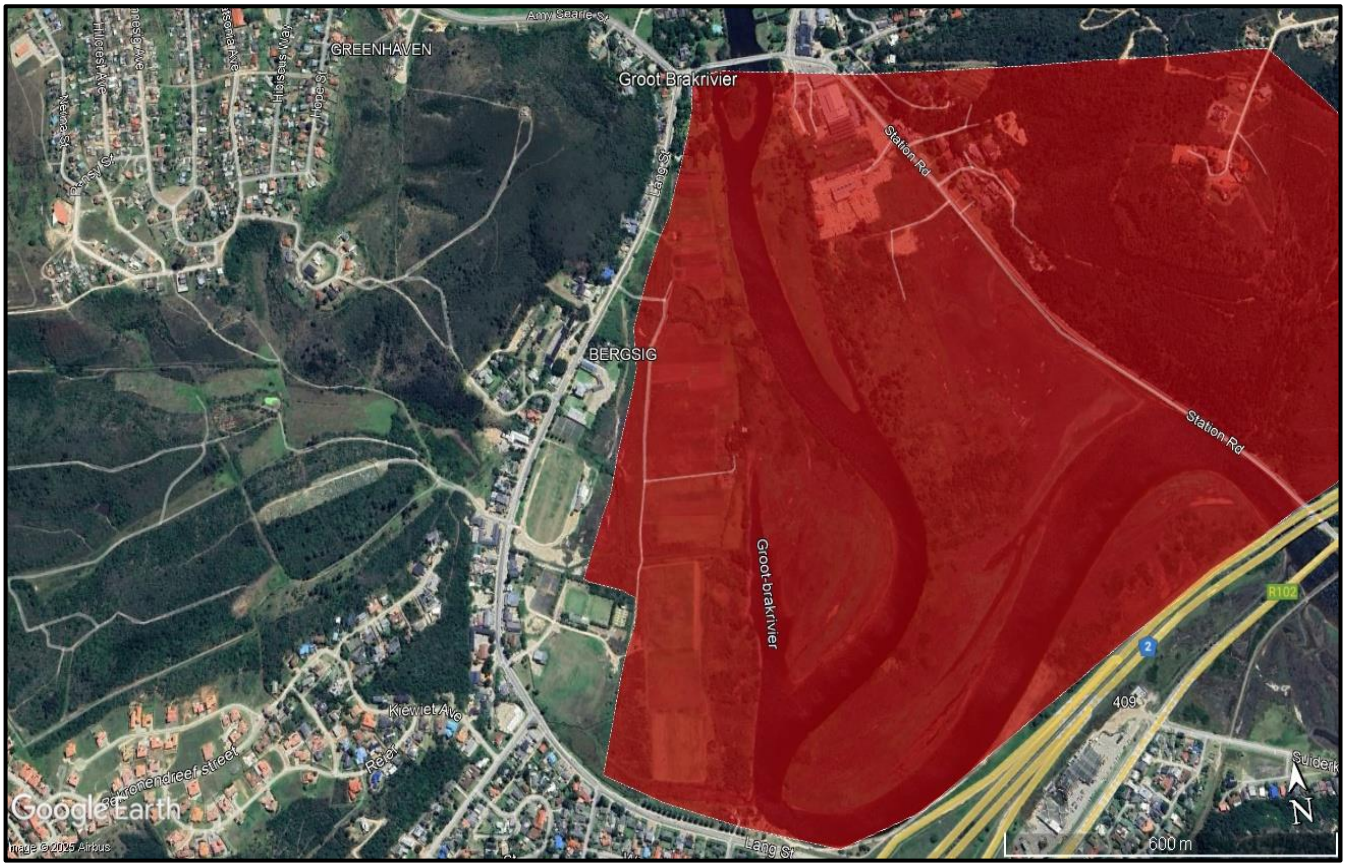



**Figure 7: No-Go Map.**

### 7.2.3 Demarcation of the site camp

The area chosen for the site camp and associated facilities must be the minimum area reasonably required to accommodate the site camp facilities, and which will involve the least disturbance to the environment.




**Figure 8: Site Camp location.**

### 7.3 Site camp and associated facilities

The following general management measures pertaining to the set-up, operation and closure of a site camp must be applied where appropriate, reasonable and practicable:

#### 7.3.1 Fencing & Security

The site camp area must be secured to prevent any un-authorised individuals from entering the site camp and possibly getting injured or posing a safety and/or security risk. Adequate signage must be displayed, designating the site office / camp as a restricted area to non-personnel. If required, the site camp and associated areas may be fenced off along the demarcated boundaries of these areas, preferably with 2m high fence and shade netting or similar.

#### 7.3.2 Fire Fighting Equipment

No less than 2 fire extinguishers must be present in the site camp. The extinguishers must be in a working condition and within their service period. A fire extinguisher must always be present wherever any "hot works" (e.g., welding, grinding etc.) are taking place. It is recommended that all construction workers receive basic training in fire prevention and basic fire-fighting techniques and are informed of the emergency procedure to follow in the event of accidental fires. No open fires may be made on the construction site during any phase of the project. Construction workers may make small, contained fires (e.g., for warming or cooking purposes), within the site camp provided the small fire is encircled by a corrugated iron structure, drum or similar, to prevent wind-blown cinders from causing fires elsewhere. Such fires may not be left unattended and must be thoroughly extinguished after use. No smoking must

be allowed on the construction site. In the case of accidental fires, the contractor must (if required) alert the Local Authority's Fire Department as soon as a fire starts prior to the fire becoming uncontrollable.

### 7.3.3 Waste Storage Area

Sufficient bins for the temporary storage of construction related waste must be provided inside the site camp and/or at the working area and should be located in such a way that they will present as little visual impact to surrounding residents and road users as possible. Label each waste receptacle for waste separation, and ensure waste is contained either by use of lids or by ensuring waste receptacles are emptied prior to filling up, making them susceptible to wind dispersion. Sufficient signage and awareness should be created to ensure that these bins are properly used.

### 7.3.4 Hazardous Substances Storage Area

Fuels, chemicals, lubricants and other hazardous substances must be stored in a demarcated, secured and clearly sign-posted area within the site camp away from the watercourses on site. Sufficient signage and awareness should be created to ensure that these bins are properly used. Ensure that when substances are transferred, this is done on an impermeable and/or bunded surface, to contain any spillage. Spillage, should it occur, should be disposed of appropriately.

### 7.3.5 Potable Water

An adequate supply of potable water must be provided to construction workers at the site camp. It is the Contractors duty to ensure that the labour has adequate access to potable water throughout construction phase, and to monitor weather conditions, to ensure that labour has enough drinking water on hotter days, or construction activity must cease, until conditions are safe to continue.

### 7.3.6 Ablution Facilities

Chemical toilets should be maintained on the site camp for the duration of the construction phase and rehabilitation, on a level surface and secured from blowing over and located in such a way that the toilets will not cause any form of pollution. As per the SANS10400 requirement, one ablution facility for every 8 male workers and 2 ablution facilities for every 8 female workers will be provided.

The ablution facilities must not be linked to the estuary system in any way. Toilets must be serviced regularly and kept in an orderly state. The contractor must ensure that no spillage occurs when the toilets are cleaned, serviced or moved. The toilet facilities should be emptied on a weekly basis, by an appropriately registered service provider. Proof of this weekly servicing must be obtained and filed in the Environmental File on site. Performing ablutions outside of the provided toilet facilities is strictly prohibited.

### 7.3.7 Eating Area & Rest Area

A dedicated area within which construction workers can rest and eat during breaks should be provided within the site camp. Seating and shade should be provided.

### 7.3.8 Vehicle & Equipment Maintenance Yard

Where possible, construction vehicles and equipment that require repair must be removed from site and taken to a workshop for servicing. If emergency repairs and/or basic maintenance of construction vehicles or equipment are necessary on site, such repair work must be undertaken within the designated maintenance yard area away from any watercourses. Repairs must be conducted on an impermeable

surface, and/or a tarpaulin and/or drip trays must be laid down prior to emergency repairs taking place, in order to prevent any fuel, oil, lubricant or other spillages from contaminating the surrounding environment.

7.3.9 House-keeping

The site camp and related site camp facilities must be kept neat and orderly at all times, in order to prevent potential safety risks and to reduce the visual impact of the site during construction.

**7.4 Vegetation clearing**

Where vegetation must be cleared the following measures must be implemented where applicable, reasonable and practical:

- Where feasible vegetation must simply be trimmed to facilitate access/ construction, rather than being completely cleared or removed.
- Vegetation clearing/trimming must be cleared by hand if possible (i.e. brush cut). Please note that the development footprint is excluded from this requirement. Cleared vegetation should be stockpiled for use as mulch/ brush-packing during rehabilitation of the site. Any alien vegetation that is cleared must be disposed of in consultation with the ECO, unless the cleared alien vegetation does not contain seeds in which case it may be retained for use in site rehabilitation.
- No bulldozing must be undertaken for the purpose of vegetation clearing.
- Only the areas required to accommodate the construction activities and access to the construction site must be cleared/trimmed of vegetation.
- Vegetation outside of the construction footprint, reasonable working area and beyond any No-Go areas must not be cleared.

- Protected tree species that will be affected, namely *Sideroxylon inerme* and *Pittosporum viridflorum* **will require a permit from the department of forestry for trimming or removal**.

- Alien vegetation must be cleared in accordance with the Site Specific Alien and Invasive Species Management Programme (Appendix J).

**7.5 Topsoil and subsoil management**

It is recommended that topsoil be removed from any area where physical disturbance of the surface will occur, including within the footprint of the development site (working area) and possibly within the site camp, ablution area, vehicle maintenance yard, refuelling area and temporary waste storage area. Topsoil removal and stockpiling must be undertaken only after consultation with the ECO.

- Removed topsoil and subsoil must be stockpiled for the duration of the active construction period and utilised for the final landscaping and rehabilitation of disturbed areas on site.
- The removed topsoil must be stockpiled in a berm, in a demarcated area as agreed with the ECO.
- Removed subsoil must be stockpiled separately from topsoil.
- The topsoil & subsoil storage area must be located on a level area outside of any surface drainage channels and at a location where it can be protected from disturbance during construction and where it will not interfere with construction activities.
- Where applicable topsoil and subsoil stockpiles must be adequately protected from being blown away or eroded by storm water. If necessary, shade cloth or other suitable measures must be

used to stabilise and protect the stockpile from wind/water erosion. Topsoil stockpiles must not be covered with tarpaulin, as this may smother and decrease the virility of topsoil.

- Handling of topsoil must be minimised as much as possible, and the location of the topsoil berm must be chosen carefully to avoid needing to relocate the topsoil berm at a later date. The ECO must be consulted with regards to the placement of the stockpiles, to ensure that the selected location is in compliance with this EMPr and EA (once granted).
- Ideally, topsoil is to be handled twice only, once to strip and stockpile, and once to replace, level, shape and scarify.
- If soil stockpiles will be stored for an extended period of time, the stockpiles must be kept clear of weeds and alien vegetation growth by regular weeding, (or application of herbicides if agreed with the ECO).
- Spoil material that will not be re-utilised on site may be removed from site and taken to an appropriate site for re-use or disposal.
- Note that the topsoil must be the final layer applied to a rehabilitated/ re-landscaped site, after subsoil/ spoil material has been placed and shaped on the site.




**Figure 9: Stockpile area.**




**Figure 10: Stockpile area.**

### 7.6 Integrated waste management approach

It is required that an integrated waste management system is adopted on site. The system must be based on waste minimisation and must incorporate reduction, recycling, re-use and disposal where appropriate. Waste bins for the different categories of recyclable waste (i.e., paper, plastic, metal) must be provided on site. These bins must be emptied, and the waste must be taken to a registered recycling facility. The receipts from the facility must be kept on file and must be available on request. Images 1 and 2 show two such systems within a construction site.




**Image 1:** Recycling system implemented on a construction site. Skips provided for general waste, plastic, cardboard and metal.



**Image 2:** Recycling system implemented on a construction site. Lidded bins provided for general waste, plastic, cardboard, and metal.

The non-recyclable and non-reusable waste (e.g., builder's rubble, etc.) generated on site must be stored and disposed of at a landfill site licensed in terms of the applicable legislation.

### 7.7 Hazardous substances and fuels

If hazardous substances and fuels such as diesel, oil, lubricant, detergents etc. are to be stored on site for construction purposes, a designated area must be set aside for this within the site camp.

- All hazardous substances must be stored in the designated area within the site camp.
- The area selected for storage of hazardous fuels must be located on a level area, well outside of any water courses, water bodies or surface drainage channels.
- The designated area must be clearly demarcated and secured by use of fencing and/or cages, to prevent access by un-authorised persons and/or animals.
- Access to the hazardous material storage area must be restricted to authorised personnel only and must be treated as a no-go zone to unauthorised personnel.
- Appropriate hazard signage indicating the nature of the stored materials must be prominently displayed at the storage area.
- Those persons tasked with handling any hazardous substances must be equipped with the knowledge, equipment, and safety gear necessary to handle the substance/s safely.
- Material Safety Data Sheets (MSDSs) must be available on site for all hazardous chemicals and hazardous substances to be used on site. Where possible and available, MSDSs must additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes
- Storage vessels of hazardous substances must be situated in an impermeable bunded area large enough to accommodate at least 110% of the capacity of the tank in question. If plastic sheeting is used to line the bunded area, care must be taken to ensure it is not punctured in any way during the course of the construction period.
- Fuel tanks must ideally be elevated so that leaks can easily be detected.
- No smoking may be permitted at or surrounding the area where fuels and hazardous substances are stored.
- Firefighting equipment must be located in close proximity to the storage area.

### 7.8 Cement and concrete batching

Cement and concrete batching is permitted on site, but may only take place on designated impermeable, bunded surfaces, as agreed with the ECO.

- Cement/ concrete must not be mixed on bare ground.
- Cement/concrete must not be mixed within any drainage lines.
- The impermeable/ bunded area must be established in such a way that cement slurry, runoff and cement water will be contained and will not flow into the surrounding environment or contaminate the soil.
- Cement run-off and excess cement slurry must be collected in the designated impermeable area, allowed to dry and then disposed of at an appropriate facility. Alternately, the contaminated water can be collected in sealed tanks and transported to an appropriate disposal site for disposal.
- Empty cement bags are currently not recycled within the Garden Route and must be disposed of in the un-recyclables waste bins on site.

**7.9 Erosion control and stormwater management**

Appropriate measures must be implemented to control the flow of storm water across the construction site, to prevent possible flooding, soil loss and dispersion of pollutants. All exposed earth surfaces must also be protected from wind and water erosion. Stripped areas must not remain uncovered for extended periods of time and must be provided with a suitable cover (vegetation, mulch, brush-packing) as soon as possible.

The scale and nature of the erosion and storm water control measures implemented on site must be appropriate to the conditions on site, and sufficient to achieve the desired outcomes (soil preservation, prevention of flooding, storm water control) to the satisfaction of the ECO and consulting engineer.

It may be necessary to implement small-scale erosion protection measures at the construction site, to prevent soil erosion. Such measures may include the use of shade netting, geo-fabric, brush-packing, logs and stakes or similar barriers in areas susceptible to erosion and along exposed slopes. The netting/fabric is placed directly across the path of flow of storm water. Poles and logs, staked in along the contours of a slope susceptible to erosion may also be used.

**7.10 Construction near a watercourse**

Construction within the vicinity of the estuary needs to be conducted in a conscious manner. The Estuarine Assessment completed by Confluent explains that impacts to the estuary can be avoided through the implementation of the mitigation measures and adherence to the EMPr. The following mitigation measures must be adhered to during construction:

- Air valves along sewer lines must be elevated above the 1:100-year flood line.
- Sewer manhole covers should not be made of metal because of the risk of theft.
- Manholes must be designed to be watertight to prevent environmental contamination from leaking sewage and to avoid ingress of surface water during rainfall and flood events. Watertight manholes achieve this seal using components like gaskets on the manhole cover, proper joint sealing between sections, and leak-resistant pipe-to-manhole connections, which are essential for system integrity and cost efficiency.
- An Environmental Control Officer (ECO) must be appointed for the duration of the construction phase to monitor and report back on compliance with conditions of the environmental authorisation.

- Consult weather forecasts daily and weekly. Do not work during rainfall and minimise the storage of mobile materials in low-lying areas. Plan the construction area as if it could be inundated with floodwaters in the event of a significant rainfall event.
- Construction access for the pipeline through Zone D (see Figure 5 of this EMPr and Appendix F) should utilise existing access points from Long Street. No new roads should be necessary.
- The width of the working area through Zone D (see Figure 5 of this EMPr and Appendix F) must be as narrow as possible and must be clearly demarcated. Estuarine habitat outside of this demarcated area must be considered as No-Go areas.
- Revegetation of the pipeline through Zone D (see Figure 5 of this EMPr and Appendix F) must be actively encouraged. The route is currently well covered by indigenous vegetation (e.g. sedges, P. australis, Stenotaphrum secundatum etc.). It is recommended that when trenching, a top layer of vegetation in association with 20-30 cm of soil should be removed and set aside for replanting or covering the filled in trench.
- Open trenching for sewer lines should be done in as short a stretch as possible and backfilled with material as soon as possible to reduce the likelihood of material loss in the event of flooding.
- Keep a skip on site so that any waste materials can be conveniently discarded and removed. This includes small amounts of dirty water, such as that used for mixing concrete.
- Equipment and materials lay-down areas should be located away from estuarine habitat and stormwater channels leading into the estuary. Minimise the storage of loose materials in case of a flood event that could wash them into the estuary.
- Post-construction site clean-up must be completed to ensure the entire site footprint and surrounding area has been cleared of litter and any waste materials associated with construction. The ECO should be informed of the construction close-out and complete an inspection to ensure this measure has been implemented.
- The pipeline route through Zone D (see Figure 5 of this EMPr and Appendix F) must be routinely inspected for the establishment of alien invasive plant species. This must be done at a high frequency following construction (i.e. monthly) and can be reduced once natural vegetation along the pipeline has recovered. These must be controlled by hand. No aerial application of herbicides is permitted. Herbicides may only be applied to cut-stumps and must be registered for use on the target plant species.

### 7.11 Excavations and Earthworks

Any major earthworks with heavy machinery must be under constant supervision and operators are to be aware of all the environmental obligations, as there is always the potential to inflict damage to the sensitive areas. Any unnecessary or excessive heavy machinery movement must be kept to a minimum i.e., only what is absolutely necessary. Areas to be excavated must be clearly demarcated. It may be necessary to demarcate excavations or earthworks along busier haulage routes with orange barrier netting (or a similar product).

All excavated material must be stored on a flat surface away from any drainage line or area susceptible to erosion. The location must be decided upon in consultation with the ECO. Stored material must be protected from wind and water erosion, and this may entail covering the material with suitable shade cloth material or similar (if and when necessary). The shade cloth may need to be weighed down by logs (or similar material) in such a manner that any stream flow is directed away from the stockpile, reducing the risk of erosion.

### 7.12 Heritage Resources

the installation of the pipeline is not anticipated to significantly impact palaeontological heritage, due mainly to re-excavation of disturbed ground. Nevertheless, an occurrence of fossil bones cannot be entirely dismissed. It is advisable that a protocol for finds of bones, the Fossil Finds Procedure (FFP), is included in the Environmental Management Plan (EMP) for the project (Appendix H of this EMPr).

The Project Manager, foremen and workers involved in earthmoving must be informed of the need to watch for fossil bones, and this must be included in the pre-construction Environmental Awareness Training. Workers seeing potential objects are to cease work at that spot and report to the Project Manager and/or the Environmental Control Officer (ECO) who must report the find to Heritage Western Cape (HWC), following the FFP. Heritage Western Cape will assess the information and liaise with an archaeological or palaeontological specialist, as appropriate. The intersection of a shelly bed must also be reported to HWC as per the FFP. The Mossel Bay Museum should be informed.

### 7.13 Site closure and rehabilitation

Upon completion of the construction phase, all disturbed areas, including the working area (disturbance corridor), temporary access roads, and all areas utilised for the site camp and associated site camp facilities will require rehabilitation as follows:

- On completion of the construction operations, the site camp area must be cleared of all site camp facilities, ablution facilities, fencing, signage, waste and surplus material.
- All areas within the working area and site camp that have become devoid of vegetation or where soils have been compacted due to construction activities must be scarified or ripped to improve filtration and reduce run-off.
- All demarcation fencing, including all droppers, wires, netting and barrier tape must be removed from site and taken to an appropriate site for re-use or disposal.
- Surfaces are to be checked for waste products from activities such as concreting or asphalting and cleared in a manner approved by the ECO. Any soil contaminated with oil, fuel or other hazardous substance must be collected and disposed of as hazardous waste.
- All construction waste, litter and rubble is to be removed from the site and disposed of at an appropriate facility. Burying or burning of waste or rubble on site is prohibited.
- Topsoil that was removed and stockpiled before construction, must be replaced by spreading it evenly over the areas from which it was removed. This topsoil (and the seedbank it contains) will facilitate the re-vegetation of the site.
- Disturbed areas, especially areas where excavations have taken place, must be shaped as appropriate (original topography must be restored where possible), and covered with a layer of stockpiled topsoil as soon as possible.
- Any topsoil, subsoil or other excavated material that cannot be utilised during site rehabilitation must be removed from the site and disposed of at an appropriate disposal site.
- The disturbed, newly rehabilitated surfaces (particularly steeper slopes and areas recently covered with topsoil) must be protected from wind & water erosion using mulch, brush packing or other appropriate erosion protection measures. Brush-packing/ mulching is done by covering the exposed surface with organic plant material such as branches, plant cuttings and leafy material. Ideally the vegetation removed from site at the start of the construction must be utilised. Brush-packing/ mulching plays a valuable role in erosion control, while also promoting re-

vegetation of the site by retaining moisture in the soil, introducing seeds and/or trapping wind-blown seeds and providing organic material (compost) to promote new plant growth.

- Final rehabilitation of the site must be done to the satisfaction of the ECO, and must adhere to all conditions/ requirements of the Environmental Authorisation.
- The location of the site camp must be rehabilitated.

- Site Specific Alien and Invasive Species Management Programme (Appendix J) must be implemented on site.

## 8. Environmental Impact Management Planning and design phase

No direct environmental impacts are associated with the planning and design phase. However, poor planning or inappropriate design decisions in this phase may result in environmental impacts arising during subsequent phases of the project.

Planning and design activities must therefore take into account the environmental constraints and opportunities identified during the Environmental Impact Assessment process, in order to avoid or minimise the potential future impacts of the development. Proper planning is also essential to ensure that adequate provision is made to implement the environmental requirements of this EMPr, and to ensure that the development remains compliant with the received Environmental Authorisation.

The environmental management objectives (goals) during this phase are to:

- Appoint an Environmental Control Officer.
- Environmental Control Officer to conduct an inspection prior to the commencement of construction activities on site

These environmental management outcomes, as well as the management actions that must be implemented in order to achieve the desired outcome and avoid/minimise potential impacts are discussed in more detail below.

**OBJECTIVE 1: APPOINTMENT OF AN ENVIRONMENTAL CONTROL OFFICER**

| ***Impact Management Objective:*** ***To appoint a suitably qualified and experienced Environmental Control Officer.*** | | |
|---|---|---|
| Potential impact to avoid | Failure to appoint an ECO will result in non-compliance with the Environmental Authorisation and the requirements of the EMPr. | |
| Impact Management Outcome | The conditions of Environmental Authorisation and the requirements of the EMPr are implemented and monitored during all phases of the development, which will promote sound environmental management on site. | |
| **IMPACT MANAGEMENT ACTIONS** | | |
| Mitigation measure | Responsible party | Time period |
| • A suitably qualified and experienced Environmental Control Officer must be appointed before any activities commence on site.<br>• The appointed ECO must adhere to the requirements stated in Chapter 15 and 17 of the EMPr and any other requirements specified in the Environmental Authorisation.<br>• The appointed ECO must be advised of the construction start date, before any activities commence on site so that the ECO can perform a pre-commencement inspection and plan for environmental awareness training of construction workers. | *Mossel Bay Municipality* | During design phase |

| | |
|---|---|
| Performance Indicator | A qualified ECO is appointed prior to the commencement of any construction activities (including pre-construction set-up activities) on site. |

**OBJECTIVE 2: UPDATE ENVIRONMENTAL MANAGEMENT PROGRAMME**

The Environmental Authorisation issued for the development may require certain amendments to be applied to the EMPr. In addition, the final site layout and detailed design may also necessitate the amendment of the EMPr, in order to ensure that the development is accommodated in the EMPr.

| ***Impact Management Objective:* To ensure the EMPr adheres to the requirements of the Environmental Authorisation and makes provision for the final detailed site layout.** | | |
|---|---|---|
| Potential impact to avoid | • Failure to update the EMPr in accordance with conditions specified in the EA may result in non-compliance with the EA.<br>• Failure to update the EMPr to accommodate the final detailed site layout may result in non-compliance with the EA. | |
| Impact Management Outcome | Good environmental management is promoted on site. | |
| **IMPACT MANAGEMENT ACTIONS** | | |
| Mitigation measure | Responsible party | Time period |
| • An independent Environmental Consultant must be appointed to amend the EMPr.<br>• All amendments to the EMPr specified in the EA must be applied to the EMPr unless agreed otherwise in writing with the Competent Authority.<br>• Amendments to the EMPr must be approved in writing by the Competent Authority.<br>• Public participation may be required on the proposed EMPr amendments. The Competent Authority must be consulted for clarity on these requirements. | *Mossel Bay Municipality* | During design phase |
| Performance Indicator | An updated EMPr that adheres to the conditions of the EA and that reflects the requirements of the final detailed site layout is approved by the Competent Authority prior to commencing activities on site. | |

## 9. Environmental Impact Management Pre-Construction Phase

Proper set-up during the pre-construction phase can set the foundation for good environmental management during the active construction phase to follow and can avoid potential impacts from arising at a later date.

The Impact Management Objectives for this phase of the project relate to:

- Demarcation of no-go areas and working areas.
- Establishment of site camp and associated site facilities.
- Pre-construction ECO visit.
- Sewer line design in the flood line

**OBJECTIVE 1: IDENTIFY & DEMARCATE NO-GO AND WORKING AREAS**

| ***Impact Management Objective:*** ***Identify and demarcate no-go areas, working areas and site facilities.*** | | | |
|---|---|---|---|
| Potential impact to avoid | • Insensitive location of working areas and site facilities may result in environmental impacts during construction phase.<br>• Failure to accurately demarcate working areas may result in increased disturbance footprint.<br>• Failure to demarcate no-go (open spaces) areas may result in disturbance to these areas during construction. | | |
| Impact Management Outcome | Future construction activities will be restricted to within the designated areas & environmentally sensitive areas (no-go areas) will be protected from disturbance. | | |
| **IMPACT MANAGEMENT ACTIONS** | | | |
| Mitigation measure | | Responsible party | Time period |
| • The no-go areas must be identified.<br>• Demarcation of working area and no-go areas must be done in accordance with Section 7.2 of this EMPr.<br>• Site camp facilities must be situated as far away from the No-Go areas as possible. However, if the contractor makes arrangements for other areas which do not trigger listed activities, these areas may also be used. | | Engineer / Contractor | Pre-construction phase (prior to arrival of construction equipment, machinery, or workers on site) |
| Performance Indicator | No-go areas, working areas and areas for site camp facilities have been identified and appropriately demarcated to the satisfaction of the ECO, before construction activities commence on site. | | |

**OBJECTIVE 2: ESTABLISH ENVIRONMENTALLY SENSITIVE SITE CAMP & SITE FACILITIES**

| | | | |
|---|---|---|---|
| ***Impact Management Objective:*** ***To set up and equip the site camp and associated site facilities in a manner that will promote good environmental management.*** | | | |
| Potential impact to avoid | • Inappropriate siting of site camp facilities may result in impacts to sensitive resources (e.g. contaminated run-off from refuelling area may contaminate soil).<br>• Failure to properly demarcate and set up site facilities may result in disorganised construction activities and unnecessary disturbance to the site.<br>• Failure to provide the necessary site facilities and/or failure to equip these facilities with the necessary equipment/materials may impede good environmental management & compromise ability to respond to emergencies. | | |
| Impact Management Outcome | Site camp facilities do not impact significantly on environment. The equipment required to implement the provisions of the EMPr are provided on site. | | |
| **IMPACT MANAGEMENT ACTIONS** | | | |
| Mitigation measure | | Responsible party | Time period |
| • The site camp and site facilities described in Section 8 of this EMPr must be provided on site.<br>• The site camp and associated site facilities must be set-up and managed in accordance with the general environmental management measures specified in Section 8 of this EMPr. | | Contractor | Pre-construction phase (prior to start of construction activities) |
| Performance Indicator | Appropriate, well organised and properly equipped site facilities are available on site prior to commencement of construction activities. The location and set up of the facilities does not impact on the natural resources. | | |

**OBJECTIVE 3: PRE-CONSTRUCTION ECO INSPECTION**

It is essential that the appointed ECO be advised of the intended construction start date before construction activities commence on site, so that the ECO can conduct an initial site inspection to assess the pre-commencement condition of the site. The ECO can also advise on the appropriate siting and demarcation of the site facilities, and the identification and demarcation of the no-go areas. The ECO may also conduct the first round of environmental awareness training at this stage, if the construction workers are present on site.

| ***Impact Management Objective:*** ***Environmental Control Officer to conduct an inspection prior to the commencement of construction activities on site.*** | | |
|---|---|---|
| Potential impact to avoid | • Failure to appoint ECO or to notify ECO of commencement prior to commencement will result in non-compliance with the EA.<br>• If a pre-commencement ECO inspection is not performed, the Applicant may be held liable for environmental degradation that took place prior to the Contractor commencing work on site. | |
| Impact Management Outcome | Good environmental management is promoted and enforced by the ECO during the full pre-construction and construction phases.<br>Site facilities are appropriately located on site.<br>Construction workers receive environmental awareness training before commencing work on site. | |
| **IMPACT MANAGEMENT ACTIONS** | | |
| Mitigation measure | Responsible party | Time period |
| • The appointed ECO must be advised of the construction start date, before any activities commence on site so that the ECO can perform a pre-commencement inspection and plan for environmental awareness training of construction workers. | Contractor | Start of construction phase |
| Performance Indicator | A pre-commencement site inspection is conducted by the appointed ECO before construction activities commence on site. | |

**OBJECTIVE 4: SEWER LINE DESIGN IN THE FLOODLINE**

| ***Impact Management Objective:*** ***To prevent leakage of sewerage during flooding events which could pollute the wetland and estuary.*** | | |
|---|---|---|
| Potential impact to avoid | • Leakage of sewerage during flooding events, resulting in pollution of the wetland and estuary. | |
| Impact Management Outcome | Sewer line design prevents leakage during flooding events. | |
| **IMPACT MANAGEMENT ACTIONS** | | |
| Mitigation measure | Responsible party | Time period |
| • Air valves along sewer lines must be elevated above the 1:100-year flood line.<br>• Sewer manhole covers should not be made of metal because of the risk of theft.<br>• Manholes must be designed to be watertight to prevent environmental contamination from leaking sewage and to avoid ingress of surface water during rainfall and flood events. Watertight manholes achieve this seal using components like gaskets on the manhole cover, proper joint sealing between sections, and leak-resistant pipe-to-manhole connections, which are essential for system integrity and cost efficiency. | Engineer / Contractor | Pre-construction phase (prior to arrival of construction equipment, machinery, or workers on site) |
| Performance Indicator | Mitigation measures of the Estuarine Assessment are adhered to. | |

## 10. Environmental Impact Management Construction Phase

A number of potential environmental impacts may arise during the construction phase of the development. These impacts have been identified and assessed during the Environmental Impact Assessment process. Environmental Management outcomes and actions that will prevent the identified potential impacts from arising – or where avoidance is not possible, that will minimise and mitigate the impact – are provided in this section.

The environmental management actions and mitigation measures prescribed in this section must be implemented throughout the construction phase, and must be implemented in conjunction with the general management measures specified in Chapter 8 of this EMPr as well as any other conditions stated in the Environmental Authorisation. The Environmental Control Officer must monitor and enforce the implementation of the relevant environmental management measures and may provide guidance on the implementation of these environmental management measures as and when required.

**The environmental management objectives (goals) for the Construction phase are:**

- Limit the impact on terrestrial biodiversity
- Limit the impact on plant species
- Limit the impact on animal species
- Limit the disturbance of estuarine and wetland habitat caused by construction activities
- Job creation

The environmental management actions that must be implemented in order to achieve the desired outcomes and avoid/minimise potential impacts are discussed in more detail in the sections below.

**OBJECTIVE 1: LIMIT THE IMPACT ON TERRESTRIAL BIODIVERSITY**

| ***Impact Management Objective:* To limit the impact on terrestrial biodiversity from the construction site.** | | |
|---|---|---|
| Potential impact to avoid | • Permanent or temporary loss of indigenous vegetation due to clearance activities.<br>• Permanent or temporary loss of indigenous vegetation outside of the construction footprint. | |
| Impact Management Outcome | Impact on terrestrial biodiversity is limited to the construction footprint and only to what is required to undertake the activities. | |
| **IMPACT MANAGEMENT ACTIONS** | | |
| Mitigation measure | Responsible party | Time period |
| • The proposed development footprint should be fully demarcated (stakes and danger tape) during the construction phase, and all construction activities must be done within this demarcated area. | Contractor | Construction phase |

| | | |
|---|---|---|
| • In the areas as displayed in Figures 11 to 14 (Appendix G of this EMPr), the topsoil that is removed during construction must be kept separate from the lower soil and replaced accordingly<br>• Alien invasive trees (Acacia spp.) within the proposed development footprint in the section, as displayed in Figures 11 to 14 (Appendix G of this EMPr), should be removed. | | |
| Performance Indicator | Impact on terrestrial biodiversity is limited to the construction footprint and only to what is required to undertake the activities. | |

**OBJECTIVE 2: LIMIT THE IMPACT ON PLANT SPECIES**

| ***Impact Management Objective:* To limit the loss of indigenous flora and SCC during the construction process** | | |
|---|---|---|
| Potential impact to avoid | • Loss of plant species during construction. | |
| Impact Management Outcome | Only the approved footprint and a reasonable working corridor is disturbed by construction activities. | |
| **IMPACT MANAGEMENT ACTIONS** | | |
| Mitigation measure | Responsible party | Time period |
| • The proposed development footprint should be fully demarcated (stakes and danger tape) during the construction phase, and all construction activities must be done within this demarcated area.<br>• In the areas as displayed in Figures 11 to 14 (Appendix H of this EMPr), the topsoil that is removed during construction must be kept separate from the lower soil and replaced accordingly<br>• Alien invasive trees (Acacia spp.) within the proposed development footprint in the section, as displayed in Figures 11 to 14 (Appendix H of this EMPr), should be removed.<br>• Site Specific Alien and Invasive Species Management Programme (Appendix J) is implemented on site. | Contractor | Construction phase |
| Performance Indicator | Only the approved footprint and a reasonable working corridor is disturbed by construction activities. | |

**OBJECTIVE 3: LIMIT THE IMPACT ON ANIMAL SPECIES**

| ***Impact Management Objective:* To prevent the direct mortality of, or displacement of fauna during the construction process** | | |
|---|---|---|
| Potential impact to avoid | • Loss of and/or displacement of animal species during construction. | |
| Impact Management Outcome | Trapped animals must be relocated outside of the development footprint. | |
| **IMPACT MANAGEMENT ACTIONS** | | |
| Mitigation measure | Responsible party | Time period |
| • The proposed development footprint should be fully demarcated (stakes and danger tape) during the construction phase, and all construction activities must be done within this demarcated area.<br>• Ditches that are dug for the sewage pipelines should be inspected daily for the presence of trapped animals (frogs, snakes, small mammals). | Contractor | Construction phase |
| Performance Indicator | Trapped animals must be relocated outside of the development footprint. | |

**OBJECTIVE 4: LIMIT THE DISTURBANCE OF ESTUARINE AND WETLAND HABITAT CAUSED BY CONSTRUCTION ACTIVITIES**

| ***Impact Management Objective:* To prevent the contamination of ground water through chemical spills or leaching of chemicals during construction** | | |
|---|---|---|
| Potential impact to avoid | • Disturbance and impact on adjacent estuarine habitat. | |
| Impact Management Outcome | Construction activities are limited to the construction footprint. | |
| **IMPACT MANAGEMENT ACTIONS** | | |
| Mitigation measure | Responsible party | Time period |
| • An Environmental Control Officer (ECO) must be appointed for the duration of the construction phase to monitor and report back on compliance with conditions of the environmental authorisation.<br>• Consult weather forecasts daily and weekly. Do not work during rainfall and minimise the storage of mobile materials in low-lying areas. Plan the construction area as if it could be inundated with floodwaters in the event of a significant rainfall event.<br>• Construction access for the pipeline through Zone D (see Figure 5 of this EMPr and Appendix F) should utilise existing access points from Long Street. No new roads should be necessary.<br>• The width of the working area through Zone D (see Figure 5 of this EMPr and Appendix F) must be as narrow as possible and must be clearly demarcated. Estuarine habitat outside of this demarcated area must be considered as No-Go areas. | Contractor | Construction phase |

| | | |
|---|---|---|
| • Revegetation of the pipeline through Zone D (see Figure 5 of this EMPr and Appendix F) must be actively encouraged. The route is currently well covered by indigenous vegetation (e.g. sedges, P. australis, Stenotaphrum secundatum etc.). It is recommended that when trenching, a top layer of vegetation in association with 20-30 cm of soil should be removed and set aside for replanting or covering the filled in trench.<br>• Open trenching for sewer lines should be done in as short a stretch as possible and backfilled with material as soon as possible to reduce the likelihood of material loss in the event of flooding.<br>• Keep a skip on site so that any waste materials can be conveniently discarded and removed. This includes small amounts of dirty water, such as that used for mixing concrete.<br>• Equipment and materials lay-down areas should be located away from estuarine habitat and stormwater channels leading into the estuary. Minimise the storage of loose materials in case of a flood event that could wash them into the estuary.<br>• Post-construction site clean-up must be completed to ensure the entire site footprint and surrounding area has been cleared of litter and any waste materials associated with construction. The ECO should be informed of the construction close-out and complete an inspection to ensure this measure has been implemented.<br>• The pipeline route through Zone D (see Figure 5 of this EMPr and Appendix F) must be routinely inspected for the establishment of alien invasive plant species. This must be done at a high frequency following construction (i.e. monthly) and can be reduced once natural vegetation along the pipeline has recovered. These must be controlled by hand. No aerial application of herbicides is permitted. Herbicides may only be applied to cut-stumps and must be registered for use on the target plant species. | | |
| Performance Indicator | Construction activities are limited to the construction footprint. | |

**OBJECTIVE 5: JOB CREATION**

| ***Impact Management Objective:*** ***To create employment opportunities with potential for skills transfer, for members of the local community.*** | | |
|---|---|---|
| Potential impact to be promoted | • Temporary jobs opportunities<br>• There may be opportunities to transfer skills from more experienced workers to less experienced workers. | |
| Impact Management Outcome | The local community benefits from the employment opportunities created during the construction phase. | |
| **IMPACT MANAGEMENT ACTIONS** | | |
| Mitigation measure | Responsible party | Time period |
| • No mitigation required for this positive benefit. However, where practical preference must be given to previously disadvantaged individuals from the local community when appointing contractors/ workers.<br>• Skills transfer between members of the workforce should be encouraged. | Contractor | Construction phase |
| Performance Indicator | The majority of the construction team is from the local community, with preference given to historically disadvantaged individuals. Skills transfer from experienced to less experienced workers is actively encouraged on site. | |

## 11. Environmental impact management post construction rehabilitation phase

After all construction activities have ceased, the sites must be cleared of all construction related equipment, materials, facilities and waste. In addition all disturbed surfaces – including disturbed areas around the structures and all areas utilised for site facilities – must be stabilised, rehabilitated and provided with a suitable cover. All temporary access roads constructed must rehabilitated and access must be restricted from the public.

**The environmental management objective (goal) for this phase is to:**

- rehabilitate all areas disturbed by construction activities in an environmentally sensitive manner

**OBJECTIVE 1: SITE CLOSURE & REHABILITATION**

| ***Impact Management Objective:*** ***To rehabilitate all areas disturbed by construction activities in an environmentally sensitive manner.*** | | |
|---|---|---|
| Potential impact to avoid | • Failure to remove all construction related waste and materials may result in environmental pollution.<br>• Failure to remove all construction related equipment, machinery and site facilities may pose an impact to the natural environment.<br>• Failure to stabilise disturbed surfaces may result in soil erosion and increased storm water run-off, which may limit successful revegetation of the site. | |
| Impact Management Outcome | The site is neat and tidy, and all exposed surfaces are suitably covered/ stabilised.<br>There is no construction-related waste or pollution remaining on site. | |
| **IMPACT MANAGEMENT ACTIONS** | | |
| Mitigation measure | Responsible party | Time period |
| • On completion of the construction operations, the site camp area must be cleared of all site camp facilities, ablution facilities, fencing, signage, waste and surplus material.<br>• Surfaces are to be checked for waste products from activities such as concreting or asphalting and cleared in a manner approved by the ECO.<br>• Any contaminated soil must be collected and disposed of as hazardous waste.<br>• All construction waste, litter and rubble are to be removed from the site and re-used elsewhere or recycled/disposed of at an appropriate facility.<br>• Burying or burning of waste or rubble on site is prohibited.<br>• All areas within the working area and site camp that have become devoid of vegetation or where soils have been compacted due to construction activities must be scarified or ripped.<br>• Topsoil removed during the establishment of the site camp and the working area must be spread evenly over the entire site camp area and all other disturbed/ exposed areas after those areas have been ripped, scarified, shaped and contoured (as required).<br>• Where necessary seeding and planting of vegetation can take place after the replacement of the topsoil. Hardy, drought tolerant, non-invasive plant species must be selected. If needed, a layer of mulch can be applied to the newly shaped/ landscaped and topsoiled areas. The mulch will serve to limit erosion and will promote the re-vegetation of the site by retaining moisture in the soil and providing organic material (compost) for new plant growth. Mulched material must be spread to a depth of ± 50mm – a thinner layer is likely to be ineffective in protecting the site, while thicker layers may suppress plant growth. | Contractor | Post-Construction phase |

| | | |
|---|---|---|
| • All exposed soils and recently topsoiled areas are to be re-vegetated or stabilised to the satisfaction of the ECO, to protect these areas from wind and water erosion. No areas are to be left exposed to erosive forces. Erosion protection measures that can be applied include mulching (described above), the placement of geotextile, onion bags filled with wood chips, brush-packing or other similar measures.<br>• Any topsoil, subsoil or other excavated material that cannot be utilised during site rehabilitation must be removed from the site and reused elsewhere on the property or disposed of at an appropriate disposal site.<br>• Where necessary disturbed soils must be revegetated with the local indigenous vegetation such as that which occurs at the site or provided with other suitable cover.<br>• It is recommended that follow-up alien clearing be conducted 6 months after construction is complete.<br>• Alien clearing to adhere to the Site Specific Alien and Invasive Species Management Programme (Appendix J). | | |
| Performance Indicator | • All construction-related materials, equipment, facilities, waste and contaminated soils have been removed from the site.<br>• Compacted soils have been scarified/ ripped and stabilised.<br>• All disturbed/exposed surfaces have been provided with a suitable covering and/or stabilised.<br>• No alien vegetation is evident on site. | |

## 12. Environmental impact management operational phase

During the operational lifespan of the upgraded sewerage pipeline, occasional maintenance activities may be required to ensure the system continues to function safely and efficiently. These may include routine inspections, clearing of blockages, repairing minor defects, or responding to unplanned operational issues. While such activities are typically infrequent and of short duration, they may still introduce limited environmental risks—particularly given the pipeline's location within or adjacent to the estuarine functional zone. To ensure that maintenance works are undertaken responsibly and with minimal environmental disturbance, the following objectives are applicable

**The environmental management objective (goal) for this phase is to:**

- To prevent pollution of wetland and estuarine habitat caused by pipe blockages
- To limit disturbance of wetland and estuarine habitat caused by maintenance activities

**OBJECTIVE 1: TO PREVENT POLLUTION OF WETLAND AND ESTUARINE HABITAT CAUSED BY PIPE BLOCKAGES**

| ***Impact Management Objective:* To prevent pollution of wetland and estuarine habitat caused by pipe blockages.** | | |
|---|---|---|
| Potential impact to avoid | • Occasional leaks due to damages or blockages resulting in pollution of wetland and estuarine habitats. | |
| Impact Management Outcome | The risk of polluting the wetland or estuary habitat is reduced. | |
| **IMPACT MANAGEMENT ACTIONS** | | |
| Mitigation measure | Responsible party | Time period |
| • When blockages to sewerage infrastructure within the EFZ occur, the maintenance team should ensure a honey-sucker is on standby to mop up any spills or overflows for removal and disposal at the Wastewater Treatment Works.<br>• Any serious sewage spills that result in large quantities of sewage leaking from a pump station or manhole must be contained in a temporary coffer dam which can be constructed using sandbags for the walls and plastic sheeting as a base. From here, honey-suckers can collect sewage for removal.<br>• Any water-tight seals around manholes, joints or other access points that must be broken for maintenance should be replaced thereafter to ensure the mitigation measures to prevent water ingress or sewage leakage are maintained under flood scenarios.<br>• Keep sewer lines clear of dense vegetation to facilitate access and reduce the risk of roots cracking sewer lines. | Mossel Bay Municipality | Operational Phase |

| | |
|---|---|
| Performance Indicator | • Mitigation measures of the specialist are adhered to. |

**OBJECTIVE 2: TO LIMIT DISTURBANCE OF WETLAND AND ESTUARINE HABITAT CAUSED BY MAINTENANCE ACTIVITIES**

| ***Impact Management Objective:*** ***To limit disturbance of wetland and estuarine habitat caused by maintenance activities.*** | | |
|---|---|---|
| Potential impact to avoid | • Damage or disturbance of nearby wetland and estuarine habitat due to maintenance activities. | |
| Impact Management Outcome | The risk of disturbing or damaging nearby wetland and estuarine habitat is reduced. | |
| **IMPACT MANAGEMENT ACTIONS** | | |
| Mitigation measure | Responsible party | Time period |
| • All of the mitigation measures provided for the construction phase are applicable to maintenance work where applicable. | Mossel Bay Municipality | Operational Phase |
| Performance Indicator | • Mitigation measures of the specialist are adhered to. | |

## 13. Emergency Preparedness

### 13.1 Emergency response procedures

The potential environmental risks that may arise as a result of construction activities must be identified, and appropriate emergency response procedures must be compiled for each emergency scenario. Potential environmental emergencies that require an emergency response include – but are not limited to – unplanned fires, sewage spills, spills of hazardous chemicals, snake bites etc.

- The construction contractor is responsible for ensuring that the requirements of the Occupational Health & Safety Act (OHSA) are adhered to during the construction phase. The Applicant is responsible for ensuring compliance with the OHSA during the undertaking of construction activities.

### 13.2 Emergency preparedness

The following measures must be implemented, as appropriate, to ensure effective responses to emergencies:

- All workers on site during the construction and maintenance phase must be properly educated about possible emergency incidents that may arise, how to avoid such incidents and how to respond in the event of an incident. "Refresher" training sessions on emergency procedures must be held if needed.
- All workers must ideally be given basic fire-awareness training and advised on basic firefighting and safety techniques. Fire-fighting equipment must be available on site during construction activities (see section 8.3).
- All workers must be trained on how to respond in the event of a spill of a hazardous substance(fuel, chemicals etc.), if hazardous substances are to be used on site.
- A spill kit for containing and/or neutralising spills of hazardous substances (e.g., hydrocarbons) must be available on site at all times, when hazardous substances are present.
- Any incidents of pollution or spillage of hazardous materials during construction must be reported to the ECO as soon as possible. The ECO must then (depending on the nature of the spill) notify the relevant authorities, if needed. A first aid kit must be available on site at all times.
- Emergency contact numbers (including the fire department, police and ambulance) must be prominently displayed on site at all times and regularly updated.
- All emergency incidents must be recorded in a site incident log. The cause of the incident, the measures taken in response to the incident and the efficacy of those measures must also be recorded. This information must be used to inform future emergency preparedness planning, and to avoid prevent similar incidents from arising again.

## 14. Method statements

The Competent Authority and/or the ECO may require the Applicant or Construction Contractor to submit Method Statements for one or more construction-related activity, or any aspect of the management of the site, before the activity is undertaken or during the performance of the activity if the activity is causing or may cause significant environmental damage or pose a health and safety risk.

Method Statements need not be complex and lengthy, but must clearly state **how**, **when** and **where** the activity concerned will be undertaken, and must specify **who** will be responsible for undertaking each component of that activity. Method Statements must be prepared by the Construction Contractor and submitted to the ECO for approval before undertaking the activity concerned.

The ECO and / or Competent Authority have the authority to request method statements for other activities, including but not limited to:

- Establishment of site camp and stockpile area.
- Cement/ concrete batching, disposal and emergency contingencies.
- Topsoil and sub-soil storage/ stockpiling.
- Storage of fuels and hazardous chemicals and emergency contingencies.
- Waste management system.
- Storm water management and control.
- Emergency preparedness plan / emergency response procedure (see Chapter 13).

The ECO has the authority to prevent activities from being undertaken until such time as a satisfactory Method Statement has been submitted to the ECO and approved by the ECO.

## 15. Roles and Responsibilities

This EMPr, once approved by the competent authority (DEADP), should be seen as binding to the Applicant, and any person acting on the Applicant's behalf, including but not limited to agents, employees, associates, contractors and service providers.

The Applicant and all other persons who may be directly involved in the development are also bound by their general Duty of Care, as stated in Section 28 of the National Environmental Management Act, 1998:

> ***Duty of Care:***
>
> *"Every person who causes, has caused, or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm cannot reasonably be avoided or stopped, to minimize and rectify such pollution or degradation of the*

### 15.1 Duties and Responsibilities of the Applicant

The Applicant is ultimately responsible for ensuring that the environmental management measures specified in this EMPr, as well as any other conditions specified by the competent authority, are implemented and adhered to during the construction phase of the proposed development.

The Applicant or party delegated by the applicant is responsible for monitoring during the construction phase. The Applicant must ensure that all appointed service providers, contractors and workers are capable of complying with all statutory requirements of this EMPr and the conditions of the Environmental Authorisation. The Applicant is responsible for ensuring that this EMPr and the conditions of the Environmental Authorisation are implemented and adhered to during construction activities undertaken by the Applicant.

The Applicant or appointed consultant is responsible for identifying emergency situations that may arise during operational activities undertaken by the Applicant and must formulate appropriate emergency response procedures for these emergency scenarios.

### 15.2 Duties and Responsibilities of the Contractor

The "Construction Contractor" is the entity responsible for undertaking the physical construction of the residential development. The construction contractor is responsible for ensuring that all environmental management measures specified in this EMPr and in the EA are implemented during the pre-construction, construction and post-construction rehabilitation phases, unless agreed otherwise with the Applicant. The contractor will be responsible for all costs incurred in the rehabilitation of the site and for ensuring effective environmental management during construction. The contractor must therefore make adequate financial provision for the implementation of all prescribed measures.

It is strongly recommended that the Construction Contractor appoint an Environmental Site Officer (ESO), who will act as the Contractor's representative to monitor and enforce compliance with the conditions of this EMPr, throughout all phases of construction.

In addition to the above, the Construction Contractor is responsible for the following:

- Identify emergency situations that may arise as a result of construction activities and formulate appropriate emergency response procedures (see Chapter 13).
- Ensure that all construction workers, including sub-consultants and service providers, undergo environmental awareness training prior to commencing work on site, or as soon as possible thereafter (see Chapter 16).
- Compile the required method statements, which must be to the satisfaction of the ECO, before commencing with the activity to be governed by the method statement (Chapter 14).
- Respond to concerns or issues identified by the ECO, as relates to environmental management, and implement the appropriate management or remediation measures, at the Contractor's own expense (unless agreed otherwise)
- Should third parties be called to the site to perform clean up and rehabilitation procedures, the Construction Contractor will be responsible for all associated costs.

Note that failure to comply with the requirements and conditions of this EMPr and the Environmental Authorisation may result in fines or other penalties being levied against the Construction Contractor by the Competent Authority.

### 15.3 Duties and Responsibilities of the ECO

The appointed Environmental Control Officer (ECO) is responsible for undertaking regular site visits to monitor and report on the implementation of the EMPr and adherence to the conditions of the Environmental Authorisation during the pre-construction, construction and post-construction rehabilitation phases. The ECO is not required to monitor the site during the operational phase of the development.

#### Competency of the ECO

The ECO must be independent of the Applicant, Engineer, Construction Contractor and their service providers. The appointed ECO must be suitably qualified and experienced, and must be able to demonstrate that he / she is of sufficient competency to undertake the required task. The ECO should preferably be a resident in close proximity to the development area to ensure quick response if required. The ECO must work in close co-operation with the Construction Contractor, resident engineer or ESO

(where applicable) and all contractors in order to identify potential problems before they occur, and provide suitable guidance as to how the identified problems (environmental impacts) can be avoided.

**Duties of the ECO**

The duties of the ECO include, but are not limited to:

- Conduct a pre-construction site inspection to ascertain the pre-commencement condition of the site (i.e. the status quo) and determine whether faunal search-and-rescue is required;
- Conduct environmental awareness training (see Chapter 16);
- Undertake regular site visits to monitor compliance with all mitigation, monitoring and management measures contained in the EMPr and the Environmental Authorisation, during the pre-construction, construction and rehabilitation phases of the development (see section below regarding frequency of ECO visits).
- Evaluate the achievement of the performance indicators associated with each impact management outcome specified in this EMPr (Chapters 9-12)
- Liaise with site contractors, engineers and other members of the development team with regard to the requirements of the EMPr;
- Provide guidance as and when required regarding the implementation of the environmental management measures contained in the EMPr and EA, so as to assist the Applicant and contractor in remaining compliant with these measures;
- Assist in finding environmentally acceptable solutions to construction problems;
- Ensure that the working area, site camp facilities, access roads and no-go areas are properly demarcated;
- Ensure that proper topsoil management practices are adhered to on site;
- Ensure that proper waste management & pollution prevention strategies are practised on site;
- Examine method statements;
- Email contractors with potential non compliance notices in case of contravention of the EMPr;
- Ensure satisfactory rehabilitation of disturbed areas on site, after construction is complete;
- Keep detailed records of all site activities that may pertain to the environment, and produce compliance-monitoring reports (ECO Reports) for submission to the Applicant, and the Competent Authority at regular intervals during the construction phase;
- Submit a final post-construction inspection report, within 6 months of completion of the construction phase. The audit report must detail the rehabilitation measures undertaken, describe all major incidents or issues of non-compliance and any issues or aspects that require attention or follow-up.
- All ECO Reports and Inspection Reports must be submitted to the Applicant and Competent Authority.

**Frequency of ECO visits**

The ECO must conduct weekly site visits during the initial bulk earthworks (civils), to check compliance with the conditions of the EA and mitigation measures and recommendations of this EMPr. The ECO has the discretion to undertake additional visits if he / she feels this is justified due to the actions of the contractors, and to make *ad hoc* visits in order to ensure compliance.

The ECO must also undertake a final inspection (audit) 6 months of completion of construction activities. The purpose of this final inspection is to ensure that the rehabilitation measures applied at the conclusion of the construction phase have been sufficient to promote the successful rehabilitation of the site, and to identify any further issues that require attention or follow-up.

Once the footprint has been established and the cofferdam is in place, the site visit frequency can be reduced to two visits per month. Once the cofferdam is removed and activities are limited to the mechanical aspects within the building the visits can be reduced to one visit per month.

**Authority of the ECO**

The ECO has the authority to recommend that the Engineer suspend all works (or part thereof) occurring on site, should any action being undertaken on site not comply with the environmental requirements, and where such actions pose a serious threat to any element of the surrounding environment.

The ECO has the authority to recommend measures to the Engineer, regarding measures that must be implemented on site in order to ensure compliance with the EMPr and Environmental Authorisation, and/or to prevent environmental degradation or pollution from occurring.

The ECO has the authority to issue verbal and written warnings to contractors. Should verbal and written instructions and/or warnings be ignored, the ECO has the authority to request the Engineer to issue pre-determined fines or other penalties.

## 16. Environmental Awareness Plan

Environmental Awareness Training must be conducted prior to the commencement of construction activities. It is the applicant's responsibility to familiarise himself/herself with the content and requirements of this EMPr. The applicant is also responsible to ensure that the contractor and all labourers working on site during the construction phase are familiar with the content of this EMPr.

The following actions must be taken to ensure that all relevant parties are aware of their environmental role and duties:

1. This EMPr must be kept on site at all times.
2. The provisions of this EMPr and the conditions of the Environmental Authorisation must be explained in detail to all staff during Awareness Training.
3. Training booklets will be handed out to all labourers and must be explained to them.
4. Weekly checks to be done by the Applicant's environmental representative (where available) who must be on site at all times.
5. The ECO to do frequent site visits, as recommended in Section 15.3 of the EMPr.
6. Monthly monitoring reports to be compiled by the ECO. These reports will be circulated to all parties involved (including the applicant, contractor and the competent authority).

The Construction Contractor must make allowance for all construction site staff, including all subcontractors that will be working at the site, to attend environmental awareness training sessions (undertaken by the ECO) before commencing any work on site. During this training, the ECO will explain the EMPr and the conditions contained therein. Attention will be given to the construction process and how the EMPr fits into this process. Other items relating to sound environmental management which must be discussed and explained during the environmental awareness training sessions include:

- The demarcated "No-Go" areas;
- General do's and don'ts of the site;
- Making of fires;
- Waste management, use of waste receptacles and littering;
- Use of the toilets provided;
- Use and control of construction materials and equipment etc.;

- Control, maintenance and refuelling of vehicles;
- Methods for cleaning up any spillage;
- Access and road safety;
- Emergency procedures (e.g. in case of fire, spillage etc.)
- General "best practice" principles, with regards to the protection of environmental resources.

Environmental awareness training and education must be ongoing throughout the construction phase and must be undertaken regularly if deemed necessary (especially if it becomes apparent that there are repeat contraventions of the conditions of the EMPr), or as new workers come to site. Translators must be utilised where needed. An Environmental Awareness Guideline has been compiled and is included in Appendix F of the EMPr.

## 17. Monitoring, Record Keeping and Reporting

### 17.1 Environmental Auditing

In accordance with the requirements of the Amended Environmental Impact Assessment Regulations of 2014 (GN No. R.327 of 7 April 2017), the holder of the Environmental Authorisation (i.e. the Applicant) must, for the period that the Environmental Authorisation is valid, appoint a suitably qualified independent person to conduct an environmental audit to audit compliance with the conditions of the Environmental Authorisation and the EMPr.

The appointed auditor must undertake environmental audits within 6 months after the completion of the rehabilitation measures. Following each audit the environmental auditor must submit an audit report to the Competent Authority (in this instance the DEA&DP). The Auditor must be independent from the EAP and ECO.

- Environmental auditing and environmental audit reports must adhere to the requirements of the Environmental Impact Assessment Regulations, in particular Section 34 (*Auditing of Compliance with Environmental Authorisation, Environmental Management Programme*) and Appendix 7 (*Objective and Content of Environmental Audit Report*).
- The audit report must provide verifiable findings on the level of compliance with the provisions/ conditions of the Environmental Authorisation and the EMPr, and must also comment on the ability of the measures contained in this EMPr to sufficiently avoid, manage and mitigate environmental impacts.
- Where the findings of the audit report indicate that the impact management measures stated in the EMPr are insufficient to adequately address environmental impacts, recommendations as to how the EMPr must be amended so as to address the identified shortcomings must be made and submitted to the competent authority together with the audit report.

### 17.2 Construction phase monitoring, reporting and record keeping.

The appointed Environmental Control Officer (ECO) is responsible for monitoring the site at regular intervals during the construction phase, in order to ensure that the provisions of this EMPr and the Environmental Authorisation are adhered to and that sound environmental management is ensuing on site.

The ECO must compile a monthly ECO report detailing the ECO's observations on site, any instances of non-compliance and any issues or aspects that require attention, follow-up or remedial action. The ECO reports must be submitted to the Applicant, and to the Competent Authority as requested by the DEADP in the EA. The ECO inspection reports must include both photographic and written records.

**ECO Inspections - Photographic Records**

The condition of the surrounding natural environment must be monitored regularly in order to ensure that construction and management activities are not impacting negatively on the condition of the landscape and any sensitive ecosystems. The most effective way to achieve this is by means of a detailed photographic record. In this way, a record of any shift in ecosystem condition can be maintained and potential impacts be detected at an early stage. It is thus recommended that fixed-point photo-monitoring sites could be set up, and photographs should be taken at these sites during each ECO inspection. Where necessary, the entire working area should be well documented and photographed.

**ECO Inspections - Written Records**

The following record-keeping during the pre-construction, construction and rehabilitation phases of the development is recommended:

- The ECO should complete an ECO Checklist after each ECO site visit.
- The ECO must compile an ECO monitoring report and submit this to the Applicant, the Contractor and the Competent Authority (the latter only if required by the Competent Authority). The monthly reports must be a summary of the ECO inspections from the preceding month and must highlight the key concerns/ issues on site, instances of non- compliance with the EA and EMPr, all instructions issued to the contractor, actions taken and aspects that still require attention.
- All ECO reports and ECO instructions must be retained on file by the Applicant at least for the duration of the construction period (retaining reports for a period of at least 5 years is recommended, in the event that the Competent Authority should request information).
- A record (minutes) of construction site meetings, liaison site meetings between the ECO and resident engineer or contractor, monitoring reports, ECO instructions and ECO observations should be clearly documented and filed on a master file off-site for safe keeping.
- It is recommended that a site register (incident register) should be kept on site at the site office for the recording of any environmental incidents (e.g., fires, spills etc.), observations which are contrary to the stipulations within the EMPr and any other contravention deemed necessary for the attention of the resident engineer. Actions taken to remedy the incidents should also be recorded.
- A complaints register should be kept on site in which complaints by any member of the public should be logged.
- The ECO must compile a final post-construction audit report, within 6 months of completion of each construction phase. The audit report should detail the rehabilitation measures undertaken, describe all major incidents or issues of non-compliance and any issues or aspects that require attention or follow-up.

***Construction Phase Record Keeping***

A copy of the approved EMPr, the Environmental Authorisation and any relevant construction method statements must be kept on site at all times during pre-construction, construction and rehabilitation activities. The ECO Reports must be retained by the Applicant for a period of at least 5 years and must be provided to the Competent Authority upon request.

### 17.3 Corrective Action Procedure

Correction actions need to be followed in the event where there is non-compliance with a condition of the EA and any recommendation and mitigation measure as stipulated in this EMPr in order to rectify the non-compliance and to prevent reoccurrence.

The ECO will be responsible for reporting non-compliance with any condition of the EA and the recommendations and mitigation measures as included in this EMPr. The ECO will also be responsible for the compilation of non-compliance reports and identifying steps to correct the non-compliance.

The ECO must report all non-compliance issues to the contractor whose responsibility it is to correct. A timeframe for the completion of the corrective actions must be agreed to the ECO. Once the corrective actions have implemented the contractor must notify the ECO. The ECO must review the effectiveness of the corrective actions and if it is found to be inadequate, additional measures must be implemented. Only once the corrective actions have been completed to the satisfaction of the ECO will the matter be considered as closed.

In instances where there are repeated instances where the requirements and conditions of this EMPr and the Environmental Authorisation are contravened or not fully complied with, the Construction Contractor may be liable for financial penalties. Penalties shall be issued by the Engineer, in accordance with the Schedule of Fines contained in the table below. Penalties may be issued at the Engineer's discretion, and/or upon the request/ recommendation of the ECO or Competent Authority.

Depending on the nature of transgression, the Engineer and/or ECO may issue one or more warnings to the Contractor prior to the issuing of a fine. Warnings may be given in writing or orally, but oral warnings must be followed up with written confirmation of the warning within 48 hours of the oral warning. The Engineer has the discretion to issue a fine without first issuing a warning, if the severity of the transgression is judged by the Engineer and/or ECO and/or Competent Authority to warrant such action.

The Engineer must ensure that the levying of fines/penalties forms part of the contract between the Construction Contractor and the Engineer and is subject to the provisions of South African contract law.

The table below specifies the transgressions for which the Construction Contractor may incur financial penalties, and the amount of the fines that may be levied. Levying of fines/ penalties is subject to alignment with South African Contractual Law. For repeat offences of the same/ similar transgression by the same party, the value of the fine shall be doubled for each subsequent repeat offence to a maximum value of **R50 000.00** per offence.

*Note: "Provisions", as stated in the table below, relates to the requirements specified in this EMPr and any requirements or conditions specified in the EA, as well as any other requirements governing the environmental management aspects of the development, which the Contractor is responsible for implementing.*

| # | Finable Transgression | Min Fine | Max Fine |
|---|---|---|---|
| 1 | Failure to notify the ECO of the commencement of construction or pre-construction activities, prior to the commencement of such activities | R1 000 | R2 000 |
| 2 | Failure to comply with the provisions relating to the demarcation of the working area, site camp and associated facilities, and the maintenance of the demarcated boundaries. | R1 000 | R5 000 |
| 3 | Failure to comply with the provisions relating to the demarcation of all "no-go" areas, and the maintenance of the demarcated boundaries. | R2 000 | R5 000 |

| | | | |
|---|---|---|---|
| 4 | Failure to provide secured ablution facilities (1:30 ratio) on site. | R500 | R15 000 |
| 5 | Failure to comply with the provisions relating to the clearance of vegetation on site. | R2 000 | R5 000 |
| 6 | Clearance of indigenous vegetation (regardless of the density of alien vegetation present) outside of the demarcated boundaries of the working area and site camp. | R2 500 | R15 000 |
| 7 | Damage to indigenous vegetation in the surrounding areas within No-Go areas | R2 000 | R10 000 |
| 8 | Failure to apply herbicide to alien vegetation when required to do so. | R500 | R2 000 |
| 9 | Failure to adhere to designated access routes and/or the driving of vehicles through undeveloped vegetation outside of the demarcated working area or site camp. | R1 000 | R5 000 |
| 10 | Movement of vehicles and/or construction workers in no-go areas; | R1 000 | R10 000 |
| 11 | Empty cement bags found on site or surrounding vegetation. Open cement bags on site with cement blowing from the bag | R2 500 | R15 000 |
| 12 | Parking or storage of vehicles, machinery, tools and other materials or equipment related to the Contractors operations, within designated "no-go" areas. | R1 000 | R10 000 |
| 13 | Parking or storage of vehicles, machinery, tools and other materials or equipment related to the Contractors operations, outside of the areas demarcated for such parking/storage. | R500 | R5 000 |
| 14 | Failure to comply with the provisions relating to the management of topsoil and subsoil. | R1 000 | R5 000 |
| 15 | Excessive excavation of material in areas not depicted for such purpose / activity on the approved design plans. | R2 500 | R10 000 |
| 16 | Failure to comply with the provisions relating to waste management on site i.e. recycling of waste | R500 | R5 000 |
| 17 | Failure to comply with the provisions relating to the storage, use and management of hazardous substances and fuels on site and/or the spillage of hydrocarbons or hazardous substances on site. | R1 000 | R10 000 |
| 18 | Mixing cement or concrete on bare ground and/or failure to comply with any other provision regarding cement/ concrete batching | R1 000 | R5 000 |
| 19 | Failure to provide adequate fire-fighting equipment (in working order) on site at all times and/or failure to comply with the provisions relating to fire prevention and/or the occurrence of unattended or out of control fires. | R500 | R5 000 |
| 20 | Refuelling of vehicles, machinery or equipment outside of the designated refuelling area. | R500 | R2 000 |
| 21 | Maintenance of vehicles, machinery or equipment outside of the designated maintenance yard, except in emergencies | R500 | R2 000 |
| 22 | Failure to undertake refuelling or repairs over a drip tray or other impermeable bunded surface to collect spilled hydrocarbons (fuels, lubricants, oils etc.) and other hazardous substances; failure to provide drip trays under fuel burning equipment (including pumps and generators) where there is a risk of hydrocarbon leakage. | R500 | R2 000 |
| 23 | Storing / placing fuel containing equipment (i.e. bowsers and other fuel containers) within a drainage line. | R2 500 | R10 000 |
| 24 | Failure to produce a required method statement/s to the engineer's and ECO's satisfaction prior to undertaking the activity concerned and/or failure to adhere to an approved method statement | R1 000 | R5 000 |
| 25 | Waste found to be buried or burnt on site | R5 000 | R15 000 |

## 18. CONCLUSION

The recommendations and mitigation measures prescribed in this EMPr have been formulated with the intention of addressing potential pre-construction, construction and operational phase impacts on the environment. It is likely that if the conditions, requirements and recommendations of the above EMPr are implemented as described and the relevant stakeholders adhere to the various mitigation measures, then the project will be completed without unforeseen negative environmental impacts. Familiarity with the contents of this EMPr by the contractors and other individuals involved in the development project will assist in achieving "environmental best-practice", which ultimately ensures that the project arrives at a sustainable outcome.

# APPENDIX A: LOCALITY MAPS

**APPENDIX A: FIGURE 1: LOCALITY MAP FOR THE PROPOSED UPGRADING OF THE BULK SEWERAGE LINE FROM AMY SEARLE STREET / GREENHAVEN TO THE CRICKET FIELD SEWERAGE PUMPSTATION**




**Prepared for:**
*Mossel Bay Municipality*

**Date:**
February 2026

**APPENDIX A: FIGURE 2: LOCALITY MAP FOR SITE CAMP FOR THE PROPOSED UPGRADING OF THE BULK SEWERAGE LINE FROM AMY SEARLE STREET / GREENHAVEN TO THE CRICKET FIELD SEWERAGE PUMPSTATION**




**Prepared for:**
*Mossel Bay Municipality*

**Date:**
February 2026

**APPENDIX A: FIGURE 3: LOCALITY MAP FOR STOCKPILE AREA FOR THE PROPOSED UPGRADING OF THE BULK SEWERAGE LINE FROM AMY SEARLE STREET / GREENHAVEN TO THE CRICKET FIELD SEWERAGE PUMPSTATION**




**Prepared for:**
*Mossel Bay Municipality*

**Date:**
February 2026

**APPENDIX A: FIGURE 4: LOCALITY MAP FOR STOCKPILE AREA FOR THE PROPOSED UPGRADING OF THE BULK SEWERAGE LINE FROM AMY SEARLE STREET / GREENHAVEN TO THE CRICKET FIELD SEWERAGE PUMPSTATION**




**Prepared for:**
*Mossel Bay Municipality*

**Date:**
February 2026

**APPENDIX A: FIGURE 5: LOCALITY MAP FOR ACCESS ROADS FOR THE PROPOSED UPGRADING OF THE BULK SEWERAGE LINE FROM AMY SEARLE STREET / GREENHAVEN TO THE CRICKET FIELD SEWERAGE PUMPSTATION**




**Prepared for:**
*Mossel Bay Municipality*

**Date:**
February 2026

# APPENDIX B: SITE DEVELOPMENT PLANS

| DESCRIPTION | Y | X | Z |
|---|---|---|---|
| BM 4 | 72973.683 | 3768295.421 | 41.638 |

| DESCRIPTION | Y | X | Z |
|---|---|---|---|
| BM 5 | 72971.528 | 3768316.559 | 42.061 |

# GROOT BRAKRIVIER TOWNSHIP EXT. 4

TP 9622
TP 11289

SG 1116/1976
SG 10891/1985

## SEWER LEGEND

| EXISTING SEWER PIPES | PROPOSED NEW SEWER PIPES |
|---|---|
| Ø100mm CLAY | Ø160mm uPVC CLASS 34 |
| Ø150mm CLAY | Ø150mm HDPE VIA PIPE CRACKING |
| Ø110mm uPVC CLASS 34 | Ø300mm uPVC CLASS 34 |
| Ø160mm uPVC CLASS 34 | BLANK OF EXISTING SEWER PIPE |
| Ø200mm uPVC CLASS 34 | |
| Ø250mm uPVC CLASS 34 | |
| Ø300mm uPVC CLASS 34 | |
| Ø100mm PITCH FIBRE | |
| Ø150mm PITCH FIBRE | |
| Ø150mm HDPE | |
| Ø400mm PVC | |
| PIPE DIMENSION / MATERIAL UNCERTAIN | |
| MANHOLE NUMBER<br>COVER LEVEL<br>OUTGOING INVERT LEVEL<br>MANHOLE DEPTH<br>INCOMING INVERT LEVEL | EXISTING STORMWATER<br>NEW Ø450 CLASS 8kN/m² HDPE SPIRAL STORMWATER PIPE<br>EXISTING WATER NETWORK |
| DISTANCE(SEE NOTE)<br>GRADIENT(SEE NOTE) | |
| CONNECT TO EXISTING SERVICE | |
| UNSURE MANHOLES POSITIONS | |

NOTES:
INDICATED DISTANCE IS FROM CENTRE TO CENTRE OF MANHOLES.

THE GRADIEN BETWEEN CONSECUTIVE MANHOLES WHERE CALCULATED FROM THE OUTGOING- AND INCOMING INVERT LEVELS BETWEEN CONSECUTIVE MANHOLES. THE INDICATED DISTANCE MUST BE REDUCED BY THE SUM OF TWO CONSECUTIVE MANHOLES RADII TO CALCULATE THE GRADIENT.

ALL MANHOLE RADII IS 1.0m.

ALL INCOMING INVERT LEVELS IS 10mm HIGHER THAN THE OUTGOING INVERT LEVELS, UNLESS OTHERWISE INDICATED

WHERE INCOMING PIPE IS SMALLER THAN OUTGOING PIPES, PIPES MUST BE LAID SOFFIT TO SOFFIT.

OORSPRONKLIKE SKAAL IN mm/ ORIGINAL SCALE IN mm

0 10 25 50

| Wysig. Amend. | Datum Date | Beskrywing-Description |
|---|---|---|
| . | . | . |


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Nagesien-Checked:

Pr.Ing. Pr.Eng.
Raadgewende Ingenieur-Consulting Engineer
Datum-Date: 2025-06-09
Kliënt-Client

Klient-Client: MOSSEL BAY MUNICIPALITY

Projek-Project: GREENHAVEN, GROOT BRAKRIVIER, UPGRADING OF SEWER LINES PHASE 3

Plan beskrywing - Plan description: SEWER UPGRADE PLAN 1

| Skaal-Scale | Datum-Date |
|---|---|
| 1:1 000 | JUNE 2025 |

Tekening Nr.-Drawing No.: M 1621-1

Wysiging Amendment: .

# GLENCAIRN No. 133

# WESTBANK No. 132

# GROOT BRAKRIVIER TOWNSHIP EXT. 4

TP 9622
TP 11289

SG 1116/1976
SG 10891/1985

## SEWER LEGEND

| EXISTING SEWER PIPES | PROPOSED NEW SEWER PIPES |
|---|---|
| Ø100mm CLAY | Ø160mm uPVC CLASS 34 |
| Ø150mm CLAY | Ø150mm HDPE VIA PIPE CRACKING |
| Ø110mm uPVC CLASS 34 | Ø300mm uPVC CLASS 34 |
| Ø160mm uPVC CLASS 34 | BLANK OF EXISTING SEWER PIPE |
| Ø200mm uPVC CLASS 34 | |
| Ø250mm uPVC CLASS 34 | |
| Ø300mm uPVC CLASS 34 | |
| Ø100mm PITCH FIBRE | |
| Ø150mm PITCH FIBRE -/607 | |
| Ø150mm HDPE | |
| Ø400mm PVC | |
| PIPE DIMENSION / MATERIAL UNCERTAIN | |
| MANHOLE NUMBER (55) | EXISTING STORMWATER |
| COVER LEVEL 56,50 / OUTGOING INVERT LEVEL 54,15 / MANHOLE DEPTH 2,35 / INCOMING INVERT LEVEL 45,07 | NEW Ø450 CLASS SN/m² HDPE SPIRAL STORMWATER PIPE |
| DISTANCE(SEE NOTE) 80,00m / GRADIENT(SEE NOTE) 1:50,00 | EXISTING WATER NETWORK |
| CONNECT TO EXISTING SERVICE | |
| UNSURE MANHOLES POSITIONS | |

NOTES:
INDICATED DISTANCE IS FROM CENTRE TO CENTRE OF MANHOLES.

THE GRADIEN BETWEEN CONSECUTIVE MANHOLES WHERE CALCULATED FROM THE OUTGOING- AND INCOMING INVERT LEVELS BETWEEN CONSECUTIVE MANHOLES. THE INDICATED DISTANCE MUST BE REDUCED BY THE SUM OF TWO CONSECUTIVE MANHOLES RADII TO CALCULATE THE GRADIENT.

ALL MANHOLE RADII IS 1,0m.

ALL INCOMING INVERT LEVELS IS 10mm HIGHER THAN THE OUTGOING INVERT LEVELS, UNLESS OTHERWISE INDICATED.

WHERE INCOMING PIPE IS SMALLER THAN OUTGOING PIPES, PIPES MUST BE LAID SOFFIT TO SOFFIT.

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OORSPRONKLIKE SKAAL IN mm/ ORIGINAL SCALE IN mm

| Wysig. Amend. | Datum Date | Beskrywing-Description |
|---|---|---|
| . | . | . |


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Nagesien-Checked

Pr.Ing. Pr.Eng.
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Kliënt-Client

Klient-Client
MOSSEL BAY MUNICIPALITY

Projek-Project
GREENHAVEN, GROOT BRAKRIVIER, UPGRADING OF SEWER LINES PHASE 3

Plan beskrywing - Plan description
SEWER UPGRADE PLAN 2

| Skaal-Scale | Datum-Date |
|---|---|
| 1:1 000 | JUNE 2025 |

Tekening Nr.-Drawing No.
M 1621-2

Wysiging Amendment .

GLENCAIRN
SG 582/1921

PORTION 1
SG 7234/1996

PORTION 144
SG 2034/1994

R.o.W. 5,00m
SG 2034/1994

PORTION 141
SG 5424/1993

PORTION 136
SG 1181/1992

PORTION 142
SG 5425/1993

PORTION 143
SG 5722/1993

PORTION 137
SG 1182/1992

PORTION 13 (PROSPECT)
SG 584/1921

REMAINDER OF PORTION 6
SG 1024/1876

R.o.W.
SG 3617/1997

WESTBANK No.

REMAINDER
SG 583/1921

REMAINDER OF PORTION 1
SG 3588/1990

REMAINDER
SG 582/1921

R.o.W
SG 4126/1993

PORTION 2 CEMETERY
SG 4126/1993

PTN 4
SG 4128/1993

PORTION 12 (FAIRHOLME)
SG 586/1921

PORTION 3
SG 4127/1993

REMAINDER
SG 585/1921

SG 5226/1991

RIVERSYDE No. 13

RIVERSYDE No. 13

REMAINDER OF PORTION 6
SG 1024/1876

MIDDLE OF SPRUIT

MIDDLE OF SPRUIT

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NSHIP

RET. WALL

TRANSF

ENNIS & NETBALL

BRAKRIVIER
WNSHIP

PAVILION

SG3229/1991

WOLVEDANS No. 129

U/C

## SEWER LEGEND

| EXISTING SEWER PIPES | PROPOSED NEW SEWER PIPES |
|---|---|
| Ø100mm CLAY | Ø160mm uPVC CLASS 34 |
| Ø150mm CLAY | Ø150mm HDPE VIA PIPE CRACKING |
| Ø110mm uPVC CLASS 34 | Ø300mm uPVC CLASS 34 |
| Ø160mm uPVC CLASS 34 | BLANK OF EXISTING SEWER PIPE |
| Ø200mm uPVC CLASS 34 | |
| Ø250mm uPVC CLASS 34 | |
| Ø300mm uPVC CLASS 34 | |
| Ø100mm PITCH FIBRE | |
| Ø150mm PITCH FIBRE | |
| Ø150mm HDPE | |
| Ø400mm PVC | |
| PIPE DIMENSION / MATERIAL UNCERTAIN | |
| MANHOLE NUMBER<br>COVER LEVEL<br>OUTGOING INVERT LEVEL<br>MANHOLE DEPTH<br>INCOMING INVERT LEVEL | EXISTING STORMWATER |
| DISTANCE(SEE NOTE)<br>GRADIENT(SEE NOTE) | NEW Ø450 CLASS 6kN/m² HDPE SPIRAL STORMWATER PIPE |
| CONNECT TO EXISTING SERVICE | EXISTING WATER NETWORK |
| UNSURE MANHOLES POSITIONS | |

NOTES:
INDICATED DISTANCE IS FROM CENTRE TO CENTRE OF MANHOLES.

THE GRADIEN BETWEEN CONSECUTIVE MANHOLES WHERE CALCULATED FROM THE OUTGOING- AND INCOMING INVERT LEVELS BETWEEN CONSECUTIVE MANHOLES. THE INDICATED DISTANCE MUST BE REDUCED BY THE SUM OF TWO CONSECUTIVE MANHOLES RADII TO CALCULATE THE GRADIENT.

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WHERE INCOMING PIPE IS SMALLER THAN OUTGOING PIPES, PIPES MUST BE LAID SOFFIT TO SOFFIT.

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OORSPRONKLIKE
SKAAL IN mm/
ORIGINAL
SCALE IN mm

| Wysig. Amend. | Datum Date | Beskrywing-Description |
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| . | . | . |


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Kliënt-Client

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Projek-Project: GREENHAVEN, GROOT BRAKRIVIER, UPGRADING OF SEWER LINES PHASE 3

Plan beskrywing - Plan description: SEWER UPGRADE PLAN 3

| Skaal-Scale | Datum-Date |
|---|---|
| 1:1 000 | JUNE 2025 |

Tekening Nr.-Drawing No.: M 1621-3

Wysiging Amendment: .

REMAINDER OF PORTION 119
SG 9890/1984

PTN 145
SG 1585/1995

SG 9890/1984

CEMETERY

2036 (PUBLIC PLACE)

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AREND STREET 13,00m

2036 (PUBLIC PLACE)

GROOT BRAKRIVIER TOWNSHIP
SG 10430/1993

762
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LONG STREET 20,00m

ROAD 13,00m

REM PTN 4
SG 7399/1971

R.O.W 2,32m
SG 4451/1998

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REM PTN 4
SG 33/1871

GROOT BRAKRIVIER TOWNSHIP

PORTION 125
SG 715/1989

PAVILION

GROOT BRAKRIVIER TOWNSHIP

WIND SOCK

BOWLS

PORTION 128
SG 3417/1990 BOWLS

REMAINDER OF PORTION 6
SG 1024/1876

SG 1024/1996

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SERVITUDE AREA
SG 10557/1999

SEWER LEGEND

EXISTING SEWER PIPES

- Ø100mm CLAY
- Ø150mm CLAY
- Ø110mm uPVC CLASS 34
- Ø160mm uPVC CLASS 34
- Ø200mm uPVC CLASS 34
- Ø250mm uPVC CLASS 34
- Ø300mm uPVC CLASS 34
- Ø100mm PITCH FIBRE
- Ø150mm PITCH FIBRE
- Ø150mm HDPE
- Ø400mm PVC
- PIPE DIMENSION / MATERIAL UNCERTAIN
- MANHOLE NUMBER
- COVER LEVEL / OUTGOING INVERT LEVEL / MANHOLE DEPTH / INCOMING INVERT LEVEL
- DISTANCE(SEE NOTE) / GRADIENT(SEE NOTE)
- CONNECT TO EXISTING SERVICE
- UNSURE MANHOLES POSITIONS

PROPOSED NEW SEWER PIPES

- Ø160mm uPVC CLASS 34
- Ø150mm HDPE VIA PIPE CRACKING
- Ø300mm uPVC CLASS 34
- BLANK OF EXISTING SEWER PIPE

EXISTING STORMWATER

NEW Ø450 CLASS 9kN/m² HDPE SPIRAL STORMWATER PIPE

EXISTING WATER NETWORK

NOTES:
INDICATED DISTANCE IS FROM CENTRE TO CENTRE OF MANHOLES.

THE GRADIEN BETWEEN CONSECUTIVE MANHOLES WHERE CALCULATED FROM THE OUTGOING AND INCOMING INVERT LEVELS BETWEEN CONSECUTIVE MANHOLES. THE INDICATED DISTANCE MUST BE REDUCED BY THE SUM OF TWO CONSECUTIVE MANHOLES RADIAN TO CALCULATE THE GRADIENT.

ALL MANHOLE RADII IS 1.0m.

THE INCOMING INVERT LEVELS IS 10mm HIGHER THAN THE OUTGOING INVERT LEVELS, UNLESS OTHERWISE INDICATED

WHERE INCOMING PIPE IS SMALLER THAN OUTGOING PIPES, PIPES MUST BE LAID SOFFIT TO SOFFIT

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OORSPRONKLIKE SKAAL IN mm/ ORIGINAL SCALE IN mm

| Wysig. Amend. | Datum Date | Beskrywing-Description |
|---|---|---|
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6520
TEL: (044) 692 0441
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e-mail: admin@clconsult.co.za


Ontwerp-Designed: J.L.L
Geteken-Drawn: D.J.L.
Nagesien-Checked:

Pr.Ing. Pr.Eng.
Raadgewende Ingenieur-Consulting Engineer
Datum-Date: 2025-06-09
Kliënt-Client

Klient-Client: MOSSEL BAY MUNICIPALITY

Projek-Project: GREENHAVEN, GROOT BRAKRIVIER, UPGRADING OF SEWER LINES PHASE 3

Plan beskrywing - Plan description: SEWER UPGRADE PLAN 4

| Skaal-Scale | Datum-Date |
|---|---|
| 1:1 000 | JUNE 2025 |

Tekening Nr.-Drawing No.: M 1621-4

Wysiging Amendment: .

| SEWER LEGEND | |
|---|---|
| **EXISTING SEWER PIPES** | **PROPOSED NEW SEWER PIPES** |
| Ø100mm CLAY | Ø160mm uPVC CLASS 34 |
| Ø150mm CLAY | Ø150mm HDPE VIA PIPE CRACKING |
| Ø110mm uPVC CLASS 34 | Ø300mm uPVC CLASS 34 |
| Ø160mm uPVC CLASS 34 | BLANK OF EXISTING SEWER PIPE |
| Ø200mm uPVC CLASS 34 | |
| Ø250mm uPVC CLASS 34 | |
| Ø300mm uPVC CLASS 34 | |
| Ø100mm PITCH FIBRE | |
| Ø150mm PITCH FIBRE | |
| Ø150mm HDPE | |
| Ø400mm PVC | |
| PIPE DIMENSION / MATERIAL UNCERTAIN | |
| MANHOLE NUMBER | EXISTING STORMWATER |
| COVER LEVEL<br>OUTGOING INVERT LEVEL<br>MANHOLE DEPTH<br>INCOMING INVERT LEVEL | NEW Ø450 CLASS 8kN/m² HDPE SPIRAL STORMWATER PIPE |
| DISTANCE(SEE NOTE)<br>GRADIENT(SEE NOTE) | EXISTING WATER NETWORK |
| CONNECT TO EXISTING SERVICE | |

NOTES:
INDICATED DISTANCE IS FROM CENTRE TO CENTRE OF MANHOLES.

THE GRADIEN BETWEEN CONSECUTIVE MANHOLES WHERE CALCULATED FROM THE OUTGOING- AND INCOMING INVERT LEVELS BETWEEN CONSECUTIVE MANHOLES. THE INDICATED DISTANCE MUST BE REDUCED BY THE SUM OF TWO CONSECUTIVE MANHOLES RADII TO CALCULATE THE GRADIENT.

ALL MANHOLE RADII IS 1.0m.

ALL INCOMING INVERT LEVELS IS 10mm HIGHER THAN THE OUTGOING INVERT LEVELS, UNLESS OTHERWISE INDICATED

WHERE INCOMING PIPE IS SMALLER THAN OUTGOING PIPES, PIPES MUST BE LAID SOFFIT TO SOFFIT.

PHASE 1 - HISTORICAL

PHASE 2 - 2023/2024 - 2024/2025

PHASE 3 - 2025/2026 - 2026/2027

WOLVEDANS No. 129

GROOT BRAKRIVIER TOWNSHIP EXT. 4

GLENCAIRN No. 133

WESTBANK No. 132

RIVERSYDE No. 131

WOLVEDANS No. 129

RENSBURG ESTATE No. 137

FARM No. 297

WOLVEDANS ANNEX No. 130

GROOT BRAKRIVIER TOWNSHIP

| DESCRIPTION | Y | X | Z |
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| BM 3 | 72971.528 | 3766316.509 | 42.061 |
| BM 4 | 72973.683 | 3766295.421 | 41.638 |

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OORSPRONKLIKE SKAAL IN mm/ ORIGINAL SCALE IN mm

| Wysig. Amend. | Datum Date | Beskrywing-Description |
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| | | |


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| Ontwerp-Designed | Pr.Ing. Pr.Eng. |
|---|---|
| J.L.L | |
| Geteken-Drawn | Raadgewende Ingenieur-Consulting Engineer |
| C.B | Datum-Date: 2022-08-29 |
| Nagesien-Checked | |
| | Kliënt-Client |

Klient-Client: MOSSEL BAY MUNICIPALITY

Projek-Project: GREENHAVEN SEWERAGE UPGRADE

Titel-Title: UPGRADING OF PITCH FIBRE SEWER LINES

| Skaal-Scale | Datum-Date |
|---|---|
| 1:2 750 | AUGUST 2025 |

Tekening Nr.-Drawing No.: M 1 068-1

Wysiging Amendment

# APPENDIX C: ENVIRONMENTAL AWARENESS GUIDELINE

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**CAPE TOWN**
**TEL**: +27 (0) 21 554 5195 **FAX:**+27 (0) 86 575 2869
**EMAIL:** lauren@sescc.net **WEBSITE:** www.sescc.net
**ADDRESS:** Unit 71, Eden on the Bay, 5 Beach Estate Boulevard
Blouberg, Big Bay, 7441
**PO BOX:** 443, Milnerton, 7435

# ENVIRONMENTAL AWARENESS TRAINING BOOKLET

# Environmental Monitor's Foreword

SES is here to ensure that everyone complies with the conditions of "Duty to Care". If these conditions are not complied with the project can be stopped and fines can be issued.

We hope that with your co-operation the project won't be stopped and fines won't be issued, and a successful project can be finished on time.

Notes:

- Workers working on this project must undergo environmental training.

- The information contained in this document should be used during day-to-day activities.

## HOW IS THIS PROJECT IMPLEMENTING ENVIRONMENTAL MANAGEMENT?

This project is implementing Environmental Management on an ongoing basis throughout the duration of the project. The following aspects would be implemented to achieve the above stated:

- A dedicated Environmental Manager or Environmental Control Officer appointment to the project to implement and monitor Environmental Management.
- Regular environmental inspection on the site.
- Regular environmental training for workers
- Environmental audits on a regular basis.

## WASTE TREATMENT

**Refuse:**

- Refuse waste includes: waste food, food containers, packaging materials, cans, bottles, newspapers and magazines.
- Day to day household waste should always be disposed of in the containers provided on site by the company.
- No dumping of waste anywhere other than in the bins provided.
- No burning of refuse.
- If there are not enough refuse containers on site, the ECO or supervisor needs to be informed.

**Construction Waste:**

- Construction waste includes: concrete, steel, cement, rock, pre-coated chips, wood, plastic, empty bags and rubble.
- Construction waste must be discarded in skips located in strategic areas for removal.
- Construction waste must not be discarded in holes or burned on site.

- Small amounts of construction waste should be collected and not discarded into vegetation or down fill slopes.
- Material should only be spoiled if a rehabilitation plan has been designed for the area.

**Liquid waste:**

- Liquid waste includes: concrete, paint, thinners, diesel, hydraulic fluids, cooking oil, chemicals, other fuel and sewage.
- Use facilities provided for waste.
- The liquid waste should be recycled as far as possible.
- Use chemical toilets and ablution facilities.

**INFORM THE ENVIRONMENTAL CONTROL OFFICER (ECO) IMMEDIATELY OF ANY IMMEDIATE OR POTENTIAL ENVIRONMENTAL INCIDENT.**

# SPECIFIC ENVIRONMENTAL ISSUES

# SPESIFIEKE OMGEWINGSKWESSIES
# IMIBA ETHILE YEZOBUME BEMEKO YENDALO

The basic Do's and Don'ts towards environmental awareness are as follows:

*Die basiese Moets en Moenies van omgewingsbesinning is as volg:*

Oondoqo bo mawukwenze no mawungakwenzi kwilinge lezobume be meko yendalo bume ngoluhlobo:

## Toilet Facilities:
## *Toilet Fasiliteite:*
## Izindlu Zangasese:

**DO:**
USE THE TOILET FACILITIES PROVIDED - REPORT FULL FACILITIES
***MOET:***
*GEBRUIK MAAK VAN TOILET FASILITEITE WAT VOORSIEN WORD – RAPPORTEER AS FASILITEITE VOL IS*
**OMAWUKWENZE:** SEBENZISA IZINDLU ZANGASESE EZIBONELELWEYO- NIKA INGXELO NGAMALUNGISELELO AGCWELEYO.

**DO NOT**:
USE THE BUSH
***MOENIE:***
*DIE BOS GEBRUIK NIE*
**OMAWUNGAKWENZI:** UKUSEBENZISA ITYHOLO.







**Vehicles operation and maintenance:**
***Voertuig werking en onderhoud:***
**Ulawulo nophatho lezithuthi:**

**DO:**
ENSURE THAT VEHICLES AND MACHINERY DO NOT LEAK FUEL OR OILS. REFUELLING, MAINTENANCE, SERVICING OR WASHING MUST BE DONE WITHIN THE DESIGNATED AREA IN THE CONSTRUCTION CAMP AREA ONLY.
***MOET:***
*VERSEKER DAT VOERTUIE EN MASJINERIE NIE OLIES OF BRANDSTOF LEK NIE. VOLMAAK, ONDERHOUD, DIENS OF SKOONMAAK VAN VOERTUIE MOET SLEGS IN AANGEWYSTE AREAS IN DIE KONSTRUKSIE KAMP GESKIED.*
**OMAWUKWENZE:** QINISEKISA IZITHUTHI NOMATSHINI ABAVUZI MAFUTHA OKANYE I OYILE, UKUGALELA, UKUPHATHA, UKULUNGISA OKANYE UKUHLAMBA KUFUNEKA KWENZIWE KUMMANDLA OTYUNJIWEYO KWINKAMPI YOLWAKHIWO KUPHELA NGOKUKHAWULEZILEYO.

**DO:**
REPORT ALL FUEL OR OIL SPILLS IMMEDIATELY & STOP THE SPILL CONTINUING.
***MOET:***
*RAPPORTEER ENIGE BRANDSTOF OF OLIE STORTE & VERHOED DAT DIE STORT AANHOU.*
**OMAWUKWENZE:** NIKA INGXELO NGE OLI NAMAFUTHA ACHITHEKILEYO, UZE UNQANDE UCHITHEKO LUNGAQHUBEKI.

**DO:**
PREVENT CONTAMINATION OR POLLUTION OF STREAMS AND WATER CHANNELS.
***MOET:***
*VERHOED DIE KONTAMINASIE EN BESOEDELING VAN STROME & WATERKANALE.*
**OMAWUKWENZE :** NQANDA USULELEKO OKANYE UNGCOLISEKO LWEMILAMBO NEMISELE YAMANZI.

**DO NOT:**
ALLOW WASTE, LITTER, OILS OR FOREIGN MATERIALS INTO THE STREAM
***MOENIE:***
*TOELAAT DAT AFVALPRODUKTE, GEMORS, OLIES OF VREEMDE MATERIALE IN STROME BELAND NIE.*
**OMAWUNGAKWENZI:** MUSA UKUVUMELA INCITHO, ULAHLO, IOYILE OKANYE EZINYE IZINTO EMILANJENI.







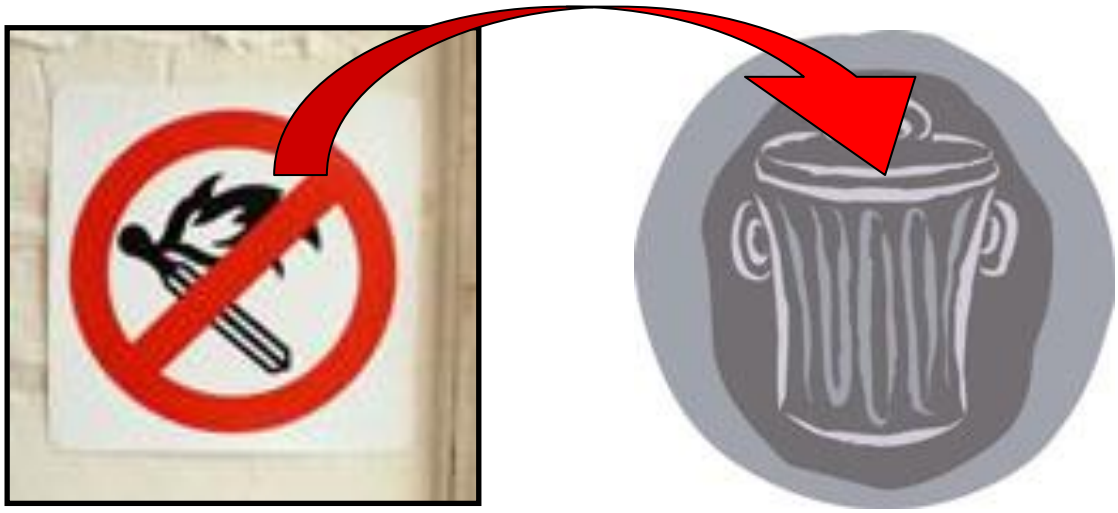


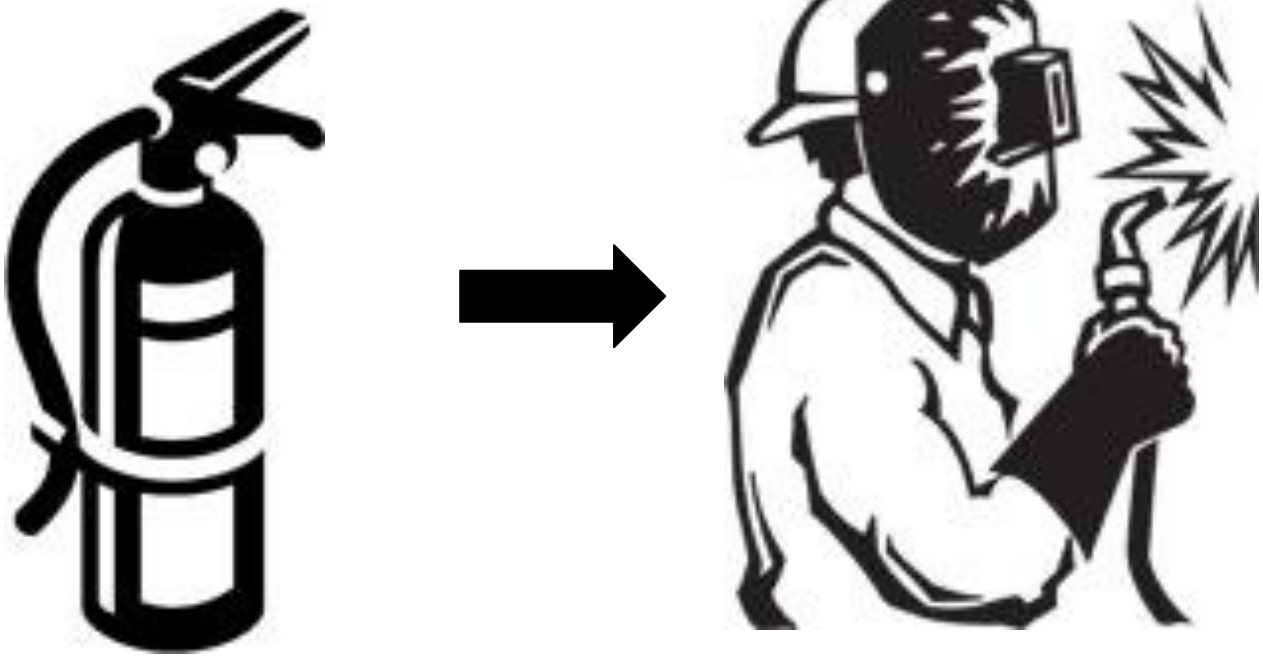
**Fire Control:**
***Vuur Beheer:***
**Ulawulo Lemililo:**

**DO:**
DISPOSE OF CIGARETTES AND MATCHES CAREFULLY. (Littering is an offence.)
***MOET:***
*GOOI SIGARETTE & VUURHOUTJIES OP GEPASTE MANIER WEG WEG (rommelstrooi is 'n oortreding)*
**OMAWUKWENZE:** LAHLA ISIGARETE NOOMATSHISI NGONONOPHELO (ukulahla lityala).

**DO:**
ENSURE A WORKING FIRE EXTINGUISHER IS IMMEDIATELY AT HAND IF ANY "HOT WORK" IS UNDERTAKEN e.g. welding, grinding, gas cutting etc.
***MOET:***
*VERSEKER DAT 'N WERKENDE BRANDBLUSSER BYDERHAND IS INDIEN "WARM WERK" GEDOEN WORD bv. Sweiswerk.*
**OMAWUKWENZE:** QINISEKISA ISICIMA-MLILO ESISEBENZAYO SISESANDLENI UKUBA KUKHO UMSEBENZI "OTSHISAYO" OWENZIWAYO, umz. ukuwelda, ugubo, ukuqhawula ugesi, njl.

**DO NOT:**
MAKE ANY FIRES
***MOENIE:***
*ENIGE VURE MAAK OF ENIGEIETS VERBRAND NIE*
**OMAWUNGAKWENZI:** UKWENZA IMILILO OKANYE UTSHISE NOKUBA YINTONI.







**Fencing and Restricted Areas:**
***Omheining en Beperkte Areas:***
**Ubiyelo Nemimanndla Engavumelekanga:**

**DO:**
CONFINE WORK AND STORAGE OF EQUIPMENT TO WITHIN THE IMMEDIATE WORK AREA.
***MOET:***
*BEPERK ALLE WERK EN STOOR VAN GEREEDSKAP TOT IN DIE GEGEWE WERKAREA.*
**OMAWUKWENZE:**GCINA UMSEBENZI NEZIXHOBO ZOKUSEBENZA NGAKUMMANDLA OKUSETYENZELWA KUWO.

**DO NOT:**
ENTER ANY FENCED OFF OR MARKED AREA. SUCH AREAS HAVE BEEN MARKED WITH "NO-GO AREA" SIGNS AND SHOULD BE ADHERED TO.
**MOENIE:**
*ENIGE OMHEINDE OF GEMERKTE AREAS BINNEGAAN NIE. SULKE AREAS IS MET "NO-GO AREA" TEKENS GEMERK EN MOET GEHOORSAAM WORD.*
**OMAWUNGAKWENZI:** MUSA UKUNGENA KWI NDAWO EBIYIWEYO OKANYE EPHAWULWEYO. IMIMANDLA ENJALO IPHAWULWE NGAMAGAMA ATHI **" NO-GO AREA**".





**NO-GO AREA**

**Safety:**
***Veiligheid:***
**Ukhuseleko:**

**DO:**
USE ALL SAFETY EQUIPMENT AND COMPLY WITH ALL SAFETY PROCEDURES.
***MOET:***
*GEBRUIK ALLE VEILIGHEIDSGEREEDSKAP EN VOLDOEN AAN ALLE VEILIGHEIDS PROSEDURES.*
**OMAWUKWENZE:** SEBENZISA ZONKE IZIXHOBO ZOKHUSELEKO, UZE UTHOBELE YONKE IMIGAQO YOKHUSELO.









**Driving and Dust:**
***Bestuur en Stof:***
**Uqhubo Nothuli:**

**DO:**
DRIVE ON DESIGNATED ROUTES ONLY.
***MOET:***
*NET OP AANGEWYSTE ROETES BESTUUR.*
**OMAWUKWENZE:** QHUBA KWIMIMANDLA EPHAWULWEYO KUPHELA.

**DO NOT:**
SPEED OR DRIVE RECKLESSLY
***MOENIE:***
*JAAG OF ROEKELOOS BESTUUR NIE.*
**OMAWUNGAKWENZI:** SUKUQHUBA NGESANTYA ESIPHEZULU OKANYE NGOKUNGAKHATHALI.

**DO NOT:**
ALLOW CEMENT TO BLOW AROUND.
***MOENIE;***
*TOELAAT DAT SEMENT WEGWAAI NIE.*
**OMAWUNGAKWENZI:** MUSUKUVUMELA ISAMENTE ISASAZWE.

**DO NOT:**
CAUSE EXCESSIVE DUST
**MOENIE:**
OORDREWE STOF VEROORSAAK NIE.




SLOW


PPC

**Vegetation protection:**
***Plantegroei Beskerming:***
**Ukhuselo Lwezityalo:**

**DO NOT:**
DAMAGE OR REMOVE ANY VEGETATION WITHOUT DIRECT INSTRUCTION.
***MOENIE:***
*ENIGE PLANTEGROEI SONDER DIREKTE INSTRUKSIE BESKADIG OF VERWYDER NIE.*
**OMAWUNGAKWENZI:** MUSA UKUTSHABALALISA OKANYE USUSE NASIPHINA ISITYALO NGAPHANDLE KOMYALELO.



**Animals:**
***Diere:***
**Izilwanyana:**

**DO NOT:**
INJURE, CAPTURE/SNARE, FEED OR CHASE ANIMALS – this includes birds, frogs, snakes, lizards, tortoises, etc.
**MOENIE:**
ENIGE DIERE BESEER, VANG, VOER OF JAAG NIE – dit sluit in: voëls, paddas, slange akkedisse, skilpaaie ens.
**OMAWUNGAKWENZI:** MUSA UKWENZAKALISA, UKUBAMBA, UKONDLA OKANYE UKULEQA IZILWANYANA- okuquka iintaka, amasele, iinyoka, amacilikishe, izikolopati.

**DO:**
REPORT ANY INJURY OF AN ANIMAL.
**MOET:**
DIE BESERING VAN 'N DIER RAPPORTEER.
**OMAWUKWENZE:** XELA NASIPHI ISENZAKALO SESILWANYANA.



**Preventing Pollution:**
***Voorkoming van Besoedeling:***
**Ukhuselo Longcoliseko:**

**DO:**
CLEAR YOUR WORK AREAS OF LITTER AND BUILDING RUBBLE AT THE END OF EACH DAY – use the waste bins provided and ensure that litter will not blow away.
***MOET:***
*RUIM NA ELKE DAG DIE WERK AREA OP EN GOOI ENIGE ROMMEL WEG IN DIE GEGEWE HOUERS – maak seker dat rommel nie kan wegwaai nie.*
**OMAWUKWENZE:** COCA INDAWO OSEBENZA KUYO, IZINTO EZILAHLIWEYO NENKUNKUMA YOKWAKHA QHO EKUPHELENI KWEMINI-sebenzisa imigqomo yenkunkuma uze uqiniseke ukuba inkunkuma ayivuthuzwa ngumoya.

**DO NOT:**
ALLOW WASTE BINS TO OVERFLOW OR WASTE TO BLOW AROUND.
***MOENIE:***
*TOELAAT DAT ROMMELHOUERS OORVLOEI OF DAT ROMMEL ROND WAAI NIE.*
**OMAWUNGAKWENZI:** MUSA UKUVUMELA IMIGQOMO YENKUNKUMA IGCWALE KAKHULU OKANYE INKUNKUMA ISASAZEKE.

**DO NOT:**
LITTER OR LEAVE FOOD LAYING AROUND
***MOENIE:***
*ROMMEL OF KOS LAAT RONDLÊ NIE.*
**OMAWUNGAKWENZI:** MUSA UKUNGCOLISA OKANYE USHIYE UKUTYA KULELE INDAWO YONKE.

**DO NOT:**
BURY ANY LITTER OR WASTE IN THE GROUND.
***MOENIE:***
*ENIGE ROMMEL OF GEMORS IN DIE GROND BEGRAWE NIE.*
**OMAWUNGAKWENZI:** MUSA UKUNGCWABA INKUNKUMA EMHLABENI.




GLASS
CARDBOARD
PAPER





# APPENDIX D: CURRICULUM VITAE OF AUTHOR

**GEORGE**
**TEL:** +27 (0) 44 873 4923 **FAX:** +27 (0) 44 874 5953
**EMAIL:** info@sescc.net **WEBSITE:** www.sescc.net
**ADDRESS:** Unit 17 Cathedral Square,
Cathedral Street, George, 6530
**PO BOX:** 9087, George, 6530

**CAPE TOWN**
**TEL:** +27 (0) 21 554 5195 **FAX:** +27 (0) 86 575 2869
**EMAIL:** betsy@sescc.net **WEBSITE:** www.sescc.net
**ADDRESS:** Tableview, Cape Town, 7441
**PO BOX:** 443, Milnerton, 7435

# CURRICULUM VITAE

## MICHAEL JON BENNETT

### PERSONAL

**Profession:** Principle Environmental Assessment Practitioner and Senior Environmental Control Officer, Sharples Environmental Services cc, George
**Possion:** Director – George
**Nationality:** South African
**Date of Birth:** 22 October 1985
**Languages:** English (read, write and speak) & Afrikaans (read, write and speak)
**Marital Status:** Single
**Drivers License:** Code B
**Health:** Excellent
**EAPASA Reg:** 2021/3163
**IAIASA Membership**: 7334

### WORK EXPERIENCE

**2014 – Present:** Sharples Environmental Services cc, George, WC
*Environmental Assessment Practitioner*

I have gained extensive experience in assessments and monitoring and have worked on a variety of multidisciplinary projects and am proficient in:

- Basic Assessments Reports
- Water Use Authorisation Applications
- Environmental Monitoring and Reporting
- Environmental Management Programmes
- Environmental Control Officer Training
- Conducting Outeniqua Sensitive Coastal Area licensing applications

**2016 – 2017:** Sharples Environmental Services cc, Cape Town, WC
*Intrim Office Manager, Environmental Assessment Practitioner*

**2011 – 2014:** Peninsula Permits & NCC Group, Cape Town, WC
*Environmental Control Officer*

### TERTIARY EDUCATION

**2010** University of Cape Town

- I hold a Bachelor of Science Degree specialising in Environmental and Geographic Science & Ocean and Atmospheric Science

## PROJECTS

**2024** George George Municipality

- Basic Assessment Report for the proposed upgrade of the Gwaing wastewater treatment works on the remainder of erf 464, George, Western Cape

**2024** George 3MP Sales and Education Services

- Basic Assessment Report for the proposed mixed-use development on erf 998 and the remainder of the farm zandhoogte no. 139, Tergniet, Mossel Bay, Western Cape

**2024** Mossel Bay Hartland lifestyle estate

- Part II amendment of the appeal environmental authorisation issued on 18 august 2009 (as amended) and the EMPr for the proposed residential development on a portion of the farm vaale valley 219, Mossel Bay - Hartland lifestyle estate

**2024** George George Municipality

- Basic Assessment Report for the proposed upgrading of the Herold's Bay pump station and associated rising main as well as the development of new associated infrastructure on erf 116, remainder of erf 95, remainder of farms 236 and 237 and portions 10, 35 and 37 of farm brakfontein no. 236, Herold's Bay, George, Western Cape

**2024** George George Municipality

- Part II Amendment of Environmental Authorisation for proposed development of a Photovoltaic Solar Plant on erf 2819, George, Western Cape

**2024** George George Municipality

- Basic Assessment Report for the proposed repair and rehabilitation of flood damage along the Camphersdrift River in the Van Riebeeck Park (Project 28(3)), George, Western Cape

**2024** Plettenberg Bay The More Family Collection

- Basic Assessment Report for the proposed expansion of the Milkwood Manor and parking on erf 10190, remainder of erf 2066 and the remainder of erf 706, Plettenberg Bay, Western Cape

**2023** George Urban Country Estate (Pty) Ltd

- Basic Assessment Report for the proposed residential development on erf 19374 (remainder erf 6182, erven 6179 and 6156), George, Western Cape

**2023** George George Municipality

- Basic Assessment Report for the Upgrading of the Eden Pumpstation, George, Western Cape

**2023** Mossel Bay Paprenax Trading 6 cc

- Amendment of Environmental Authorisation (Part 2, Substantive amendment) for the proposed establishment of a filling station and associated business infrastructure on a portion of erf 13996, Kwanonqaba, Mossel Bay, Western Cape

**2023** George George Municipality

- Basic Assessment Report for proposed upgrade of the Schaapkop Pumpstation rising main on remainder of erf 464 and erf 13486, George, Western Cape

**2023** George Garden Route Gateway Plaza

- Basic Assessment Report for proposed mixed-use development on portions 278 and 282 of farm Kraaibosch no. 195, George, Western Cape

**2023** George George Municipality

- Basic Assessment Report for proposed development of a Photovoltaic Solar Plant on erf 2819, George, Western Cape

**2023** George EARP Construction

- Basic Assessment Report for the proposed commercial development on portion 49 of Farm Hansmoeskraal 202, George, Western Cape

**2022** George Pieter Koen Development Company

- Basic Assessment Report for the proposed residential development on Portion 21 of the Farm Kraaibosch No. 195 (Pieter Koen), George, Western Cape

**2022** Mossel Bay Dalmar

- Amendment of Environmental Authorisation (Part 2, Substantive amendment) for the Proposed Residential Development On A Portion Of The Farm Vaale Valley 219, Mossel Bay (Hartenbos Landgoed II), Western Cape

**2022** George Dalmar

- Amendment of Environmental Authorisation Proposed Development of Herold's Bay Country Estate on A Portion of Portion 7 of The Farm Buffelsfontein No. 204, Herold's Bay, Western Cape

**2022** George Pieterkoen Trust

- Basic Assessment Report for the proposed residential development on Portion 21 of the Farm Kraaibosch No. 195 (Pieter Koen), George, Western Cape

**2022** Still Bay W. Nel & Irma Oosthuizen Trust IT 1596/2008

- Basic Assessment Report for the development of 5 residential units on erven 4139, 4140, 4141, 4142, 4143, 4144, 4145 (Erf 3997), Still Bay West, Western Cape

**2022** George Octo Trading 377 cc

- Section 24 G Retrospective Environmental Authorisation for the alleged unlawful construction of a road clearance of vegetation to establish a house on remainder of Farm Holle Kloof 91 and Portion 1 of the Farm Plattekloof 131, Waboomskraal, George, Western Cape

**2022** Knysna CapeNature

- Basic Assessment Report for the Proposed development on Portions 38 and 39 of Farm 205 and Remainder of Farm 211, Goukamma Nature Reserve, Knysna, Western Cape

**2021** Prince Albert Jurie Klue

- Section 24 G Retrospective Environmental Authorisation for the alleged unlawful clearance of vegetation on Farm Angliers Bosch (Fernkloof), Remainder of Farm 157, Klaarstroom, Prince Albert, Western Cape

**2021** Mossel Bay Mossel Bay Municipality

- Basic Assessment Report for the proposed Dana Bay Emergency Access Road on Remainder of Portion 7 of the Farm 225, Dana Bay, Mossel Bay, Western Cape

**2021** Willowmore LEZMIN 2087cc

- Basic Assessment Report for the proposed development of Portion 1 of the Farm Matjiesfontein No. 206, Baviaanskloof, Division Willowmore, Eastern Cape

**2020** Sedgefield Knysna Municipality

- Basic Assessment Report for the proposed housing development on erven 3861, 3865, 3866, 3917, 3918 and 5010 in Sedgefield, Knysna, Western Cape

**2020** Mossel Bay Paprenax Trading 6 cc

- Basic Assessment Report for the proposed establishment of a filling station and associated business infrastructure on a portion of erf 13996, Kwanonqaba, Mossel Bay, Western Cape

**2020** Ladismith Department of Transport and Public Works

- Maintenance Management Plan for the periodic maintenance of Trunk Road 31, section 4, km 30.8 to km 76.06, Barrydale to Ladismith, Western Cape

**2020** Knysna Knysna Municipality

- Maintenance Management Plan for the Maintenance of the potable water pipeline system on Erven 4197, RE/1352, RE/1351, RE/1146 and 1316 in Knysna, Western Cape

**2020** Humansdorp Kouga Municipality

- Environmental Control Officer for the Phase 1A of New municipal 66kV double circuit overhead line between the Melkhout substation at Humansdorp and the main intake substation at Jefferys Bay, Eastern Cape

**2020** Humansdorp Kouga Municipality

- Environmental Control Officer for the Construction of a new 22kv overhead powerline between Melkhout substation and Allison Street, Humansdorp, Eastern Cape

**2020** Knysna Knysna Municipality

- Environmental Control Officer for the Charlesford raw water pumping scheme: Upgrade and refurbishment of pumpstation: Mechanical and electrical, Knysna, Western Cape

**2020** Seweweekspoort, Department of Transport & Public Works

- Amendment of Environmental Authorisation (Part 2, Substantive amendment) for the flood damage repairs to road structures on MR309 in Seweweekspoort, Western Cape

**2019 – 2021** Seweweekspoort, Department of Transport & Public Works

- Environmental Control Officer for the flood damage repairs to road structures on MR309 in Seweweekspoort, Western Cape

**2019** George George Municpality

- Environmental Control Officer for the Raising of the Garden Route Dam Spillway on Portion 3/352, Remainder of 536 of Erf 221, Erf 3055 and Erf 3056, George, Western Cape

**2019** Laingsburg Department of Agriculture

- Environmental Control Officer for the Construction Of Erosion Prevention Structures Within The One In Ten Year Flood Line Of The Buffels River, Laingsburg, Western Cape

**2019** Williston Williston Municipality

- Environmental Control Officer for the Upgrading of bulk water network in Williston – Phase 3, Williston, Northern Cape

**2019** George George Municipality

- Environmental Control Officer for the construction of new 66kV overhead line between Ballots Bay and Glanwood substations, George, Western Cape

**2019** Oudtshoorn Department of Transport & Public Works

- Environmental Control Officer for the Periodic maintenance of Trunk Road 31, Section 6, km 23.3 to km 47.8 Calitzdorp to Oudtshoorn, Western Cape

**2019** Kleinbrak Mossel Bay Municipality

- Environmental Control Officer for the Upgrading of Beyers Street, Klienbrak River, Western Cape

**2019** George Outeniqua Eye Clinic Body Corporate

- Environmental Control Officer for the proposed expansion of parking area on erf 5950 and part of remainder erf 464, George, Western Cape

**2019** Mossel Bay Hey Innovations

- Basic Assessment Report for the proposed establishment of a residential development on Erf 2839, Great Brak River, Western Cape

**2019** Oudtshoorn Oudtshoorn Municipality

- Environmental Management Programme for the Blossoms Emergency Supply Scheme, Oudtshoorn, Western Cape

**2019** Humansdorp Clinkscales Maughan-Brown

- Environmental Management Programme for the proposed construction of a new 22kV overhead powerline between Melkhout Substation and Allison Street, Humansdorp, Eastern Cape

**2019** George PN&MR Lotter Family Trust

- Addendum to the Environmetnal Management Programme for the Establishment of a Township (Rivendale) on Portions 5, 15, 16 and 31 of the Farm Hansmoeskraal 202, Western Cape

**2019** Oudtshoorn Department of Transport and Public Works

- Basic Assessment Report for the Proposed Maintenance Activities of Trunk Road 33/4 between km 4.6 and km 14.4, Meiringspoort, Western Cape

**2019** George Dynarc Capital

- Substantive amendment of environmental authorisation for the proposed Development of Portion 130, 131 and 132 of the Farm Gwayang 208

**2019** George Department of Transport & Public Works

- Basic Assessment Report for the proposed Upgrading of Bridge No. 2221 on Trunk Road 2/9 at km 15.1 over the Maalgate River.

**2018 - 2019** Oudtshoorn Department of Transport and Public Works

- Maintenance Management Plan for the proposed periodic maintenance of Trunk Road 31, section 6, km 23.3 to km 47.8, Western Cape

**2018 - 2019** Humansdorp Clinkscales Maughan-Brown

- Applicability of the EIA regulations Checklist for the proposed new 22kV overhead line between Melkhout Substation and Allison Street, Eastern Cape

**2018 - 2019** Knysna Knysna local Municipality

- Applicability of the EIA regulations Checklist for the proposed Rheenendal infill housing, subdivision and rezoning of portions of erf 42, 36 and 387 as well as erven 535, 536, 553, 54, 393, 406, 672, 673 and 68, Rheenendal, Western Cape

**2018 - 2019** Knysna Knysna local Municipality

- Applicability of the EIA regulations Checklist for the proposed infill housing and subdivision of erven in Welsyndorp and the rezoning and subdivision of erven in Bosdorp, Karatara, Western Cape.

**2018** Port Elizabeth ACSA P.E.

- Applicability of the EIA regulations Checklist for the proposed ACSA Port Elizabeth Airport Photovoltaic Plant, Eastern Cape Province

**2018** Mossel Bay TopUp Prop Inv.

- Applicability of the EIA regulations Checklist for the proposed Farm Stall Centre and filing Station on Portion 65 of the Farm Hartenbosch 217, Hartenbos

**2018** George Outeniqua Eye Clinic Body Corporate

- Basic Assessment Report for the proposed expansion of parking area on erf 5950 and part of remainder erf 464

**2018** Beaufort West Beaufort West Municipality

- Environmental Control Officer for the First and Second Environmental Audit for the provision of adequate water supply within the jurisdiction of the Beaufort West municipality

**2018** Mossel Bay Element Consulting Engineers

- Environmental Management Programme update for the replacement of 22kV overhead powerline between Power Town and Hartenbos and between Hartenbos and the Hartenbos sewage substation and the construction of a new 22kV overhead power line between the Midbrak and Kleinbrak Substations.

**2018** Mossel Bay Element Consulting Engineers

- Environmental Control Officer for the construction of a new 22kV overhead power line between the Midbrak and Kleinbrak Substations

**2018** Mossel Bay Element Consulting Engineers

- Environmental Control Officer for the Upgrade of Amy Searle Canal – Phase 5, Great Brak River

**2018** Gouritsmond Hessequa Consulting Engineers

- Environmental Control Officer for the Upgrade and expansion of the Gouritsmond Water Water Treatment Works on remainder of erf 140, Gouritsmond

**2018** George Biprops 14

- Environmental Control Officer for the residential development on portion 5 of the farm Kraaibosch No. 195, Groenkloof Woods: Phase C & D

**2018** Knynsa Knysna Municipality

- Environmental Control Officer for upgrading of Knysna bulk water supply scheme: phase 2B

**2018** Plettenberg Bay Bitou Municipality

- Environmental Control Officer for the upgrade of the Kranshoek Bulk Water Supply Scheme: Construction of Pipelines, reservoirs and associated infrastructure near Plettenberg Bay.

**2018** Mossel Bay SMEC

- Environmental Control Officer for the Upgrade of Kusweg and associated infrastructure in Rheebok

**2017** George EARP Construction

- Invasive Alien Management Plan for the proposed residential development on portions 21, 23, 24 & 48 of Farm Hansmoeskraal 202 near George

**2017** Mossel Bay Mossel Bay Municipality

- Environmental Control Officer for the development of the new Mossel Bay municipal cemetery on erf 2001/0

**2017** Knynsa Knysna Municipality

- Environmental Control Officer for the remedial work to prevent further settlement of the low-lift pump sump and retaining wall at Gouna River Pump Station

**2017** Knynsa Knysna Municipality

- Environmental Control Officer for upgrading of Knysna bulk water supply scheme: phase 1

**2017** George Biprops 14 (Pty) Ltd

- Environmental Control Officer for the residential development on portion 5 of the farm Kraaibosch No. 195

**2017** Still Bay Hessequa Municipality

- Environmental Control Officer for the construction of a reservoir, booster pump station and associated infrastructure in Melkhoutfontein near Still Bay

**2016 - 2017** Heidelberg Department of Transport & Public Works

- Environmental Control Officer for the flood damage repairs to structures in the Central Eden District Municipality Region, Heidelberg North

**2016 - 2017** Riversdale Department of Transport & Public Works

- Environmental Control Officer for the flood damage repairs to structures in the Central Eden District Municipality Region, Riversdale East area

**2016 - 2017** Still Bay Department of Transport & Public Works

- Environmental Control Officer for the upgrade of main road 332 near Still Bay

**2016 - 2017** Mossel Bay The South Cape College

- Environmental Control Officer for the extension of the South Cape College: Phase 3, Mossel Bay Campus

**2016 - 2017** Klein Brak Mossel Bay Municipality

- Environmental Control Officer for the removal of obstructions in the lower floodplain of the Klein Brak River Estuary

**2016** Prince Albert Milway Trade and Invest 1014cc

- Basic Assessment for the proposed guest lodge on remainder of Farm Rietpoort 13

**2016** Plettenberg Bay Bitou Municipality

- Basic Assessment for the proposed Qolweni phase 5 development near Plettenberg Bay

**2016** Mossel Bay Element Consulting Engineers

- Environmental Management Programme for the replacement of 22kV overhead powerline between Power Town and Hartenbos and between Hartenbos and the Hartenbos sewage substation

**2016** George SMEC

- Environmental Policy for the resurfacing of York Street, George

**2016** Mossel Bay Department of Transport & Public Works

- Maintenance Management Plan for proposed upgrade of Louis Fourie Road.

**2016** George Oaklands Bridge Country Estate HOA

- Maintenance Management Plan for proposed repair and maintenance of the riverbank at Oaklands Bridge Country Estate in Heather Park

**2016** Gouritz Department of Transport & Public Works

- Update of the Maintenance Management Plan for proposed repair and maintenance of the Gouritz River Bridge bank protection along the R325 near Gouritzmond

**2016** George Ivorybell Investment (Pty) Ltd

- Outeniqua Sensitive Coastal Area Environmental Impact Report for the proposed new house on erf 379 in Heralds Bay

**2016** George George Municipality

- Environmental Assessment Report for the substantive amendment of environmental authorisation of the proposed upgrade and extension of the overhead power lines and associated substations

**2016** Oudtshoorn SA Army Infantry School

- Environmental Control Officer for the construction of a fighting in built up areas (FIBUA) range on portion 10 of the farm Blaauwtjes Drift 110 in Oudtshoorn

**2015 - 2016** Gouritz Department of Transport & Public Works

- Environmental Control Officer for the repair and maintenance of the Gouritz River Bridge bank protection along the R325 near Gouritzmond

**2015 - 2016** Albertinia Garden Route Game Lodge (Pty) Ltd

- Environmental Control Officer for the five new units at the Garden Route Game Lodge

**2015 - 2016** Mossel Bay Element Consulting Engineers

- Environmental Control Officer for the replacement of 22kV overhead powerline between Power Town and Hartenbos and between Hartenbos and the Hartenbos sewage substation

**2014 - 2016** Plettenberg Bay Chauke Quanity Surveyers

- Environmental Control Officer for the Qolweni and Kwanokuthula High Density Units and engineering services

**2016** Plettenberg Bay Bitou Municipality

- Environmental Control Officer for the civil engineering works for Kwanokuthula Phase 4 and the extension of Sishuba Street

**2014 - 2016** Mossel Bay The South Cape College

- Environmental Control Officer for the extension of the South Cape College, Mossel Bay Campus

**2016** George SMEC

- Environmental Control Officer for the resurfacing of York Street

**2014 - 2015** Mossel bay The Muller Murray Trust

- Environmental Control Officer for the construction of gravity pipeline from the Nautilus take-off to the Boggomsbaai Reservoir phase 2

**2015** Swellendam Casidra SOC Ltd

- Environmental Control Officer for the Grootvaderbos Groynes in the Buffeljags River

**2015** George Element Consulting Engineers

- Environmental Control Officer for the upgrading and extension of overhead power lines and substations: construction of a new 66kV overhead line between Protea and Ballots Bay substation

**2014 - 2015** George Department of Transport & Public Works

- Environmental Control Officer for the flood damage repair projects in the George and Knysna local municipal areas

**2015** George BDE Consulting Engineers (Pty) Ltd

- Environmental Control Officer for the photovoltaic solar plant for the ACSA George Airport

**2015** Heidelberg Bergstan South Africa

- Environmental Control Officer for the Duiwenhoks River stabilization works: Sites B31, B38 and B39

**2015** Krakeel Element Consulting Engineers

- Environmental Control Officer for the construction of filling station at SSK Tuinrote Agri on portion 5 of the farm no. 320

**2014 - 2015** Herbertsdale SMEC

- Environmental Control Officer for the flood damage repairs to structures in the Eden region: Herbertsdale area

**2014 - 2015** George Department of Transport & Public Works

- Environmental Control Officer for the flood damage repair projects in the George and Knysna local municipal areas

**2015** George SMEC

- Environmental Control Officer for the improvements to the Pacaltsdorp interchange and new pedestrian bridge

**2014 - 2015** Still Bay De Villiers & Moore Consulting Engineers

- Environmental Control Officer for the Still Bay 66kV substation and overhead powerline

**2014** Beaufort West Worley Parsons Consulting Engineers

- Environmental Control Officer for the Nelspoort bulk water supply scheme northeast of Nelspoort

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# CURRICULUM VITAE

## CHRISTIAAN CHARL SMIT

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**Drivers License:** Code B
**EAPASA Registration**: 2024/8297 (Candidate EAP)

### SUMMARY

Christiaan holds a Masters degree in Environmental Management, a BSc in Biodiversity and Ecology and a PGD in Environmental Management all from Stellenbosch University. He has experience in environmental monitoring and has contributed to numerous projects. Christiaan is registered with EAPASA as a Candidate Environmental Assessment Practitioner (2024/8297)

### WORK EXPERIENCE

**February 2024 - Present:** Sharples Environmental Services cc, George, WC
*Candidate Environmental Assessment Practitioner and Environmental Control Officer*

- Environmental Monitoring and Reporting
- Environmental Management Programmes
- Rehabilitation Plans
- Applicability Checklists
- Amendments
- Environmental Audit Reports
- Notice of Intent to Develop

**January 2024 – February 2024:** Oudtshoorn Municipality, Oudtshoorn, WC
*Intern under Municipal Environmental Control Officer*

- Drafting of notices
- Environmental complaints register
- Site inspections

### TERTIARY EDUCATION

**2020** Stellenbosch University
- Bachelor of Science Degree in Biodiversity and Ecology

**2021** Stellenbosch University
- Post Graduate Diploma in Environmental Management

**2024** Stellenbosch University
- Master of Philosophy in Environmental Management

## ACCREDITATION / ASSOCIATION

- **EAPASA** Registration: 2024/8297 (Candidate EAP)
- **Junior Member IAIA South Africa**

## KEY PROJECTS

**2025** **George** – George Municipality – Water and Sanitation: Civil Engineering Services

- Assisted with the amendment application for the proposed upgrade of the existing Eden Sewage Pump Station, on Erven RE/5987, 6013 and 6014, George, Western Cape Province.

**2025** **Mossel Bay** – Hartland Lifestyle Estate (Pty) Ltd 71

- Assisted with the amendment application for the proposed residential development on a portion of the Farm Vaale Valley 219, Mossel Bay – Hartland Lifestyle Estate.

**2025** **George** – George Municipality – Water and Sanitation: Civil Engineering Services

- Environmental Control Officer for the proposed rehabilitation of a donga and upgrade of the effluent pipe at the Gwaing Waste Water Treatment Works, Remainder Erf 464, George Local Municipality, George, Western Cape.

**2024-2025** **Mossel Bay –** Hatch Consulting Engineers on Western Cape Procincial Government: Department of Transport and Public Works - Roads

- Environmental Control Officer for the upgrade of Louis Fourie Road in Mossel Bay, WC.

**2024-2025** **George –** Zutari on behalf of George Municipality

- Environmental Control Officer for the proposed development of a new additional 40 megalitre raw water balancing dam and associated infrastructure at the George Water Treatment Works, George, Western Cape.

**2024-2025** **Mossel Bay –** Zutari on behalf of Mossel Bay Municipality

- Environmental Control Officer for the Upgrading of Informal Settlements Program (UISP) – Precinct 2, Mossel Bay.

**2024-2025** **George –** George Municipality – Water and Sanitation: Civil Engineering Services

- Environmental Control Officer for the proposed upgrade of the existing Schaapkop Sewage Pump Station, on Erf 13486, George, Western Cape Province.

**2024-2025** **Great Brak –** Outeniqua Game Farm: Langdon Johnston

- Environmental Control Officer for the proposed development of a residential development on Erf 2839, Great Brak, Western Cape.

**2024-2025** **Herolds Bay** – Long Island Trading 44 (Pty) Ltd

- Environmental Control Officer for the proposed development of Herolds Bay Country Estate on a Portion of Portion 7 Farm Buffelsfontein No. 204, Herolds Bay, Western Cape.

**2024-2025** **George** – SNA Consulting Engineers on behald of Western Cape Government: Department of Transport and Public Works

- Environmental Control Officer for the upgrade of the bridge No. 2221 on Trunk Road 2/9 at km 15.1 over the Maalgate River, George, Western Cape.

**2024-2025** **George** – BA Developments (Pty) Ltd

- Environmental Control Officer for the development of Glen Haven Country Estate on Portion 52/195, George, Western Cape.

**2024-2025** **George** – George Municipality – Water and Sanitation: Civil Engineering Services

- Environmental Control Officer for the proposed upgrade of the existing Eden Sewage Pump Station, on Erven RE/5987, 6013 and 6014, George, Western Cape Province.

**2024-2025** **Hartenbos** – SMEC South Africa (Pty) Ltd

- Environmental Control Officer for the periodic maintenance of TR33/2, MR344, DR1582 and OP6811 near Hartenbos, Western Cape.

**2024-2025** **Plettenberg Bay** – Status Homes Property Developers

- Environmental Control Officer for the proposed mixed – use development on Portion 9 of the Farm Kranshoek No. 432, Knysna Road, Plettenberg Bay, Western Cape.

**2024** **Plettenberg Bay** – Sonqua Consulting on behalf of Western Cape Government

- Environmental Control Officer for the New Horizons Mixed – Used Development on Farmhillview No. 437 and associated infrastructure.

**2024** **Mossel Bay** – Confuel (Pty) Ltd

- Environmental Control Officer for the proposed truck stop and associated infrastructure on Erf 56 and 57, Mossdustria, Mossel Bay Local Municipality, Western Cape.

**2024** **George** – CS Hentiq 1044 (Pty) Ltd

- Applicability Checklist for the detemination of the applicability of the NEMA EIA Regulations, 2014 (as amended) for the installation of Le Grand external sewer rising main, Hansmoeskraal, George, Western Cape.

**2024** **Mossel Bay** – Mossel Bay Municipality

- Rehabillitation Plan for the piggery site restoration on Erf 1717, Kwanonqaba, Mossel Bay, Western Cape.

**2024** **George** – Zutari

- Notice of Intent for the proposed amendment of the Environmental Authorisation for the proposed development of a new additional 40 megalitre raw water balancing dam and associated infrastructure at the George Water Treatment Works on Erf 221, George.

**2024** **Dana Bay** – Private

- Applicability Checklist for the detemination of the applicability of the NEMA EIA Regulations, 2014 (as amended) for the proposed subdivision of portions of land on Remainder Droogfontein No. 245 to consolidate with existing business zoned plots, Dana Bay, Western Cape.

**2024** **George** – Zutari

- Notice of Intent for the proposed amendment of the Environmental Authorisation for the proposed development of a new additional 40 megalitre raw water balancing dam and associated infrastructure at the George Water Treatment Works on Erf 221, George.

**2024** **Oudtshoorn** – Buitendag Property Investments (Pty) Ltd

- Applicability Checklist for the detemination of the applicability of the NEMA EIA Regulations, 2014 (as amended) for the proposed development of a house on the Farm Kleinsvlakte Nr 288, Oudtshoorn, Western Cape.

**2024** **Still Bay** – Vivren Propeties (Pty) Ltd

- Environmental Audit Report for the proposed Preekstoel Coastal Development on Erf 1028 and Portion 2 of Erf 599, Still Bay East, Hessequa Municipality, Western Cape.

**2024** **George** – George Municipality

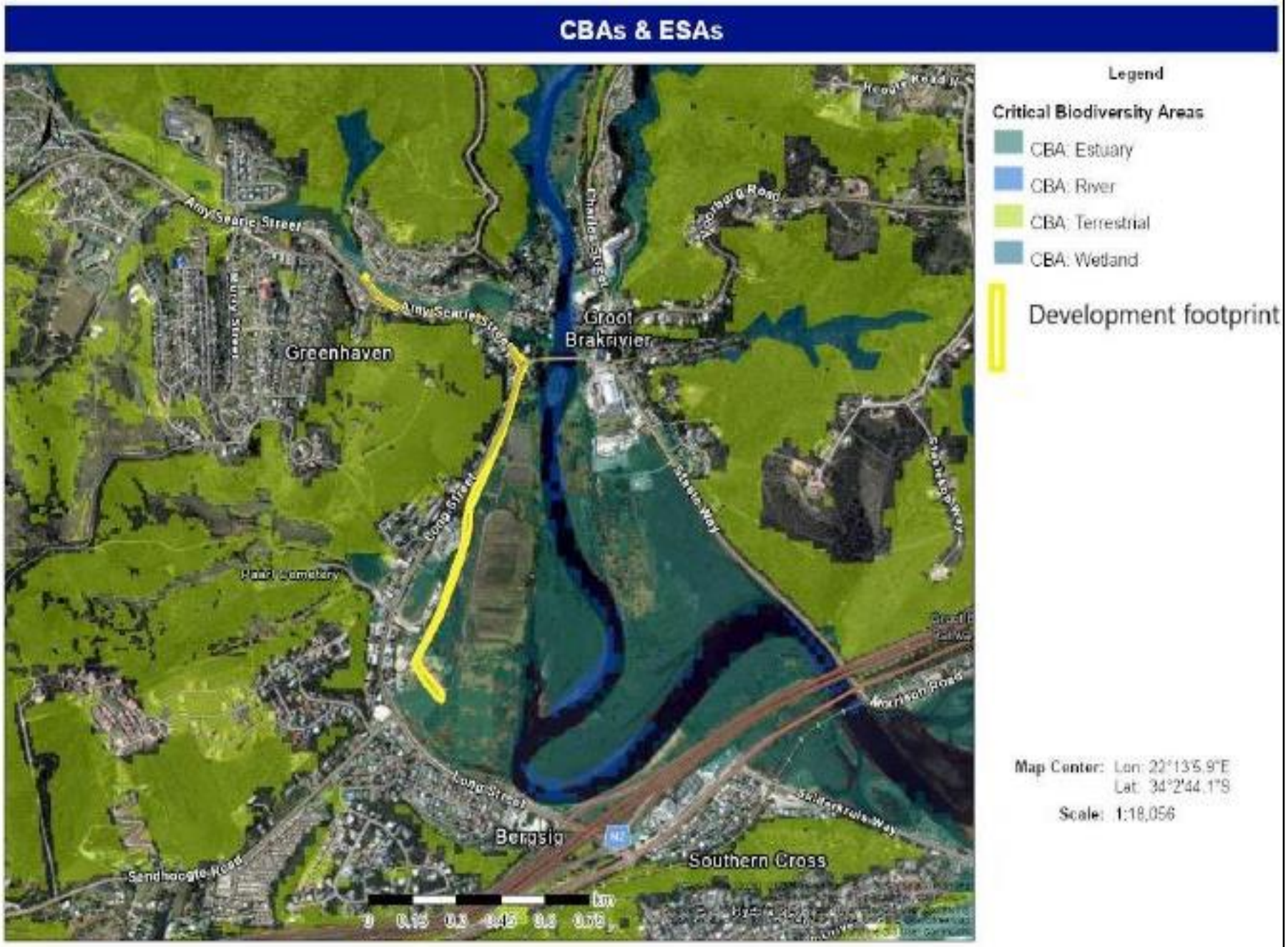
- Environmental Audit Report for the Molen Close River Rehabillitation Remainder of Farm 464, George, Western Cape.

# APPENDIX E: SENSITIVITY MAPS

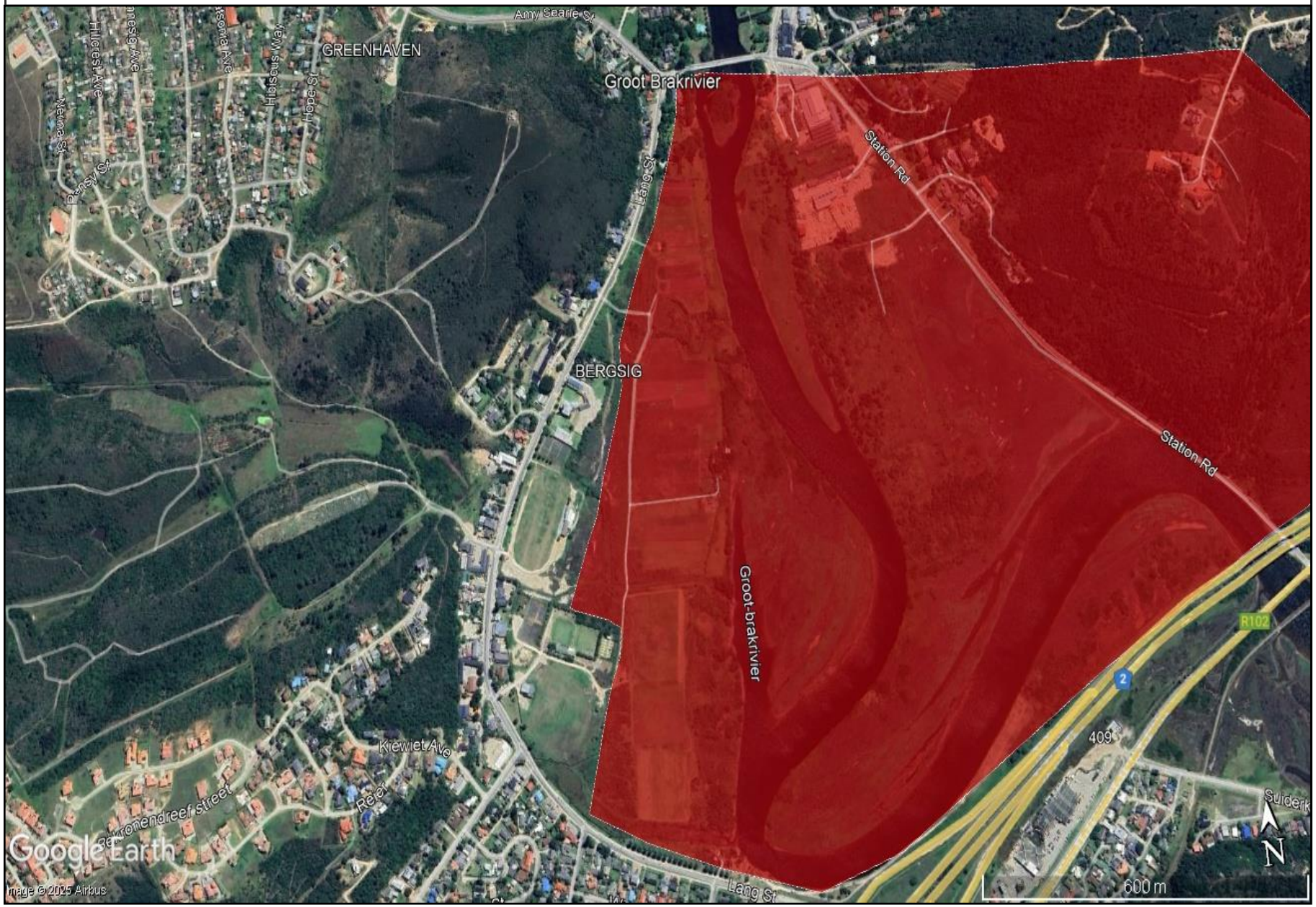
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**APPENDIX E: FIGURE 2: CRITICAL BIODIVERSITY AREAS AND ECOLOGICAL SUPPORT AREAS**



## APPENDIX E: FIGURE 3: NO-GO MAP



# APPENDIX F: ESTUARINE IMPACT ASSESSMENT

# Upgrade of Bulk Sewage Pipeline, Great Brak, Western Cape.

## Specialist Estuarine Assessment




| | |
|---|---|
| **Prepared For:** | Sharples Environmental Services |
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| **Date:** | 15 September 2025 |
| **Version:** | Draft Final |


confluent

## EXECUTIVE SUMMARY

Confluent Environmental was appointed to conduct an estuarine assessment for the proposed upgrade of a bulk sewage pipeline located within the estuarine functional zone (EFZ) of the Great Brak Estuary. The proposed project entails the installation of a new Ø 300mm pipeline along an existing sewer line alignment. The primary objective of the sewer line upgrade will be to increase the capacity of the pipeline which is crucial to avoiding blockages and leaks associated with increased sewage flows as the town of Great Brak expands. In this respect, the project is aligned to many of the management objectives of the Great Brak Estuarine Management Plan (EMP) – particularly with respect to improving water quality in the estuary.

Existing catchment-scale impacts on the estuary relate primarily to the reduction in base and low flows caused by construction of weirs and small and large dams (most notably the Wolwedans Dam) in the catchment area and abstraction of water for irrigation and domestic water supply. These reduced flows have altered the magnitude of freshwater base flows and the seasonal distribution of flows and flood events into the estuary. This in turn has a significant impact on the dynamics of the estuary mouth, which remains closed for long periods of time due to the lack of regular flooding events. When large flow/flood events do occur, the mouth is artificially breached to prevent flooding of infrastructure and residential areas. Other impacts include alteration of the natural salinity gradient due to impedance of freshwater flows into the estuary and alteration to estuary mouth dynamics, degradation and/or loss of estuarine habitat through development (urban and agricultural) in the EFZ, nutrient inputs from agricultural activities, fishing pressures and human disturbance of birds. The estuary experiences frequent blooms of the nuisance filamentous macro-algae *Cladophera glomerata*, which is indicative of eutrophication caused by prolonged mouth closure that results in a combination of increased residence time of water in the estuary and recycling of nutrients from the benthos (Human et al., 2016). Based on these impacts the Present Ecological State (PES) of the estuary is **C/D**. According to Resource Quality Objectives (RQOs) set for the estuary, the Target Ecological Category (TEC) is **E**, indicating a high tolerance for development and utilisation of estuarine resources.

While the entire pipeline route is mapped within the EFZ, long sections of the route run through urbanised, transformed habitat. Five distinct zones (Zones A to E) have been identified and of these, only Zone D runs through estuarine habitat. A short length of the pipeline (~40 m – Zone A) runs adjacent to, but well outside of the delineated area of an unchannelled valley bottom wetland which is located outside of the EFZ. The majority of the upgrades to the sewage pipeline will occur in transformed sections of the EFZ (Zone B, C and E – total length of ~ 1 050 m) and no estuarine habitat will be directly disturbed in these zones. Where the pipeline does traverse estuarine habitat (Zone D for a length of ~ 725 m), it does so within an existing servitude and there will be no additional disturbance of estuarine habitat outside of this servitude. Upgrades to the pipeline in this zone will however result in disturbance to estuarine vegetation that, whilst maintained, does cover the existing servitude. Impacts to estuarine wetland habitat can be mitigated to a low or negligible significance of impact (for all phases of the project) and it is therefore recommended that authorisation for the upgrade is granted.

## Declaration of Specialist Independence

- I consider myself bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP);
- At the time of conducting the study and compiling this report I did not have any interest, hidden or otherwise, in the proposed development that this study has reference to, except for financial compensation for work done in a professional capacity;
- Work performed for this study was done in an objective manner. Even if this study results in views and findings that are not favourable to the client/applicant, I will not be affected in any manner by the outcome of any environmental process of which this report may form a part, other than being members of the general public;
- I declare that there are no circumstances that may compromise my objectivity in performing this specialist investigation. I do not necessarily object to or endorse any proposed developments, but aim to present facts, findings and recommendations based on relevant professional experience and scientific data;
- I do not have any influence over decisions made by the governing authorities;
- I undertake to disclose all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by a competent authority to such a relevant authority and the applicant;
- I have the necessary qualifications and guidance from professional experts in conducting specialist reports relevant to this application, including knowledge of the relevant Act, regulations and any guidelines that have relevance to the proposed activity;
- This document and all information contained herein is and will remain the intellectual property of Confluent Environmental. This document, in its entirety or any portion thereof, may not be altered in any manner or form, for any purpose without the specific and written consent of the specialist investigators.
- All the particulars furnished by me in this document are true and correct.



Dr. James Dabrowski (Ph.D., Pr.Sci.Nat. Water Resources; SACNASP Reg. No: 114084)

September 2025

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# 1 INTRODUCTION

## 1.1 Project Background

Confluent Environmental were appointed to conduct an estuarine assessment for the proposed upgrade of a bulk sewerage line from Amy Searle Street/Greenhaven to the cricket field sewerage pumpstation in Great Brak. The proposed project entails the installation of a new Ø300mm pipeline which will run along the edge of the estuarine functional zone (EFZ) of the Great Brak Estuary (Figure 1). The pipeline route will follow an existing pipeline servitude. The reporting requirements of this assessment are prescribed by the legislative requirements of the National Environmental Management Act (NEMA) and the National Water Act (NWA).

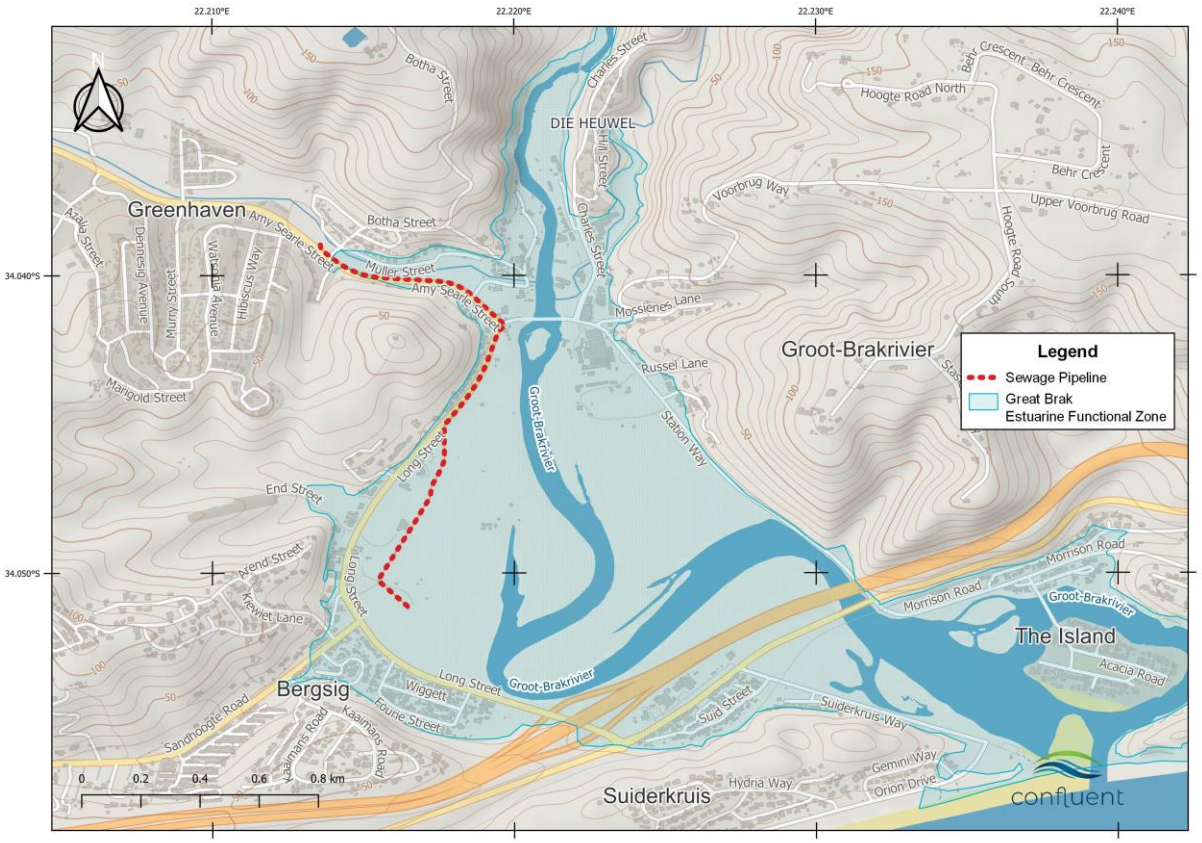



*Figure 1: Proposed pipeline route in Great Brak.*

## 1.2 Key Legislative Requirements

### *1.2.1 National Environmental Management Act (NEMA, 1998)*

According to the protocols specified in GN 1540 (Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in Terms of Sections 24(5)(A) and (H) and 44 of the National Environmental Management Act, 1998, when Applying for Environmental Authorisation), assessment and reporting requirements for aquatic biodiversity are associated with a level of environmental sensitivity identified by the national web-based environmental screening tool (screening tool). An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being of:

- **Very High** sensitivity for aquatic biodiversity, must submit an Aquatic Biodiversity Specialist Assessment; or

- **Low** sensitivity for aquatic biodiversity, must submit an Aquatic Biodiversity Compliance Statement.

According to the protocol, prior to commencing with a specialist assessment a site sensitivity verification must be undertaken to confirm the sensitivity of the site as indicated by the screening tool:

- Where the information gathered from the site sensitivity verification differs from the screening tool designation of **Very High** aquatic biodiversity sensitivity, and it is found to be of a **Low** sensitivity, an Aquatic Biodiversity Compliance Statement must be submitted.
- Similarly, where the information gathered from the site sensitivity verification differs from the screening tool designation of **Low** aquatic biodiversity sensitivity, and it is found to be of a **Very High** sensitivity, an Aquatic Biodiversity Specialist Assessment must be submitted.

The screening tool identified the site as being of **Very High** aquatic biodiversity based on the fact that the pipeline will intersect with the Great Brak Estuary which has also been mapped as an aquatic critical biodiversity area (CBA). A detailed site verification visit was therefore undertaken to confirm the site sensitivity and report accordingly.

### *1.2.2 National Water Act (NWA, 1998)*

The Department of Water & Sanitation (DWS) is the custodian of South Africa's water resources and therefore assumes public trusteeship of water resources, which includes watercourses, surface water, estuaries, or aquifers. The National Water Act (NWA) (Act No. 36 of 1998) aims to protect water resources, through:

- The maintenance of the quality of the water resource to the extent that the water resources may be used in an ecologically sustainable way;
- The prevention of the degradation of the water resource; and
- The rehabilitation of the water resource.

A watercourse means:

- A river or spring;
- A natural channel in which water flows regularly or intermittently;
- A wetland, lake or dam into which, or from which, water flows; and
- Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

According to Section 21 (c) and (i) of the NWA, no activity may take place within a watercourse unless it is authorised by the Department of Water and Sanitation (DWS). Estuaries are, however, not defined as watercourses and maintenance or construction activities assessed as part of this report therefore do not require any Section 21 (c) or (i) water use authorisation in terms of the NWA.

## 1.3 Scope of Work

Based on the key legislative requirements listed above, the scope of work for this report includes the following:

- A desktop review of estuary and provincial and national conservation plans relevant to the site;
- Undertake a site visit to the study area to verify the sensitivity of aquatic biodiversity affected by the proposed development; and
- Develop a plan to guide the timing, extent and execution of maintenance activities.
- Describe and assess the significance of the potential impacts of the proposed development on the estuarine environment;
- Recommend mitigation measures to minimise the potential negative impacts of rehabilitation activities on freshwater ecosystems; and
- Provide a report that meets the requirements of the NEMA as per Section 1.2.1 above.

## 1.4 Assumptions & Limitations

- Estuaries are highly dynamic systems and the assessment of impacts related to this development relied on a single site visit. While every effort has been made to increase the confidence of the assessment presented in this report, given the dynamic nature of estuaries, it is possible that certain impacts may have been overlooked.

# 2 METHODS

## 2.1 Estuarine Assessment

### *2.1.1 Desktop Assessment*

A desktop assessment was conducted to contextualize the affected estuary in terms of its local and regional setting, and conservation planning. An understanding of the biophysical attributes and conservation and water resource management plans of the area assists in the assessment of the importance and sensitivity of the estuary, the setting of management objectives and the assessment of the significance of anticipated impacts. The following data sources and GIS spatial information were consulted to inform the desktop assessment:

- National Freshwater Ecosystem Priority Area (NFEPA) atlas (Nel at al., 2011);
- National Wetland Map 5 and Confidence Map (CSIR, 2018);
- Western Cape Biodiversity Spatial Plan (CapeNature, 2023);
- DWS hydrological spatial layers;
- Resource quality objectives (RQOs) set for the Breede-Gouritz WMA (DWS, 2018);
- The National Biodiversity Assessment (NBA) for estuaries (Van Niekerk et al., 2019);
- The desktop provisional eco-classification of the temperate estuaries of South Africa (Van Niekerk et al., 2014); and
- Great Brak Estuarine Management Plan (EMP) (DEADP, 2018)

### *2.1.2 Present Ecological State*

According to Van Niekerk et al. (2014), the desktop Present Ecological State (PES) of all estuaries in South Africa was derived from several abiotic (hydrology, state of the mouth, salinity, water quality and physical habitat) and biotic (microalgae, macroalgae, invertebrates, fish and birds) indices of estuarine health. Based on the combined score for each of these

indices an overall PES was derived and classified according to the categories defined in Table 1.

*Table 1: Estuary health scoring system indicating the relationship between the six Ecological Categories and the loss of ecosystem condition and functionality.*

| Category | Description |
|---|---|
| **A** | **Natural:** The natural biotic processes should not be modified. The characteristics of the resource should be determined by unmodified natural disturbance regimes. There should be no human induced risks to the abiotic and biotic processes and function. |
| **B** | **Largely Natural:** A small change in natural habitats and biota may have taken place, but the ecosystem functions are essentially unchanged. |
| **C** | **Moderately Modified:** A loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged |
| **D** | **Largely Modified:** A large loss of natural habitat, biota, and basic ecosystem function has occurred. |
| **E** | **Seriously Modified:** The loss of natural habitat, biota and basic ecosystem function is extensive. |
| **F** | **Critically Modified:** Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural abiotic processes and associated biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible. |

### *2.1.3 Ecological Importance and Sensitivity*

The Ecological Importance and Sensitivity (EIS) for all estuaries in South Africa was determined by Turpie and Clarke (2007). The EIS takes size, the rarity of the estuary type within its biographical zone, habitat, biodiversity and functional importance of the estuary into account. Biodiversity importance, in turn is based on the assessment of the importance of the estuary for plants, invertebrates, fish and birds, using rarity indices. These importance scores ideally refer to the system in its Present State. These criteria were each rated (out of a score of 100) and the average of all criteria was used as the final EIS Score (Table 2).

*Table 2: Description of EIS Scores for estuaries derived by Van Niekerk et al. (2014).*

| EIS Score | Description |
|---|---|
| **0 – 60** | Average Importance |
| **61 – 80** | Important |
| **80 – 100** | High Importance |

## 2.2 Wetland Assessment

### *2.2.1 Present Ecological State*

WET-Health 2.0 is designed to assess the PES of a wetland by scoring the perceived deviation from a theoretical reference condition, where the reference condition is defined as the un-impacted condition in which ecosystems show little or no influence of human actions. In thinking about wetland health or PES, it is thus appropriate to consider ‘deviation’ from the natural or reference condition, with the ecological state of a wetland taken as a measure of the extent to which human impacts have caused the wetland to differ from the natural reference condition. Whilst wetland features vary considerably from one wetland to the next, wetlands are all broadly influenced/ by their climatic and geological setting and by three core

inter-related drivers, namely hydrology, geomorphology and water quality. The biology of the wetland (in which vegetation generally plays a central role) responds to changes in these drivers, and to activities within and around the wetland. The interrelatedness of these four components forms the basis of the modular-based approach adopted in WET-Health Version 2. Desktop and field data were captured in GIS software and used to populate the Level 1 WET-Health tool (Macfarlane et al., 2020) which was used to derive the PES of the wetland HGM units. The magnitude of observed impacts on the hydrological, geomorphological, water quality and vegetation components of the wetland were calculated and combined as per the tool to provide a measure of the overall condition of the wetland on a scale from 1-10. Resultant scores were then used to assign the wetland into one of six PES categories as shown in Table 3 below.

*Table 3: Wetland Present Ecological State (PES) categories and impact descriptions.*

| ECOLOGICAL CATEGORY | DESCRIPTION | IMPACT SCORE* | PES SCORE (%)* |
|---|---|---|---|
| A | Unmodified, natural. | 0-0.9 | 90-00 |
| B | Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place. | 1-1.9 | 80-89 |
| C | Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact | 2-3.9 | 60-79 |
| D | Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred. | 4-5.9 | 40-59 |
| E | Seriously modified. The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable. | 6-7.9 | 20-39 |
| F | Critically modified. Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota. | 8-10 | 0-19 |

### 2.2.2 *Ecological Importance and Sensitivity*

The ecological importance of a water resource is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales (Duthie, 1999). Ecological sensitivity refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred (Duthie, 1999). The Ecological Importance and Sensitivity (EIS) provides a guideline for determination of the Ecological Management Class (EMC). The revised method for the determination of the EIS of a wetland considers the three following ecological aspects (Rountree et al., 2013):

- **Ecological importance and sensitivity**
  - Biodiversity support including rare species and feeding/breeding/migration;
  - Protection status, size and rarity in the landscape context;
  - Sensitivity of the wetland to floods, droughts and water quality fluctuations.
- **Hydro-functional importance**
  - Flood attenuation;
  - Streamflow regulation;
  - Water quality enhance through sediment trapping and nutrient assimilation;
  - Carbon storage
- **Direct human benefits**

- Water for human use and harvestable resources;
- Cultivated foods;
- Cultural heritage;
- Tourism, recreation, education and research.

Each criterion is scored between 0 and 4, and the average of each subset of scores is used to derive a score for each of the three components listed above. The highest score is used to determine the overall Importance and Sensitivity category of the wetland system.

*Table 4: Ecological importance and sensitivity categories. Interpretation of average scores for biotic and habitat determinants.*

| Ecological Importance and Sensitivity Category (EIS) | Range of Median | Recommended Ecological Management Class |
|---|---|---|
| Very high: Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these floodplains is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers. | >3 and <=4 | A |
| High: Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these floodplains may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers. | >2 and <=3 | B |
| Moderate: Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these floodplains is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers. | >1 and <=2 | C |
| Low/marginal: Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these floodplains is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers. | >0 and <=1 | D |

## 2.3 Impact Assessment

A site visit was conducted on the 14th of August 2025, with the primary objective of identifying existing impacts and assessing the impacts of the proposed pipeline upgrade on the estuary. The impact assessment methodology is described in the appendix to this report (Appendix 1). Development and maintenance activities typically impact on the following important drivers of estuaries:

- *Hydrology:* Impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes and base flows and modifications to general flow characteristics, including change in the hydrological regime or hydroperiod of the aquatic ecosystem;
- *Geomorphology:* This refers to the alteration of hydrological and geomorphological processes and drivers, and associated impacts to aquatic habitat and ecosystem goods and services primarily driven by changes to the sediment regime of the aquatic ecosystem and its broader catchment;
- *Modification of water quality:* This refers to the alteration or deterioration in the physical, chemical and biological characteristics of water within estuaries, streams, rivers and wetlands, and associated impacts to aquatic habitat and ecosystem goods

and services (e.g. due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication etc.);

- *Fragmentation:* Loss of lateral and/or longitudinal ecological connectivity due to structures crossing or bordering watercourses (e.g. road or pipeline crossing a wetland or estuary);
- *Modification of estuarine habitat:* This refers to the physical disturbance of in-stream and riparian aquatic and estuarine habitat and associated ecosystem goods and services including the loss or degradation of all or part of any unique or important features associated with or within the ecosystem*;* and
- *Estuarine biodiversity:* Impacts on community composition (numbers and density of species) and integrity (condition, viability, predator prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the site.

Construction and operational activities associated with the jetty were therefore assessed with respect to their impact on these drivers (if applicable).

# 3 PROPOSED DEVELOPMENT

In South Africa, the Estuarine Functional Zone (EFZ) is defined as the area that not only delineates the boundaries of the estuarine waterbody, but also the supporting physical and biological processes and adjacent habitats necessary for estuarine function and health (Van Niekerk et al., 2019). It includes all dynamic areas influenced by long-term estuarine sedimentary processes, multiple ecotones of floodplain and estuarine vegetation that contribute organic material and provide refuge from strong currents during high flow events. EFZs are currently delineated by the 5 m contour line and therefore include large areas of terrestrial habitat (much of which has been historically developed) that border the actual water body. The EFZ is now commonly used to delineate the spatial extent of the entire estuary.

The pipeline route runs adjacent to Amy Searle and Long streets (Figure 2). The upper, western most section of the pipeline is located adjacent to freshwater wetland habitat (i.e. outside of the EFZ). The majority of the pipeline is located within the EFZ and will be buried immediately adjacent to Amy Searle and Long streets (beneath the sidewalk). The southern most section of the pipeline deviates from Long Street, further in towards the EFZ and closer to open water estuarine habitat.

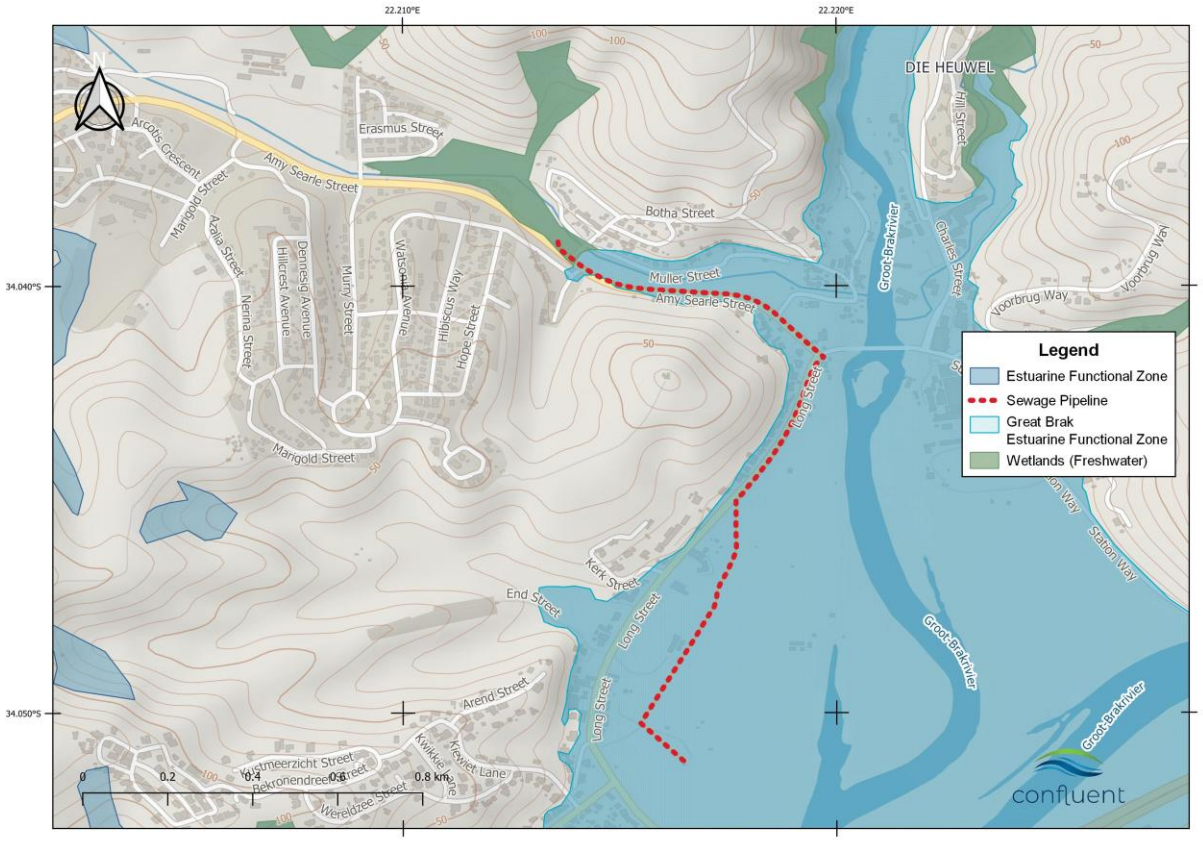



*Figure 2: Mapped estuarine and freshwater wetland habitat (CSIR, 2018) relative to the pipeline route.*

## 4 DESKTOP ASSESSMENT

The Great Brak estuary falls in quaternary catchment K20A (Figure 3). The main river flowing through the catchment area is the Groot Brak River. The estuary falls within level 22.02 of the Southern Coastal Belt ecoregion, which is characterised by moderately undulating plains of moderate relief with altitude ranging from 0 to 500 m above mean sea level. Mean annual precipitation for the catchment area is relatively high (between 300 and 700 mm per annum), and occurs year-round, with peaks in late winter and early spring (August to October).

According to Van Niekerk et al. (2019), the estuary is classified as a **warm temperate, large temporarily closed system** with the mouth closed for the majority of the time. The EFZ extends from the coast approximately 6.5 km further upstream, beyond the Searle's Bridge and further up the Great Brak River (Figure 2). The estuary is approximately 6 km long and has a water surface area of 0.6 $km^2$ at high tide, and a tidal prism of 0.3 x $10^6$ $m^3$ (DEADP, 2018). The lower reaches of the estuary are mostly shallow (0.5 to 1.2 m deep), comprising of extensive sand banks. Deeper areas are associated with scouring zones near the rocky cliffs and bridges (Human et al., 2016). The middle reaches are also relatively shallow and are characterised by larger intertidal and floodplain salt marsh areas – much of which has been transformed into agricultural land. A summary of the composition of different natural habitat types occurring in the estuary is provided in (Table 5). A large proportion of the area of the EFZ has been transformed from natural habitat to schools and agricultural, commercial and residential properties.




*Figure 3: Location of the project area relative to quaternary catchment K20A.*

*Table 5: Compostion of different habitat types in the Great Brak estuary.*

| Habitat | Area (ha) | Area (%) |
|---|---|---|
| Inter-tidal Salt Marsh | 13.0 | 12.3 |
| Supratidal Salt Marsh | 26.6 | 25.3 |
| Submerged Macrophytes | 0 | 0 |
| Reeds & Sedges | 2.5 | 2.4 |
| Mangroves | 0 | 0 |
| Sand/Mud Banks | 29.9 | 28.4 |
| Open Water | 33.1 | 31.5 |
| Rocks | 0 | 0 |
| Swamp Forest | 0 | 0 |
| Macroalgae | 0 | 0 |
| **TOTAL** | **105.1** | **100** |

According to the Great Brak EMP (DEADP, 2018) benthic invertebrates of the Great Brak estuary are dominated by the mudprawn *(Upogebia Africana),* the sandprawn *(Callianassa kraussi)* and the bivalve *(Loripes clausus)*. Diversity and abundance is considered to be low relative to other closed estuaries in the region. Zooplankton biomass and abundance in the estuary is typical of temporarily closed systems and is dominated by the copepods *Acartia longiptella* (during closed phases) and *Pseudodiaptomus hessei* (during open phases). A total of 33 species of fish from 21 families have been recorded from the Great Brak estuary, which is considered to be high compared to other temporarily open/closed estuaries in the region.

A total of 52 non-passerine waterbird species have been recorded on the Great Brak estuary (excluding vagrants), with 39 of these species being recorded during summer, and 41 in

winter. Numbers of birds on the estuary are relatively low, however. The estuary supports an average of about 240 birds in mid-summer and 153 in mid-winter. The estuary is ranked 135th out of 258 estuaries in terms of its avifauna.

## 4.1 Freshwater Conservation & Management

### *4.1.1 National Freshwater Ecosystem Priority Atlas (NFEPA)*

The Great Brak estuary is located in sub-quaternary catchment (SQC) 9083 (Figure 4), which, according to the National Freshwater Ecosystem Priority Atlas (NFEPA, Nel et al., 2011), has been classified as a Fish Support Area (FSA). FSAs are SQCs that are not necessarily in a good ecological condition but are still essential for protecting threatened or near-threatened freshwater fish species that are indigenous to South Africa. The management goal of FSAs is to prevent additional fish species from becoming threatened or to prevent threatened or near-threatened species from becoming extinct. In order to achieve these objectives, there should be no further deterioration in river condition. Freshwater fish species that are expected to occur in the Great Brak River are listed in Table 6. Of these species *A. mossambica* and *M. capensis* are likely to also occur within the estuary. Both of these species are catadromous and breed at sea, with juveniles migrating through estuaries and into freshwater systems until they reach maturity (after which they migrate back to the sea). *G. zebratus* and *S. capensis* are endemic to South Africa but are not expected to occur in estuarine environments.

*Table 6: List of freshwater fish species that occur in the Great Brak River (DWS, 2014).*

| Scientific Name | Common Name |
|---|---|
| *Anguilla mossambica* | African Longfin Eel |
| *Galaxius zebratus* | Cape Galaxius |
| *Myxus capensis* | Freshwater Mullet |
| *Sandelia capensis* | Cape Kurper |

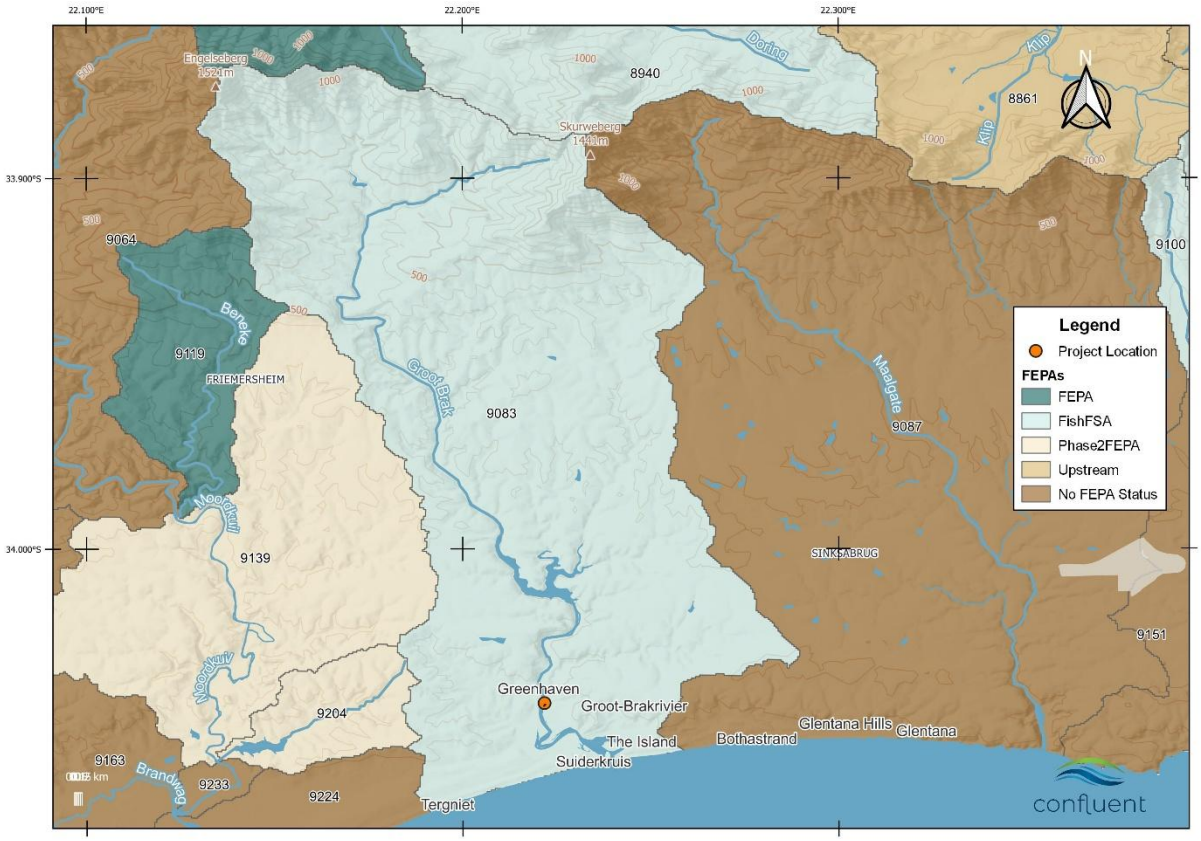



*Figure 4: Map indicating the location of the project area in relation to FEPAs.*

## 4.2 Western Cape Biodiversity Spatial Plan

The main purpose of a biodiversity spatial plan is to ensure that the most recent and best quality spatial biodiversity information can be accessed and used to inform land use and development planning, environmental assessments and authorisations, natural resource management and other multi-sectoral planning processes. The WCBSP plan achieves this by providing a map of terrestrial and freshwater areas that are important for conserving biodiversity pattern and ecological processes – these areas are called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). According to the Western Cape Biodiversity Spatial Plan (WCBSP) for Mossel Bay, the lower, southern section of the pipeline traverses natural and modified aquatic CBAs (Figure 5). The northern section runs through modified terrestrial CBAs. Management objectives associated with aquatic CBAs are provided in Table 7.

*Table 7: Definitions and management objectives of the Western Cape Biodiversity Spatial Plan.*

| Category | Definition | Management Objective |
|---|---|---|
| CBA1 | Areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure. | Maintain in a natural or near-natural state, with no further loss of natural habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate. |
| CBA2 | Areas in a degraded or secondary condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure. | Maintain in a natural or near-natural state, with no further loss of habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land-uses are appropriate. |

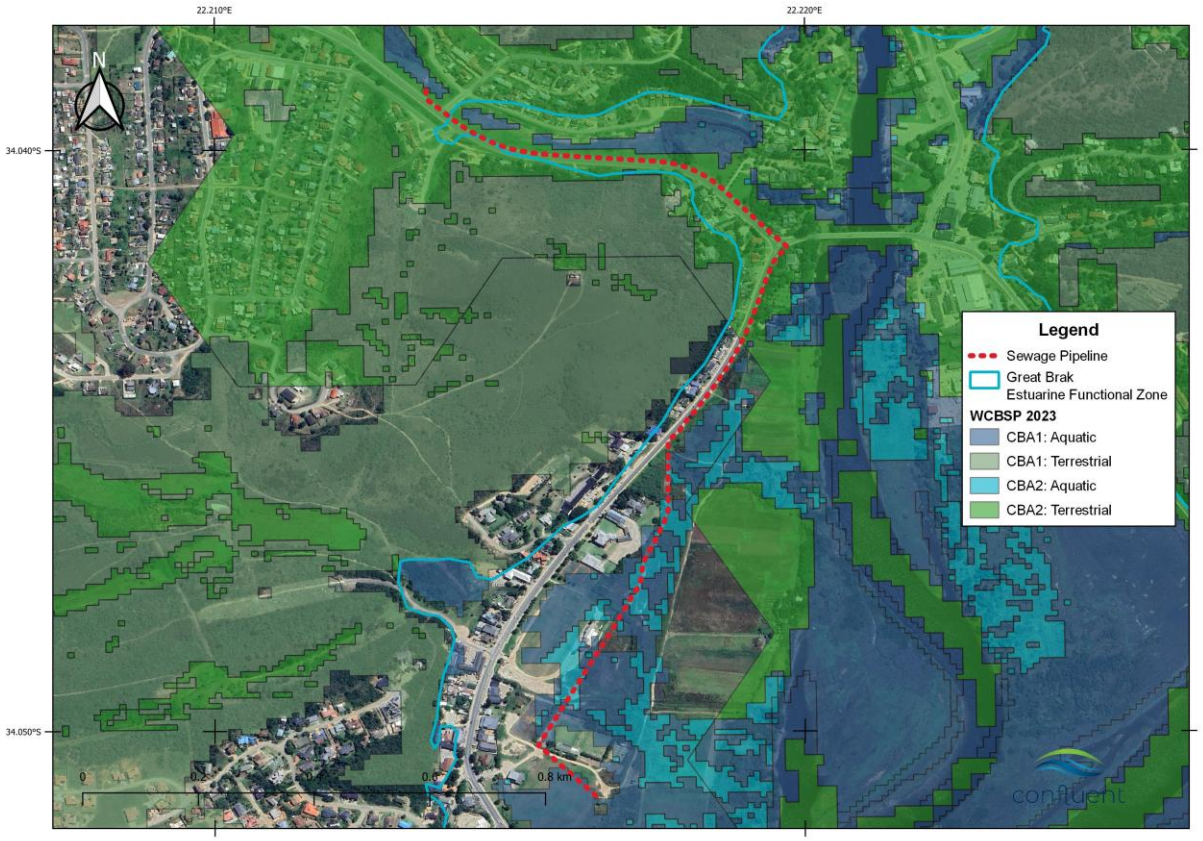



*Figure 5: Map of the Western Cape Biodiversity Spatial Plan (WCBSP).*

## 4.3 Great Brak Estuarine Management Plan

Estuaries are recognised as particularly sensitive and dynamic ecosystems and the National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008, as amended by Act 36 of 2014) (ICMA), via the prescriptions of the South African National Estuarine Management Protocol (the Protocol), require Estuary Management Plans (EMPs) to be prepared for estuaries in order to create informed platforms for efficient and coordinated estuarine management. To this end, the Great Brak River EMP was compiled in 2018 (DEADP, 2018) and provides a detailed situation assessment of the estuary as well as management objects aimed at achieving an agreed upon vision for the estuary which is as follows:

*"The Great Brak River estuary is managed in a transparent, accountable and cooperative manner to ensure an appropriate balance between biodiversity conservation, recreational use, human safety and development, now and in the future."*

Specific management objectives highlighted in the EMP that are relevant to the proposed development include are listed in Table 8. The primary objective of the sewer line upgrade will be to increase the capacity of the pipeline which is crucial to avoiding blockages and leaks associated with increased sewage flows as the town of Great Brak expands. In this respect, the project is aligned to many of the management objectives of the EMP – particularly with respect to improving water quality in the estuary.

*Table 8: Management objectives included in the Estuarine Management Plan (EMP) for the Great Brak Estuary (objectives highlighted in bold are relevant to the proposed sewage line upgrade).*

| Description | Management Objectives |
|---|---|
| 1. Conservation of estuarine biodiversity | • Zonation plan for the estuary approved and implemented.<br>• Great Brak River EMP integrated within local, district and provincial level planning documents (IDPs and SDFs).<br>• Alien vegetation clearing and monitoring operations in place.<br>• **Future development on the estuary is constrained to ensure that it does not compromise estuary health, ecosystem functioning and/or sensitive species (e.g. no development in the 1:50 year flood line).**<br>• Harvesting of living marine resources (fish and bait) on the estuary remains within sustainable limits, resource users do not exceed applicable size and bag limits |
| 2. Restoration of estuary health | • Freshwater environmental reserve for the Great Brak River estuary implemented; revised dam operating rules for the Wolwedans are in force and respected.<br>• **Quantity and quality of freshwater reaching the estuary adequate to restore and maintain estuary health.**<br>• **Sewage and storm water entering the estuary monitored and controlled** |
| 3. Effective and efficient mouth Management | • Mouth Management Plan (MMP) accepted and signed off by all relevant authorities (DWS,<br>• Disaster Management, Weather SA, Eden and Mossel Bay Municipalities).<br>• Beaching protocols are implemented in accordance with the accepted Mouth Management<br>• Plan & approved Maintenance Management Plan (MMP). |
| 4. Water quality management | • Water quality samples collected and analysed in accordance with EMP requirements.<br>• Bacteriological (Faecal coliforms, E. coli and Enterococci) and physico-chemical parameters (nitrate, nitrite, ammonia, phosphorus, silica, suspended sediment, toxic substances) from water quality samples taken in the estuary. |
| 5. Visitor management | • Informative and educational signage erected at key points access points that highlights the conservation importance and value of the Great Brak River estuary.<br>• Visitors are sensitive to and aware of activities affecting health and functioning of the estuary, and management regulations governing use of the estuary.<br>• Quality and quantity of visitor facilities (ablutions, parking, etc.) sufficient to meet visitor expectations and requirements. |
| 6. Development planning | • **Future development on the estuary is constrained to ensure that it does not compromise the existing sense of place, conservation value and/or cultural heritage resources associated with the Great Brak River estuary** |
| 7. Harmonious and effective Governance | • Great Brak River Estuary Advisory Forum convened and meets regularly.<br>• Manager for the Great Brak River estuary appointed and capacitated<br>• Arrangements for co-operative governance of the Great Brak River estuary defined and agreed to by all participating agencies.<br>Finance required for implementation of the Great Brak River estuary EMP secured and available.<br>• Adequate capacity and resources available for implementation of the EMP amongst participating agencies |
| 8. Enhanced public awareness and appreciation for the Great Brak River estuary | • Functional and effective stakeholder communication, education and awareness programmes are in place.<br>• Informative and educational signage erected at key access points that highlights the conservation importance and value of the Great Brak River estuary<br>• Great Brak River estuary recognised as an important local ecotourism destination. |
| 9. Research and monitoring | • Adequate research and monitoring is being conducted that allows for quantification of utilisation patterns, changes in abiotic and biotic health, and benefits accruing to local communities and national economy. |

## 4.4 Resource Quality Objectives

The classification of water resources and development of Resource Quality Objectives (RQOs) for the Breede-Gouritz Catchment Management Area was finalised in 2018 (DWS, 2018). The estuary falls within quaternary catchment K20A, which falls within the G14 Gouritz-Olifants Integrated Unit of Analysis (IUA). The Water Resource Class for this IUA is III, indicating sustainable minimal protection and high utilisation. The estuary falls within G14-E16 priority resource unit, and gazetted RQOs are provided in Table 9 below. While the Present Ecological State (PES) of the estuary is C/D (Moderately to Largely Modified – see section 5.3), the Target Ecological Category (TEC) for the Great Brak Estuary been set as an **E (Seriously Modified)**, which indicates a highly impacted river with a low level of protection for high utilisation for socio-economic development.

*Table 9: Resource Quality Objectives (RQOs) for the Great Brak estuary.*

| IUA | Class | Quaternary Catchment | RU | Resource Name | Biophysical Node Name | TEC | Component | Sub-component | Indicator | RQO Narrative | RQO Numeric | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| G14 Groot-Brak | III | K20A | G14-E16 | Groot-Brak Estuary | gxi5 | E | Quantity | Flow | MMR/MAR (% Nat) | Maintain a flow regime to create the required habitat for birds, fish, macrophytes, microalgae and water quality. | Months | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Annual |
| | | | | | | | | | | | MMR/MAR (% Nat) | 62.2 | 67.3 | 55.3 | 48.2 | 43.4 | 55.7 | 49.2 | 54.9 | 38.3 | 43.7 | 63.4 | 63.8 | 56.2 |
| | | | | | | | Quality | Nutrients | DIN | Inorganic nutrient concentrations not to exceed TPCs for macrophytes and microalgae | River inflow: NOx-N not to exceed 100 µg/ℓ over 2 consecutive months, $NH_3$-N not to exceed 20 µg/ℓ over 2 consecutive months; Estuary (except during upwelling or floods): average NOx-N not to exceed 100 µg/ℓ, no single measurement to exceed 150 µg/ℓ, average $NH_3$-N not to exceed 20 µg/ℓ during survey, no single measurement to exceed 100 µg/ℓ | | | | | | | | | | | | |
| | | | | | | | | | DIP | | River inflow: $PO_4$-P not to exceed 20 µg/ℓ over 2 consecutive months; Estuary (except during upwelling or floods): average $PO_4$-P not to exceed 20 µg/ℓ during survey, no single measurement to exceed 50 µg/ℓ | | | | | | | | | | | | |
| | | | | | | | | Salinity | Salinity | Salinity distribution not to exceed TPCs for fish, invertebrates, macrophytes and microalgae | A salinity gradient should always be present in the upper reaches of the estuary (Zone D and F), an REI zone should always be present in the upper reaches of the estuary (Zone D and F), salinity should not exceed 35 | | | | | | | | | | | | |
| | | | | | | | | System variables | Dissolved oxygen | System variables not to exceed TPCs for biota | Entire estuary and river inflow: DO >5 mg/ℓ | | | | | | | | | | | | |
| | | | | | | | | | pH | | 6 < pH > 8.5 in estuary | | | | | | | | | | | | |
| | | | | | | | | Pathogens | Enterococci | Concentrations of waterborne pathogens should be maintained in an Acceptable category for full contact recreation | ≤185 Enterococci/100 ml ($90^{th}$ percentile) | | | | | | | | | | | | |
| | | | | | | | | | Escherichia coli | | ≤500 E. coli/100 ml ($90^{th}$ percentile) | | | | | | | | | | | | |
| | | | | | | | Habitat | Hydrodynamics | Mouth state | Maintain connectivity with marine environment at a level that ensures water quality and habitat remains suitable for biota typically found in the estuary | Closed mouth state should not increase by >10% from established baseline | | | | | | | | | | | | |
| | | | | | | | | Sediment | Sediment characteristics, Channel shape/size | Flood regime is sufficient to maintain natural bathymetry and sediment characteristics | Channel shape/size, sediment grain size and organic matter must not change by >30% from established baseline | | | | | | | | | | | | |

| IUA | Class | Quaternary Catchment | RU | Resource Name | Biophysical Node Name | TEC | Component | Sub-component | Indicator | RQO Narrative | RQO Numeric |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Biota | Microalgae | Biomass and community composition of phytoplankton and benthic microalgae community | Maintain the composition and richness of phytoplankton and benthic microalgae groups and medium-low biomass | Maintain low phytoplankton biomass. Maintain microalgal group diversity as measured for the baseline survey; phytoplankton biomass should not increase by more than 20% above baseline concentrations; phytoplankton group diversity to should not change more than 20% from baseline conditions; maintain high subtidal benthic microalgal biomass during the closed mouth phase and low intertidal benthic microalgal biomass during the open phase; Epipelic diatoms indicative of brackish conditions should be found during the closed phase. |
| | | | | | | | | Macrophytes | Extent, distribution and richness of macrophytes | Maintain extent, distribution and richness of macrophyte groups, limit colonisation/spread of the EFZ by alien species | Maintain distribution of macrophyte habitats as for present (2013): Submerged macrophyte, *Ruppia cirrhosa* beds: ~5 ha, *Zostera capensis* present during open mouth conditions, intertidal salt marsh: ~13 ha, supratidal and floodplain salt marsh: ~26.6 ha), Reed (*Phragmites australis)* and sedge stands in the middle / upper reaches: ~2.5 ha); prevent excessive filamentous macroalgal growth. Area covered should be half that covered by submerged macrophytes and less than 50 % of the open water surface area; maintain the zonation of salt marsh and distribution of different species along an elevation gradient. Ensure the long-term persistence of intertidal salt marsh species such as *Triglochin* spp. and *Cotula coronopifolia*; prevent hypersaline sediment and groundwater conditions in the salt marsh. Sediment electrical conductivity should be approximately 30 mS and similar to groundwater values. |
| | | | | | | | | Invertebrates | Macrofauna community composition, abundance and richness | Maintain composition, richness and abundance of different groups of benthic macrofauna and zooplankton | Density of mudprawns should exceed 100 – 150 burrow counts per m2 in the highest density areas; in the zooplankton, the density of Pseudodiaptomus hessei should exceed levels of about 5000-10000 m3 in the upper estuary in spring. Salinity variation in the estuary is highly variable and the mouth remains closed for extended periods - this may also lead to the temporary absence of some invertebrate species that might be expected to occur here. |

| IUA | Class | Quaternary Catchment | RU | Resource Name | Biophysical Node Name | TEC | Component | Sub-component | Indicator | RQO Narrative | RQO Numeric |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Fish | Fish community composition, abundance and richness | Maintain composition, richness and abundance of different groups of fish, prevent colonisation/increase of alien species | Fish assemblage should comprise the five estuarine association categories in similar proportions (diversity and abundance) to that under the reference. Numerically, assemblage should comprise: Estuarine species (40-60%), Estuarine associated marine species (30-50%), Indigenous freshwater fish (1-5%); Category Ia species should contain viable populations of at least two species (e.g. *G. aestuaria*, & *Hyporamphus capensis*); Category IIa obligate dependents should be well represented by at least two large exploited species |
| | | | | | | | | Birds | Avifauna community composition, abundance and richness | Maintain composition, richness and abundance of different avifauna groups | Retain species richness, abundance and density of bird counts of resident and migrant waders, gulls, terns, wading birds and waterfowl within 15 % of present state (2006). |

# 5 ESTUARINE ASSESSMENT

## 5.1 Historical Impacts

Historical impacts relevant to the proposed pipeline upgrade are summarized as follows:

- 1939: The natural estuarine channel below the wetland ran in close proximity to present day Amy Searle Street (Figure 6).
- 1957: The channel had been straightened – presumably to drain the wetland during high flood events (Figure 6)
- 1989: Loss of wetland habitat associated with development of roads. Estuarine channel was realigned to flow further north of present-day Amy Searle Street (Figure 6).

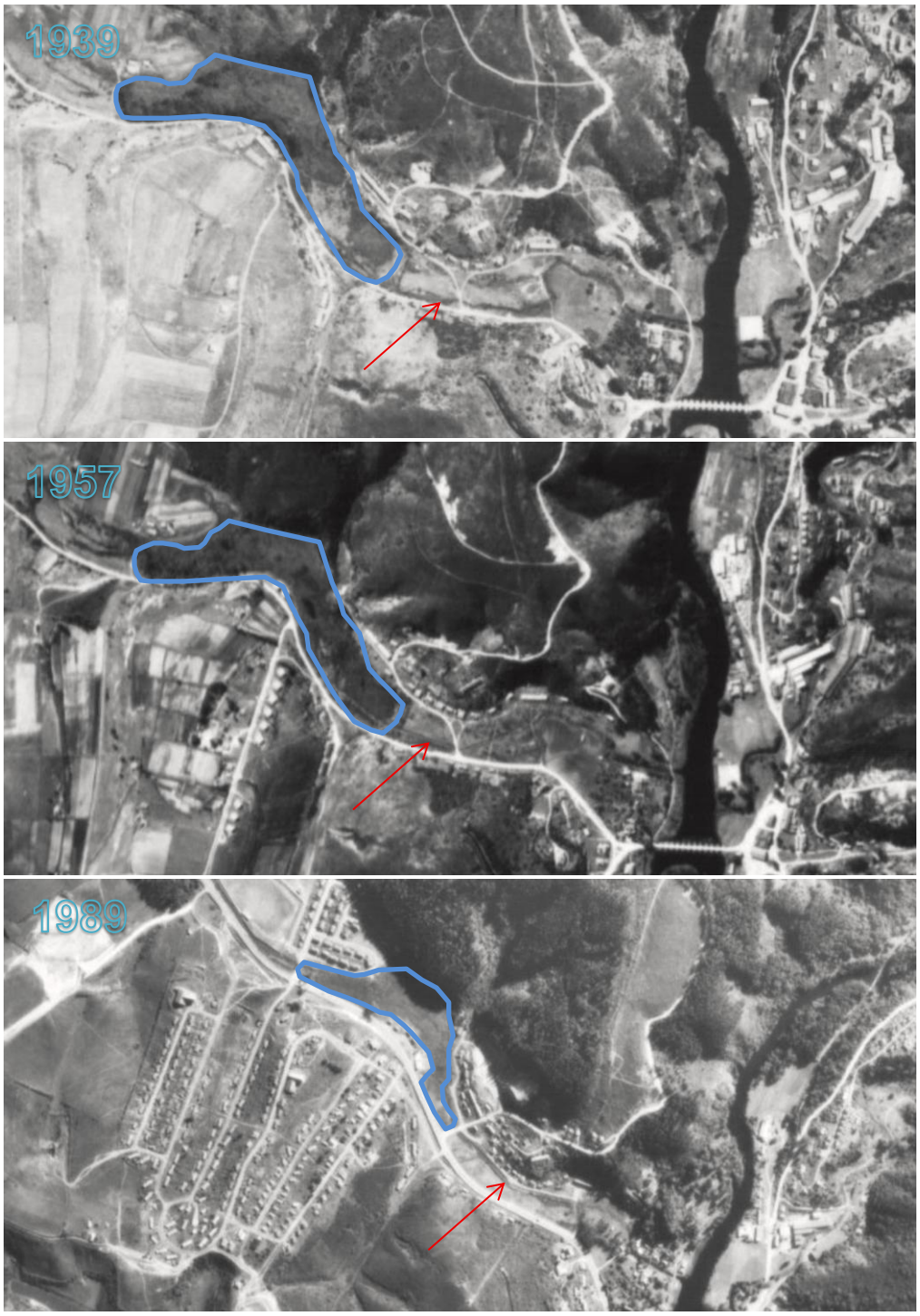



*Figure 6: Historical images illustrating modifications to wetland habitat upstream and adjacent to Zone A (blue outline indicates the extent of the wetland and red arrow indicates the positions of the channel).*

## 5.2 Existing Impacts

### *5.2.1 Catchment Scale Impacts*

Broader catchment-scale impacts relate primarily to the reduction in base and low flows caused by construction of weirs and small and large dams (most notably the Wolwedans Dam) in the catchment area and abstraction of water for irrigation and domestic water supply. These reduced flows have altered the magnitude of freshwater base flows and the seasonal distribution of flows and flood events into the estuary. This in turn has a significant impact on

the dynamics of the estuary mouth, which remains closed for long periods of time due to the lack of regular flooding events. When large flow/flood events do occur, the mouth is artificially breached to prevent flooding of infrastructure and residential areas. Other impacts include alteration of the natural salinity gradient due to impedance of freshwater flows into the estuary and alteration to estuary mouth dynamics, degradation and/or loss of estuarine habitat through development (urban and agricultural) in the EFZ, nutrient inputs from agricultural activities, fishing pressures and human disturbance of birds. The estuary experiences frequent blooms of the nuisance filamentous macro-algae *Cladophera glomerata*, which is indicative of eutrophication caused by prolonged mouth closure which results in a combination of increased residence time of water in the estuary and recycling of nutrients from the benthos (Human et al., 2016).

### *5.2.2 Site Specific Impacts*

While the entire pipeline route is mapped within the EFZ, long sections of the route run through urbanised, transformed habitat. Five distinct zones have been identified (Figure 7).

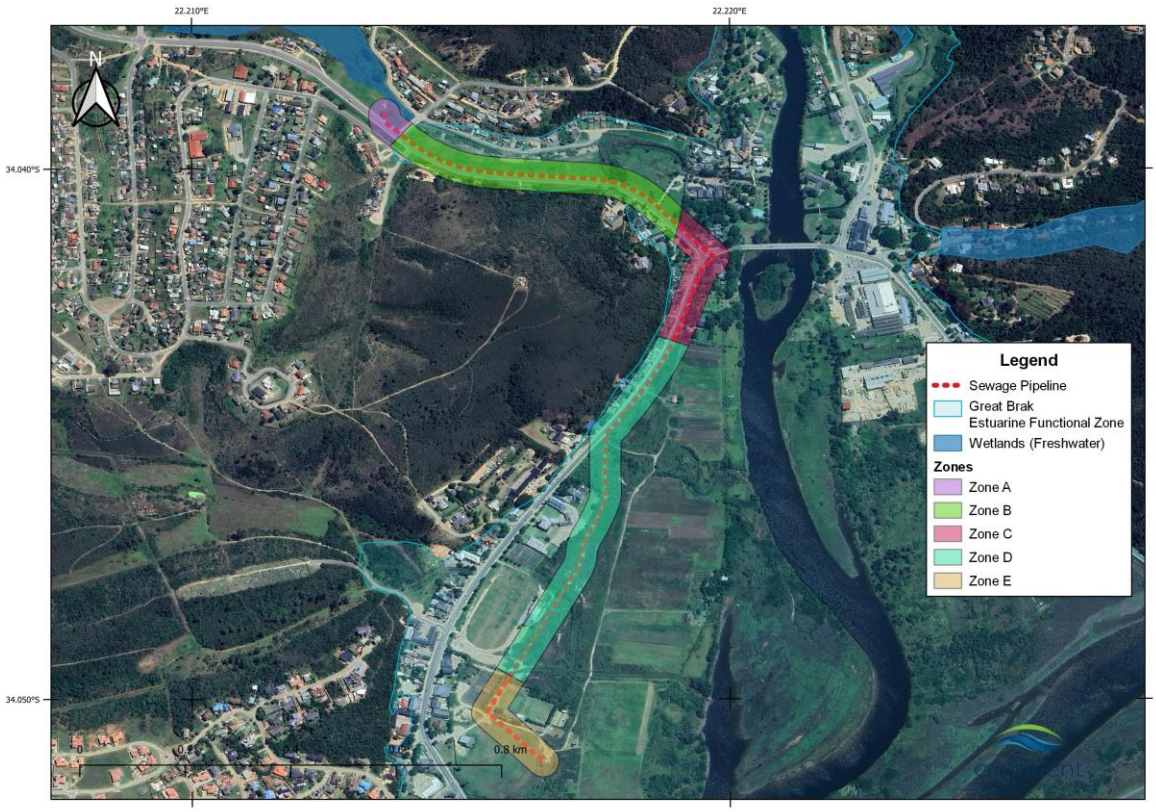



*Figure 7: Habitat zones identified along the route of the proposed sewage pipeline upgrade.*

Each of the zones is characterised as follows:

- **Zone A:** The upper-most manhole linked to the proposed pipeline upgrade is located adjacent to a channel that extends from a large *Phragmites australis* dominated unchannelled valley-bottom wetland (Figure 8). Other prominent species include *Nidorella ivifolia* and *Cyperus textilus.* The channel is narrow and receives stormwater input from the surrounding area. The channel drains water from the wetland and has been diverted from its original course, which used to run closer to Amy Searle Street (see Section 5.1). This wetland falls outside of the EFZ and is considered as freshwater habitat (not estuarine).



*Figure 8: Photographs of the wetland (left) and the channel extending from the lower end of the wetland towards the EFZ (right).*

- **Zone B:** The upper section of the pipeline (running adjacent to Amy Searle Street) runs through a grassed public open space area (Figure 9). Open water estuarine habitat has been transformed into a concrete-lined canal. The pipeline route along this section runs immediately beneath the sidewalk and does not traverse through any natural estuarine habitat. The closest distance to the canal is approximately 20 m. Several stormwater channels drain stormwater from Amy Searle Street down towards the canal. The canal has undergone many modifications in the past and has been diverted from its natural course (see Section 5.1). There is a patch of estuarine wetland vegetation that extends away from the channel towards Amy Searle Street. This is a remnant of the historical channel that used to run closer to Amy Searle Street (see Section 5.1). The wetland area is dominated by *P. australis* reedbeds but also includes *C. textilus* and *N. ivifolia*. There are clear signs of historical excavation within the wetland as was by vegetated mounds of soil around the perimeter (adjacent to Amy Searle Street). These mounds have been invaded by alien tree species – most notably *Melia azedarach* (Syringa).



*Figure 9: Photographs of the grassed area adjacent to the canal (top left), the canal lined with open concrete pavers (top right), a stormwater channel leading from Amy Searle Street down towards the canal (bottom left) and a patch of remnant wetland vegetation in close proximity to Amy Searle Street (bottom right).*

- **Zone C:** This section of the pipeline follows Long Street and runs immediately adjacent to the road and sidewalk. The pipeline runs through a transformed section of the EFZ and does not run through or adjacent to any natural estuarine habitat.
- **Zone D:** The pipeline route passes through natural, estuarine habitat located immediately adjacent to Long Street and eventually deviates from Long Street and passes through estuarine habitat, characterised by stands of *Phragmites australis* and patches of salt marsh vegetation (Figure 10). The habitat is supratidal and lies above the level of the highest high tide. Several stormwater channels that divert stormwater off of Long Street intersect with the pipeline route. While, the pipeline passes along an existing, disturbed servitude, the habitat immediately adjacent to the servitude is considered to the be sensitive. This zone largely coincides with mapped aquatic CBA1 and CBA2 habitat (Figure 5).



*Figure 10: Examples of estuarine habitat located immediately adjacent to the sewer line servitude, including Juncus kraussii sedge beds (top left), P. australis reed beds (top right), salt marsh (bottom left) and vegetated stormwater channels extending from Long Street further into the interior of the EFZ (bottom right).*

- **Zone E:** The final section of the pipeline passes through the Great Brak municipal sport grounds complex where any former natural estuarine habitat has once again been transformed (roads, parking areas and sports fields) - Figure 11.



*Figure 11: Paved roads and sports fields in Zone E (left and right).*

## 5.3 Present Ecological State (PES) and Ecological Importance & Sensitivity (EIS)

### *5.3.1 Great Brak Estuary*

The rapid level assessment for the Great Brak estuary confirmed the Present Ecological State as **C/D – Moderately to Largely Modified** (Van Niekerk et al., 2014) indicating that while loss and/or change of natural habitat and biota has occurred, the basic ecosystem functions and processes remain predominantly unchanged. In this respect alterations to water quality and the hydrodynamics of the estuary (e.g. prolonged mouth closure) are considered the most important variable with respect to impacts on habitat (Table 10). This in turn has notably influenced the majority of biotic indicators, with macrophytes, fish and birds most heavily affected. The Recommended Ecological Category (REC) is also set at **D**. The EIS of the estuary is presented in Table 11 and is rated as **Important**.

*Table 10: Present Ecological State (PES) of the Groot Brak Estuary as determined by Van Niekerk et al. (2015).*

| Variable | Weight |
|---|---|
| Hydrology | C |
| Hydrodynamics and Mouth Condition | C/D |
| Water Quality | D |
| Physical Habitat Alteration | B |
| **Habitat Health Score** | **C** |
| Microalgae | C/D |
| Macrophytes | D/E |
| Invertebrates | D |
| Fish | D/E |
| Birds | C |
| **Biotic Health Score** | **D** |
| **PES** | **C/D** |

*Table 11: Estuarine Importance Scores (EIS) of the Groot Brak Estuary (Turpie and Clark, 2007)*

| Criteria | Weight | Score |
|---|---|---|
| Estuary Size | 15 | 90 |
| Zonal Rarity Type | 10 | 80 |
| Habitat Diversity | 25 | 10 |
| Biodiversity Importance | 25 | 80 |
| Functional Importance | 25 | 77 |
| **Weighted Estuary Importance Score** | | **63.25** |

### *5.3.2 Unchannelled Valley Bottom Wetland*

As described in Section 5.1, the extent of the wetland has decreased over time and has also been artificially drained, presumably to accommodate development within the adjacent areas and to control flooding. The short length of channel upstream of Botha Street, was originally part of this broader wetland area. Despite these modifications the wetland is relatively large, provides good habitat for aquatic biota and its hydro-functional attributes remain largely unchanged and the PES is C – Moderately Modified (Table 12).

*Table 12: Present ecological state (PES) of the unchannelled valley bottom wetland.*

| Final (adjusted) Scores | | | | |
|---|---|---|---|---|
| PES Assessment | Hydrology | Geomorphology | Water Quality | Vegetation |
| Impact Score | 4.8 | 1.2 | 3.0 | 3.0 |
| PES Score (%) | 52% | 88% | 70% | 70% |
| **Ecological Category** | **D** | **B** | **C** | **C** |
| Confidence (revised results) | Not rated | Not rated | Not rated | Not rated |
| **Combined Impact Score** | 3.2 | | | |
| **Combined PES Score (%)** | 68% | | | |
| **Combined Ecological Category** | **C** | | | |

The ecological importance and sensitivity of and the ecosystem services provided by the wetland are summarised as follows:

- The ecological importance and sensitivity of the wetland is **Moderate**. The wetland is relatively large and provides permanent reed-bed habitat which is likely to provide habitat for red-data bird species. The wetland is sensitive to changes in water quality and flow and (Table 13);
- The hydro-functional importance and sensitivity of the wetland is **Moderate**. The wetland does provide moderately important supporting and regulating ecosystem services, including flood attenuation, streamflow regulation and pollutant assimilation capabilities (Table 14);
- Provisioning (e.g. water for abstraction, harvestable materials, cultivated and livestock foods) and cultural (e.g. recreation, tourism, education and research) services provided by the wetland are **Low** (Table 15).
- The overall importance and sensitivity of the wetland is **Moderate.**

*Table 13. Ecological Importance and Sensitivity criteria for the wetland.*

| Ecological Importance and Sensitivity | Score |
|---|---|
| **Biodiversity Support** | |
| Presence of Red Data species | 2- Rare or endangered avifauna likely to utilise the wetland. |
| Populations of unique species | 1 – Relatively low probability of unique species |
| Migration/feeding/breeding sites | 1 – Low importance |
| **Average** | **1.66** |
| **Landscape Space** | |
| Protection status of wetland | 1 – Public area |
| Protection status of vegetation type | 0 – Vegetation has been transformed |
| Regional context of the ecological integrity | 2 – Moderate (PES C) |
| Size and rarity of the wetland types present | 2 – Moderate, relatively large, unchannelled valley bottom wetland |
| Diversity of habitat types | 1 – Low diversity – dominated by *P. australis* reedbeds |
| **Average** | **1.2** |
| **Sensitivity of Wetland** | |
| Sensitivity to changes in floods | 2 – Moderate sensitivity |
| Sensitivity to changes in low flows | 3 – High sensitivity |
| Sensitivity to changes in water quality | 1 – Low sensitivity |
| **Average** | **2** |
| **ECOLOGICAL IMPORTANCE AND SENSITIVITY** | **2 (Moderate)** |

*Table 14: Hydro-functional importance of the wetland.*

| Hydro-functional Importance | | | Score |
|---|---|---|---|
| Regulating & supporting benefits | Flood attenuation | | 2 |
| | Streamflow regulation | | 2 |
| | Water quality enhancement | Sediment trapping | 2 |
| | | Phosphate assimilation | 2 |
| | | Nitrate assimilation | 2 |
| | | Toxicant assimilation | 2 |
| | | Erosion control | 1 |
| | Carbon storage | | 2 |
| **HYDRO-FUNCTIONAL IMPORTANCE** | | | **1.5 (Moderate)** |

*Table 15: Direct human benefit importance of the wetland.*

| Direct Human Benefits | | Score |
|---|---|---|
| Subsistence benefits | Water for human use | 0 – No formal abstraction occurring |
| | Harvestable resources/cultivated foods | 1 – Reedbeds provide harvestable resources but unlikely to be heavily utilised |
| Cultural benefits | Cultural heritage | 0 |
| | Tourism and recreation<br>Education and research | 1 – Potential bird-watching opportunities |
| **DIRECT HUMAN BENEFITS** | | **0.4 (Low)** |

## 5.4 Sensitivity

Habitat zones (as described in Section 5.2.2) were assigned sensitivity ratings based on the proximity of the pipeline to estuarine habitat (Figure 12):

- Low sensitivity (Zone C and E): These zones are located outside of natural estuarine habitat and are unlikely to have any impact on aquatic biodiversity.
- Medium sensitivity (Zone A and B): These zones are located outside of natural freshwater and estuarine habitat but are in close enough proximity to warrant precautions that prevent impacts – particularly during the construction phase.
- High Sensitivity (Zone D): This zone traverses through or runs in very close proximity to natural estuarine habitat. Precautions must be taken to minimise impacts to natural estuarine habitat during the construction and operational phase.

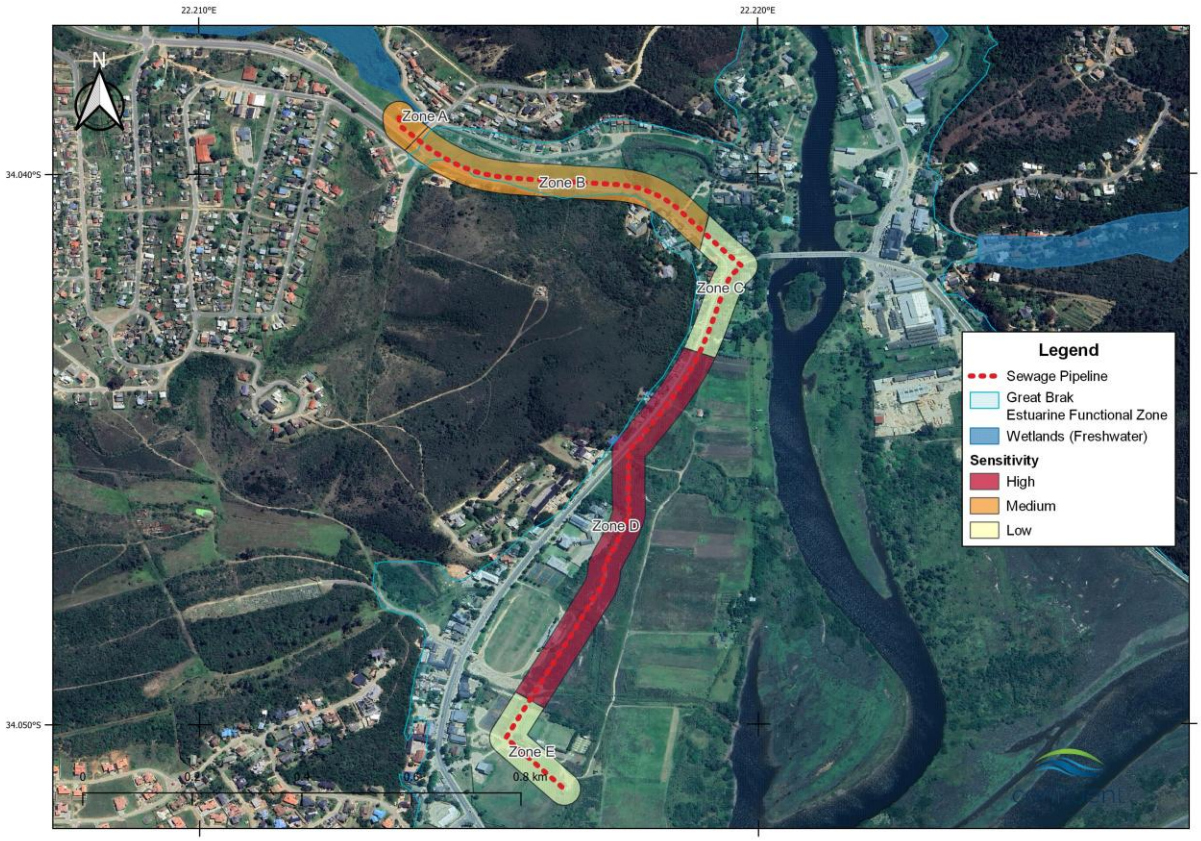



*Figure 12: Sensitivity of zones.*

## 6 IMPACT ASSESSMENT

The impact assessment follows the principals of the mitigation hierarchy which states that the next step along the hierarchy should only be followed once the previous step is no longer viable, and with valid reason (Figure 13). The impact assessment methodology is provided in the Appendix to this report.

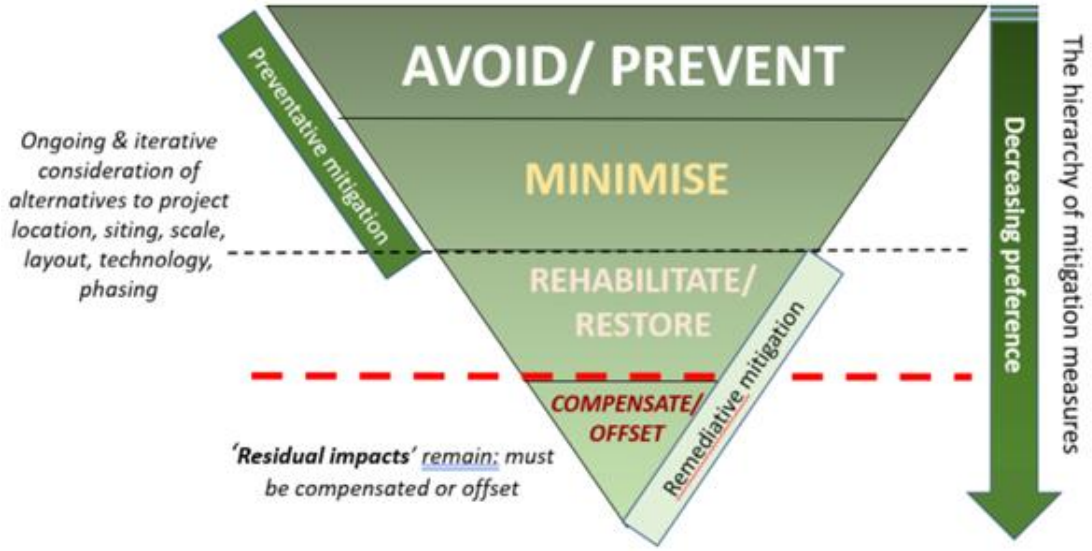



*Figure 13: The mitigation hierarchy as presented in (Brownlie et al., 2023). The lower steps in the diagram should only be considered once the steps above have been duly considered.*

## 6.1 Layout and Design Phase

**Impact 1: Sewer line design in the flood line (applicable to all zones)**

The entire pipeline route is located within the 1:50 and 1:100 year floodline. The primary concern around development of sewerage infrastructure in flood prone areas is prevention of the leakage of sewage during flood events which could pollute the wetland and estuary.

| | Without Mitigation | With Mitigation |
|---|---|---|
| **Intensity** | High | High |
| **Duration** | Brief | Brief |
| **Extent** | Local | Local |
| **Probability** | Likely | Probably |
| **Significance** | **-50: Minor** | **-40: Minor** |
| **Reversibility** | High | High |
| **Irreplaceability** | Low | Low |
| **Confidence** | High | High |

**Mitigation:**

- Air valves along sewer lines must be elevated above the 1:100-year flood line
- Sewer manhole covers should not be made of metal because of the risk of theft.
- Manholes must be designed to be watertight to prevent environmental contamination from leaking sewage and to avoid ingress of surface water during rainfall and flood events. Watertight manholes achieve this seal using components like gaskets on the manhole cover, proper joint sealing between sections, and leak-resistant pipe-to-manhole connections, which are essential for system integrity and cost efficiency.

## 6.2 Construction Phase

**Impact 2: Disturbance of estuarine and wetland habitat caused by construction activities.**

Construction activities in Zone A, B and D will take place in, or adjacent to natural freshwater and estuarine habitat. These activities include clearing of vegetation, excavation of trenches, stockpiling of materials and mixing of cement (e.g. for construction of manholes). Care must therefore be taken to minimise disturbance and impact on adjacent habitat.

| | Without Mitigation | With Mitigation |
|---|---|---|
| **Intensity** | High | Moderate |
| **Duration** | Short term | Short term |
| **Extent** | Limited | Very limited |
| **Probability** | Almost certain | Unlikely |
| **Significance** | **-60: Minor** | **-24: Negligible** |
| **Reversibility** | High | High |
| **Irreplaceability** | Low | Low |
| **Confidence** | High | High |

**Mitigation:**

- An Environmental Control Officer (ECO) must be appointed for the duration of the construction phase to monitor and report back on compliance with conditions of the environmental authorisation.

- Consult weather forecasts daily and weekly. Do not work during rainfall and minimise the storage of mobile materials in low-lying areas. Plan the construction area as if it could be inundated with floodwaters in the event of a significant rainfall event.
- Construction access for the pipeline through Zone D should utilise existing access points from Long Street. No new roads should be necessary.
- The width of the working area through Zone D must be as narrow as possible and must be clearly demarcated. Estuarine habitat outside of this demarcated area must be considered as No-Go areas.
- Revegetation of the pipeline through Zone D must be actively encouraged. The route is currently well covered by indigenous vegetation (e.g. sedges, *P. australis*, *Stenotaphrum secundatum* etc.). It is recommended that when trenching, a top layer of vegetation in association with 20-30 cm of soil should be removed and set aside for replanting or covering the filled in trench.
- Open trenching for sewer lines should be done in as short a stretch as possible and backfilled with material as soon as possible to reduce the likelihood of material loss in the event of flooding
- Keep a skip on site so that any waste materials can be conveniently discarded and removed. This includes small amounts of dirty water, such as that used for mixing concrete.
- Equipment and materials lay-down areas should be located away from estuarine habitat and stormwater channels leading into the estuary. Minimise the storage of loose materials in case of a flood event that could wash them into the estuary.
- Post-construction site clean-up must be completed to ensure the entire site footprint and surrounding area has been cleared of litter and any waste materials associated with construction. The ECO should be informed of the construction close-out and complete an inspection to ensure this measure has been implemented.
- The pipeline route through Zone D must be routinely inspected for the establishment of alien invasive plant species. This must be done at a high frequency following construction (i.e. monthly) and can be reduced once natural vegetation along the pipeline has recovered. These must be controlled by hand. No aerial application of herbicides is permitted. Herbicides may only be applied to cut-stumps and must be registered for use on the target plant species.

## 6.3 Operational Phase

**Impact 3: Pollution of wetland and estuarine habitat caused by pipeline blockages.**

There is a high likelihood that occasional leaks will occur due to blockages or damaged sections of the pipeline. Standard operating procedures must be developed and implemented in order to detect, respond to and contain leaks when these do occur. The objective is to reduce the risk of pollution entering the estuary.

| | Without Mitigation | With Mitigation |
|---|---|---|
| **Intensity** | High | Moderate |
| **Duration** | Brief | Brief |
| **Extent** | Local | Local |
| **Probability** | Almost certain | Almost certain |
| **Significance** | **-60: Minor** | **-54: Minor** |
| **Reversibility** | High | High |
| **Irreplaceability** | Low | Low |
| **Confidence** | High | High |
| **Mitigation:** | | |

- When blockages to sewerage infrastructure within the EFZ occur, the maintenance team should ensure a honey-sucker is on standby to mop up any spills or overflows for removal and disposal at the Wastewater Treatment Works.
- Any serious sewage spills that result in large quantities of sewage leaking from a pump station or manhole must be contained in a temporary coffer dam which can be constructed using sandbags for the walls and plastic sheeting as a base. From here, honey-suckers can collect sewage for removal.
- Any water-tight seals around manholes, joints or other access points that must be broken for maintenance should be replaced thereafter to ensure the mitigation measures to prevent water ingress or sewage leakage are maintained under flood scenarios.
- Keep sewer lines clear of dense vegetation to facilitate access and reduce the risk of roots cracking sewer lines.

**Impact 4: Disturbance of wetland and estuarine habitat caused by maintenance on pipelines (Zone A, B and Zone D).**

The operational phase primarily relates to maintenance and repairs required for the sewer lines within the EFZ. The proximity of the pipeline to estuarine habitat increases the risk that contractors appointed for maintenance could inadvertently create impacts to the estuary. Mitigation measures aim to reduce the risk of damage or disturbance to nearby estuarine or wetland habitat.

| | Without Mitigation | With Mitigation |
|---|---|---|
| **Intensity** | High | Moderate |
| **Duration** | Short term | Short term |
| **Extent** | Limited | Very limited |
| **Probability** | Almost certain | Unlikely |
| **Significance** | **-60: Minor** | **-24: Negligible** |
| **Reversibility** | High | High |
| **Irreplaceability** | Low | Low |
| **Confidence** | High | High |

**Mitigation:**

- All of the mitigation measures provided for the construction phase are applicable to maintenance work where applicable.

# 7 DWS RISK ASSESSMENT

Risks of activities associated with the phases of sewage pipeline upgrade to the unchannelled valley-bottom wetland were determined according the risk assessment matrix developed as part of GN 4167 of 2023 (Section 21 (c) and (i) water use Risk Assessment Protocol). The first stage of the risk assessment is the identification of environmental activities, aspects and impacts and essentially mirror those that were identified in the impact assessment (see Section 6). The intensity of impact to receptors and resources (i.e. hydrology, water quality, geomorphology, biota and vegetation) is rated (from 0 to 5, representing negligible and very high impact, respectively), which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. Risks were then quantified based on the anticipated spatial scale, duration and likelihood of occurrence and assumed the full implementation of recommended mitigation measures described in Section 6. A short section of the pipeline lies adjacent to a modified, artificially channelised section of the wetland. Impacts that will be affect

the wetland (and measures that must be implemented in order to mitigate these impacts) are described in detail in Section 6 and are summarised as follows:

Design Phase

- Leaking manholes caused by stormwater ingress.

Construction Phase

- Erosion and sedimentation of the wetland due to clearance of vegetation and stockpiling of soil during the trench excavation.
- Contamination of watercourses by solid waste and chemical pollutants caused by construction activities.
- Physical disturbance of aquatic habitat caused by construction activities (including excavation of trenches, operation of vehicles, stockpiling of materials, management of waste).

Operational Phase

- Leaking manholes caused by blockages in the pipeline.
- Future maintenance of the pipeline.

*Table 16: DWS risk assessment of the proposed Great Brak sewage pipeline upgrade on wetland habitat.*

| Phase | Activity | Impact | Potentially affected watercourses | | | Intensity of Impact on Resource Quality | | | | | Overall Intensity (max = 10) | Spatial scale (max = 5) | Duration (max = 5) | Severity (max = 20) | Importance rating (max = 5) | Consequence (max = 100) | Likelihood (Probability) of impact | Significance (max = 100) | Risk Rating (with mitigation) | Confidence level |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Abiotic Habitat (Drivers) | | | Biota | | | | | | | | | | | |
| | | | Name/s | PES | EIS | Hydrology | Water Quality | Geomorph | Vegetation | Fauna | | | | | | | | | | |
| LAYOUT | Periodic flooding | Leaking manholes caused by stormwater ingress | Unchannelled VB Wetland | C | High | 1 | 2 | 1 | 1 | 2 | **4** | 1 | 1 | **6** | **4** | **24** | 60% | **14.4** | L | High |
| CONSTRUCTION | Operation of machinery and construction vehicles | Spills and leaks of fuel and oil | Unchannelled VB Wetland | C | High | 0 | 1 | 0 | 1 | 1 | **2** | 1 | 1 | **4** | **4** | **16** | 20% | **3.2** | L | High |
| | | Disturbance of wetland habitat and water quality | Unchannelled VB Wetland | C | High | 0 | 1 | 0 | 1 | 1 | **2** | 1 | 1 | **4** | **4** | **16** | 20% | **3.2** | L | High |
| | Construction workers working adjacent to delineated area of wetland | Disturbance of wetland habitat and water quality | Unchannelled VB Wetland | C | High | 0 | 1 | 0 | 1 | 1 | **2** | 1 | 1 | **4** | **4** | **16** | 40% | **6.4** | L | High |
| | Excavation of trench to lay new pipeline | Erosion and sedimentation caused by clearing of vegetation and excavation of trench | Unchannelled VB Wetland | C | High | 0 | 1 | 1 | 1 | 1 | **2** | 1 | 1 | **4** | **4** | **16** | 40% | **6.4** | L | High |
| | Construction of manhole | Pollution caused by mixing of cement | Unchannelled VB Wetland | C | High | 0 | 1 | 0 | 1 | 1 | **2** | 1 | 1 | **4** | **4** | **16** | 20% | **3.2** | L | High |
| | Stockpiles and laydown areas | Sedimentation and pollution caused by erosion of stockpiles | Unchannelled VB Wetland | C | High | 0 | 1 | 1 | 1 | 1 | **2** | 1 | 1 | **4** | **4** | **16** | 40% | **6.4** | L | High |
| | | Disturbance of wetland habitat caused by placement of laydown areas and stockpiles | Unchannelled VB Wetland | C | High | 1 | 0 | 1 | 1 | 1 | **2** | 1 | 1 | **4** | **4** | **16** | 20% | **3.2** | L | High |
| OPERATIONAL | Operation of Sewage Pipeline | Leaking manholes caused by blocked pipelines | Unchannelled VB Wetland | C | High | 1 | 2 | 1 | 1 | 2 | **4** | 1 | 1 | **6** | **4** | **24** | 100% | **24** | L | High |

# 8 CONCLUSION

The majority of the upgrades to the sewage pipeline will occur in transformed sections of the EFZ (Zone A, B, C and E) and no estuarine habitat will be directly disturbed in these zones. Where the pipeline does traverse estuarine habitat (Zone D), it does so within an existing servitude. Impacts to estuarine wetland habitat can however be mitigated to a low or negligible significance of impact and it is recommended that authorisation for the upgrade is granted.

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Van Niekerk, L., Taljaard, S., Adams, J.B., Fundisi, D., Huizinga, P., Lamberth, S.J., Mallory, S., Snow, G.C., Turpie, J.K., Whitfield, A.K. and Wooldridge, T.H. (2014). *Desktop Provisional EcoClassification of the temperate estuaries of South Africa.* Water Research Commission Report No. K5/2187. Pretoria.

# APPENDIX 1: IMPACT ASSESSMENT METHODOLOGY

Individual impacts for the construction and operational phase were identified and rated according to criteria which include their intensity, duration and extent. The ratings were then used to calculate the consequence of the impact which can be either negative or positive as follows:

***Consequence*** = *type x (intensity + duration + extent)*

Where type is either negative (i.e. -1) or positive (i.e. 1). The significance of the impact was then calculated by applying the probability of occurrence to the consequence as follows:

***Significance*** = *consequence x probability*

The criteria and their associated ratings are shown in Table 17.

*Table 17: Categorical descriptions for impacts and their associated ratings*

| Rating | Intensity | Duration | Extent | Probability |
|---|---|---|---|---|
| **1** | Negligible | Immediate | Very limited | Highly unlikely |
| **2** | Very low | Brief | Limited | Rare |
| **3** | Low | Short term | Local | Unlikely |
| **4** | Moderate | Medium term | Municipal area | Probably |
| **5** | High | Long term | Regional | Likely |
| **6** | Very high | Ongoing | National | Almost certain |
| **7** | Extremely high | Permanent | International | Certain |

Categories assigned to the calculated significance ratings are presented in Table 18.

*Table 18: Value ranges for significance ratings, where (-) indicates a negative impact and (+) indicates a positive impact*

| Significance Rating | Range | |
|---|---|---|
| **Major (-)** | -147 | -109 |
| **Moderate (-)** | -108 | -73 |
| **Minor (-)** | -72 | -36 |
| **Negligible (-)** | -35 | -1 |
| **Neutral** | 0 | 0 |
| **Negligible (+)** | 1 | 35 |
| **Minor (+)** | 36 | 72 |
| **Moderate (+)** | 73 | 108 |
| **Major (+)** | 109 | 147 |

Each impact was considered from the perspective of whether losses or gains would be irreversible or result in the irreplaceable loss of biodiversity of ecosystem services. The level of confidence was also determined and rated as low, medium or high (Table 19).

*Table 19: Definition of reversibility, irreplaceability and confidence ratings.*

| Rating | Reversibility | Irreplaceability | Confidence |
|---|---|---|---|
| **Low** | Permanent modification, no recovery possible. | No irreparable damage and the resource isn't scarce. | Judgement based on intuition. |
| **Medium** | Recovery possible with significant intervention. | Irreparable damage but is represented elsewhere. | Based on common sense and general knowledge |
| **High** | Recovery likely. | Irreparable damage and is not represented elsewhere. | Substantial data supports the assessment |

# APPENDIX G: TERRESTRIAL BIODIVERSITY SITE VERIFICATION AND COMPLIANCE STATEMENT REPORT

# SITE VERIFICATION AND COMPLIANCE STATEMENT REPORT FOR THE PROPOSED UPGRADE OF A SEWERAGE PIPELINE IN GREAT BRAK, WESTERN CAPE

## Terrestrial Biodiversity



| | |
|---|---|
| **Date:** | **17 August 2025** |
| **Version:** | Final |
| **Author:** | JA van der Walt (Pr. Sci.Nat: 116549) |
| **EAP:** | Sharples Environmental Services |
| **Applicant:** | Mossel Bay Municipality |

ADVANCED ENVIRONMENTAL CORPORATION

# EXECUTIVE SUMMARY

| | |
|---|---|
| **VEGETATION UNITS** | **National:** Groot Brak Dune Strandveld (CR)<br>**Vlok Veg Map**: Brandwag Fynbos Renosterveld Thicket and Groot Brak River Saltmarsh.<br><br>The original vegetation has been almost fully transformed into roads, pavements, and lawns. The remaining natural vegetation is dominated by non-native species, with no intact plant communities remaining. |
| **DEVELOPMENT FOOTPRINT SIZE AND LEVEL OF TRANSFORMATION** | No intact communities of natural vegetation remain in the proposed development footprint, which is approximately 2,100 m long and 5 m wide. |
| **LANDUSE PLANNING** | Smaller sections of the proposed development footprint fall within a CBA wetland and estuary, but these areas are transformed/degraded and mostly dominated by non-native plant species. |
| **CONNECTIVITY** | Portions of the proposed development footprint can be regarded as a buffer for the Groot Brak estuary. |
| **PLANT SPECIES OF CONSERVATION CONCERN** | No plant species of conservation concern were recorded in the proposed development footprint |
| **ANIMAL SPECIES OF CONSERVATION CONCERN** | No animal species of conservation concern were recorded in the proposed development footprint |
| **WATER COURSES AND WETLANDS** | The proposed pipeline crosses artificial drainage ditches created to direct stormwater into low-lying areas between the Groot Brak estuary and the urban development along Lang Street. |
| **MAIN CONCLUSIONS** | The site has been assessed as having **low** sensitivity from a terrestrial biodiversity perspective, contrary to the very high rating assigned in the Environmental Screening Tool. This determination is supported by the absence of intact natural and threatened vegetation due to urban transformation. The CBAs in the proposed development footprint will not be significantly impacted and should return to their current state within two years. |

**DECLARATION OF INDEPENDENCE IN TERMS OF CHAPTER 5 OF THE NATIONAL ENVIRONMENTAL MANAGEMENT (NEMA), ACT 107 OF 1998:**

I, Johannes Adriaan van der Walt, ID: 6706225172085, declare that:

• I act as the independent environmental specialist in this report;

• I will perform the work relating to the report objectively, even if this results in views and findings that are not favourable to the applicant;

• I declare that there are no circumstances that may compromise my objectivity in performing such work;

• I have expertise in conducting environmental impact assessments and specialist reports, including knowledge of the Act, Regulations, and any guidelines that have relevance to the proposed activity;

• I will comply with the Act, Regulations, and all other applicable legislation;

• I do not have and will not have any vested interest (either business, financial, personal, or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations

**ENVIRONMENTAL SPECIALIST:**

Johannes Adriaan van der Walt

Tel: +27 (82) 305 8945

Email: admin@aecorp.co.za

**Signature** **Date:** 17 August 2025



# Abridged Curriculum Vitae – Johannes Adriaan van der Walt

**PROFESSIONAL REGISTRATION**

Professional Natural Scientist: South African Council for Natural Science Professionals (SACNASP) nr116549

**QUALIFICATIONS**

MTech Nature Conservation (cum laude) 2014, CPUT

BTech Nature Conservation (cum laude) 2012, CPUT

NDip Nature Conservation (cum laude) 1994, CPUT

**LANGUAGES**

English – fluent
Afrikaans – fluent

**EXPERIENCE**

37 years of biodiversity conservation and botanical experience in the Fynbos and Succulent Karoo Biomes

**EMPLOYMENT**

1988 – 2006 CapeNature

2007 – 2010 Botanical Insight cc

2010 - 2017 CapeNature

2017 – present: Director at Advanced Environmental Corporation (Pty) Ltd and Fynbos Fish Trust trustee

**BOTANICAL, ANIMAL, AND BIODIVERSITY EXPERTISE WAS GAINED THROUGH:**

- Employment as a nature conservationist with CapeNature for 25 years;
- biodiversity assessments (including botanical, animal species, and biodiversity) since 1994;
- participating as a SANBI-CREW volunteer for botanical assessments for threatened plants;
- participating in the Protea Atlas project as a volunteer;
- contributing as a Red-list assessor for a selection of Fynbos species;
- conservation initiatives for threatened flora with CapeNature;
- compliance monitoring of wildflower shows (Clanwilliam, Leipoldtville, Porterville, Tulbagh, and Darling) between 1994 and 2006;
- compilation of species lists for protected areas;
- compilation of specialist botanical assessments for DEA&DP and private landowners since 2017;
- discovering five new plant species in the CFR since 2019;
- keeping up to date with new plant descriptions and taxonomic revisions in the CFR and
- keeping an extensive private collection of applicable literature, including field guides and other botanical reference books.

**PUBLICATIONS:**

- Author and co-author of 14 biodiversity conservation and botanical scientific papers

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# 1. INTRODUCTION

## 1.1 Background

The Mossel Bay Municipality is in the process of upgrading its sewage system in Groot Brakrivier, and one of these upgrades includes the installation of a new Ø300mm pipeline from Amy Searle Street/Greenhaven, past the cricket field sewerage pump station to Lang Street. The Environmental Assessment Practitioner (EAP) appointed by the municipality is Sharples Environmental Services. The proposed activities trigger environmental regulations promulgated under the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("NEMA") and require environmental authorization.

## 1.2 Environmental Screening Tool Report

Regulation 16(1)(b)(v) of the Environmental Impact Assessment Regulations requires an applicant for an Environmental Authorisation to submit a report generated by the Environmental Screening Tool as part of their application. This tool, developed by the Department of Forestry, Fisheries, and the Environment (DFFE), became operational on July 5, 2019, as announced in the Government Gazette. The screening tool report will identify the environmental sensitivities that intersect with the proposed development footprint as defined by the applicant, as well as the relevant protocols that the applicant would need to follow. The screening tool is accessible at https://screening.environment.gov.za.

An environmental screening tool report for the proposed development was completed on the 25th of July 2025. A **"Very High"** environmental sensitivity rating was indicated for the Terrestrial Biodiversity theme. As per the procedures for the assessment and minimum criteria for reporting on identified environmental themes (Terrestrial Biodiversity) in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation (October 2020), "*An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of "**very high sensitivity**" for terrestrial biodiversity, must submit either a Terrestrial biodiversity Specialist Assessment Report or a Terrestrial Biodiversity Compliance Statement, depending on the outcome of a site inspection/site sensitivity verification undertaken*".

The site sensitivity verification was conducted on 19 and 20 July 2025, and the outcome, as reported in **Section 7** of this report, indicated a **low sensitivity** towards terrestrial biodiversity and therefore a terrestrial biodiversity compliance statement was compiled and included in this report.

# 2. TERMS OF REFERENCE

## 2.1 Site verification

-The assessment must contextualize the study area to provide a baseline description of the ecological system; the terrestrial plant biodiversity and any significant terrestrial features must be provided.

-The assessment must identify the following:

- Terrestrial critical biodiversity areas (CBAs)
- Terrestrial ecological support areas (ESAs)
- Protected areas as defined by the National Environmental Management: Protected Areas Act, 2004
- Priority areas for protected area expansion
- Indigenous forests

-Undertake a site visit and ground-truth biodiversity information. Where required, undertake baseline surveys and/or studies to supplement the information base and inform the assessment.

-Estimate the trajectory of change in the context of the 'No-Go' Alternative due to existing impacts.

-Assessment criteria to be aligned with the promulgated Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes (October 2020).

Following the site verification visit, in which the Specialist confirms the presence, likely presence or confirmed absence of a SCC identified within the site identified as "medium" sensitivity by the screening tool, the Specialist is to confirm the need for a Compliance Statement or a Terrestrial Plant Species Assessment and undertake this report/statement following the Gazetted Protocol (October 2020).

## 2.2 Compliance statement

The compliance statement must:

- be applicable within the study area;
- confirm that the study area is of "low" sensitivity for terrestrial biodiversity; and
- indicate whether the proposed development will have any impact on the biodiversity feature.

Minimum Requirements Include:

- contact details, relevant experience, and the SACNASP registration number of the specialist preparing the compliance statement, including a curriculum vitae.
- a signed statement of independence by the specialist;

- a statement on the duration, date, and season of the site inspection and the relevance of the season to the outcome of the assessment;
- a description of the methodology used to undertake the site survey and prepare the compliance statement, including equipment and modelling used where relevant;
- in the case of a linear activity, confirmation from the terrestrial biodiversity specialist that, in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase;
- where required, proposed impact management actions and outcomes or any monitoring requirements for inclusion in the EMPr;
- a description of the assumptions made and any uncertainties or gaps in knowledge or data;
- the mean density of observations/ number of sample sites per unit area; and
- any conditions to which the compliance statement is subjected.

A signed copy of the compliance statement must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.

### 2.3. Legal requirements applicable to the specialists conducting assessments

The Environmental Impact Assessment Regulations that were published on 4 December 2014 and amended on 7 April 2017, state that:

(1) an EAP and a specialist, appointed in terms of regulation 12(1) or 12(2), must-

(a) be independent;

(b) have expertise in conducting environmental impact assessments or undertaking specialist work as required, including knowledge of the Act, these Regulations, and any guidelines that have relevance to the proposed activity;

(c) ensure compliance with these Regulations;

(d) perform the work relating to the application objectively, even if this results in views and findings that are not favourable to the application;

(e) take into account, to the extent possible, the matters referred to in regulation 18 when preparing the application and any report, plan, or document relating to the application; and

(f) disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in the possession of the EAP and, where applicable, the specialist, that reasonably has or may have the potential of influencing-

(i) any decision to be taken concerning the application by the competent authority in terms of these Regulations; or

(ii) the objectivity of any report, plan or document to be prepared by the EAP or specialist, in terms of these Regulations for submission to the competent authority; unless access to that information is protected by law, in which case it

must be indicated that such protected information exists and is only provided to the competent authority.

(2) In the event where the EAP or specialist does not comply with sub-regulation (1)(a), the proponent or applicant must, before conducting public participation as contemplated in chapter 5 of these Regulations, appoint another EAP or specialist to externally review all work undertaken by the EAP or specialist, at the applicant's cost.

(3) An EAP or specialist appointed to externally review the work of an EAP or specialist as contemplated in sub-regulation (2) must comply with sub-regulation (1).

### 2.4 Report Content Requirements

The following legislation and guideline documents are applicable and were adhered to in compiling this report:

#### 2.4.1 Guidelines documents

a) Department of Environmental Affairs and Development Planning (DEA&DP) Guidelines for Involving Biodiversity Specialists in the EIA Process (Brownlie 2005).

b) Ecosystem Guidelines for Environmental Assessments in the Western Cape (Cadman 2016).

c) The Western Cape Biodiversity Spatial Plan Handbook (Pool-Stanvliet *et al*. 2017)

d) South African National Biodiversity Institute (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.

#### 2.4.2 Legal documents

a) Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("NEMA"), when applying for Environmental Authorisation" ("the Protocols") (GN No. 320 as published in Government Gazette No. 43110 on 20 March 2020) came into effect on 09 May 2020 the Protocol.

b) Appendix 6 of the 2014 EIA Regulations (National Environmental Management Act, 1998 (Act No. 107 of 1998)

## 3. LIMITATIONS AND ASSUMPTIONS

The field surveys for this report were conducted on July 19 and 20, 2025. The findings from this specialist assessment are based on a two-day site visit, which means some species might not have been recorded. However, the proposed development footprint was highly altered, reducing the likelihood that species were missed. Confidence in the findings is high. It is unlikely that a full terrestrial biodiversity assessment would reveal additional findings that would significantly impact the outcome.

# 4. STUDY AREA

## 4.1 Location

Groot Brakrivier is situated on the southern coast of the Western Cape Province, South Africa, as illustrated in **Figure A.** The town is located on both sides of the Groot Brakrivier estuary.

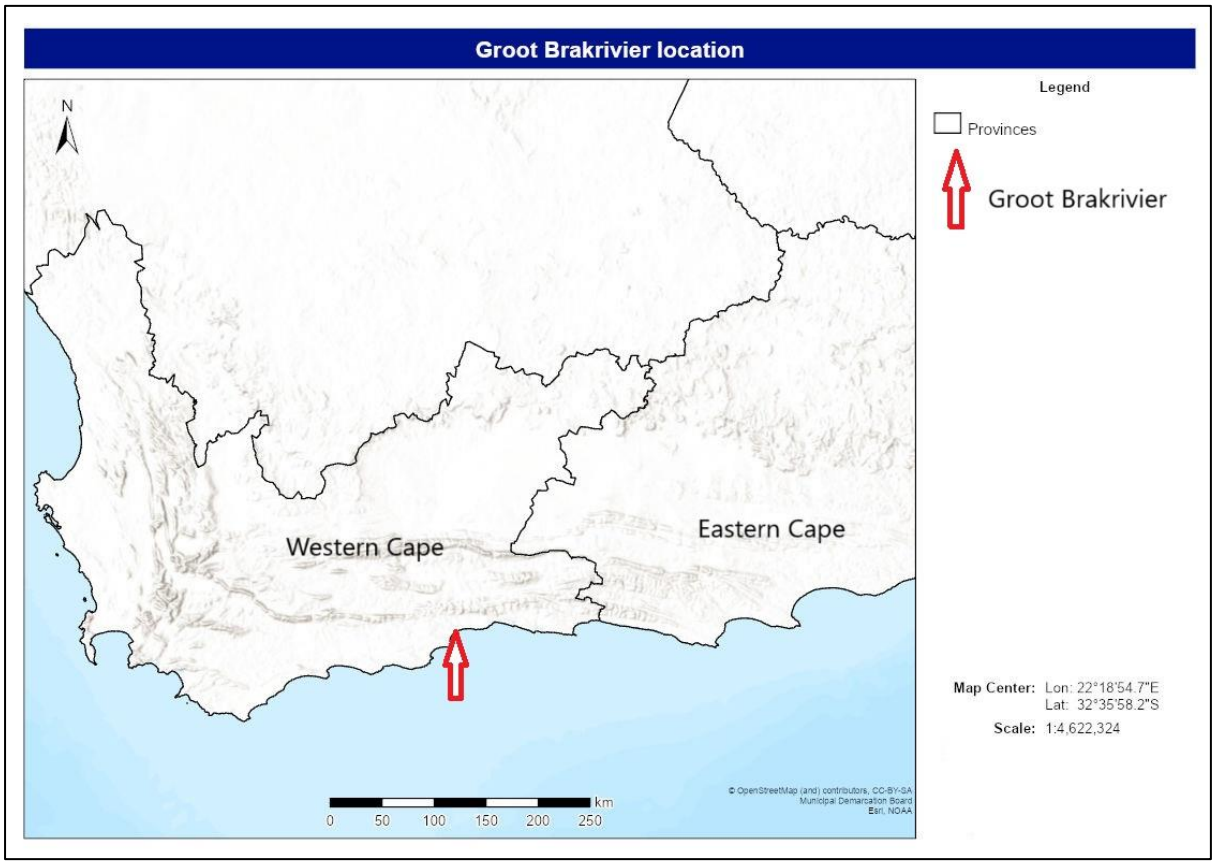



**Figure A.** Map showing the location of Groot Brakrivier.

## 4.2 Proposed Development Footprint (PDI) and Project Area of Influence (PAOI)

The proposed development footprint is indicated as a purple polygon in **Figure B**. This purple polygon is the route of the old sewage pipeline that is due for an upgrade. The development footprint will The proposed sewage pipeline earmarked for this upgrade will be approximately 2,1 km in length, with a construction footprint of 5 m in width for installation during the construction phase. The anticipated impacts will mostly occur during the construction phase of the project when the municipality will dig a trench along the proposed development footprint for the replacement of the sewage pipeline. These impacts are not expected to extend beyond the demarcated footprint. The PAOI is therefore treated here as the development footprint within which direct impacts will occur.

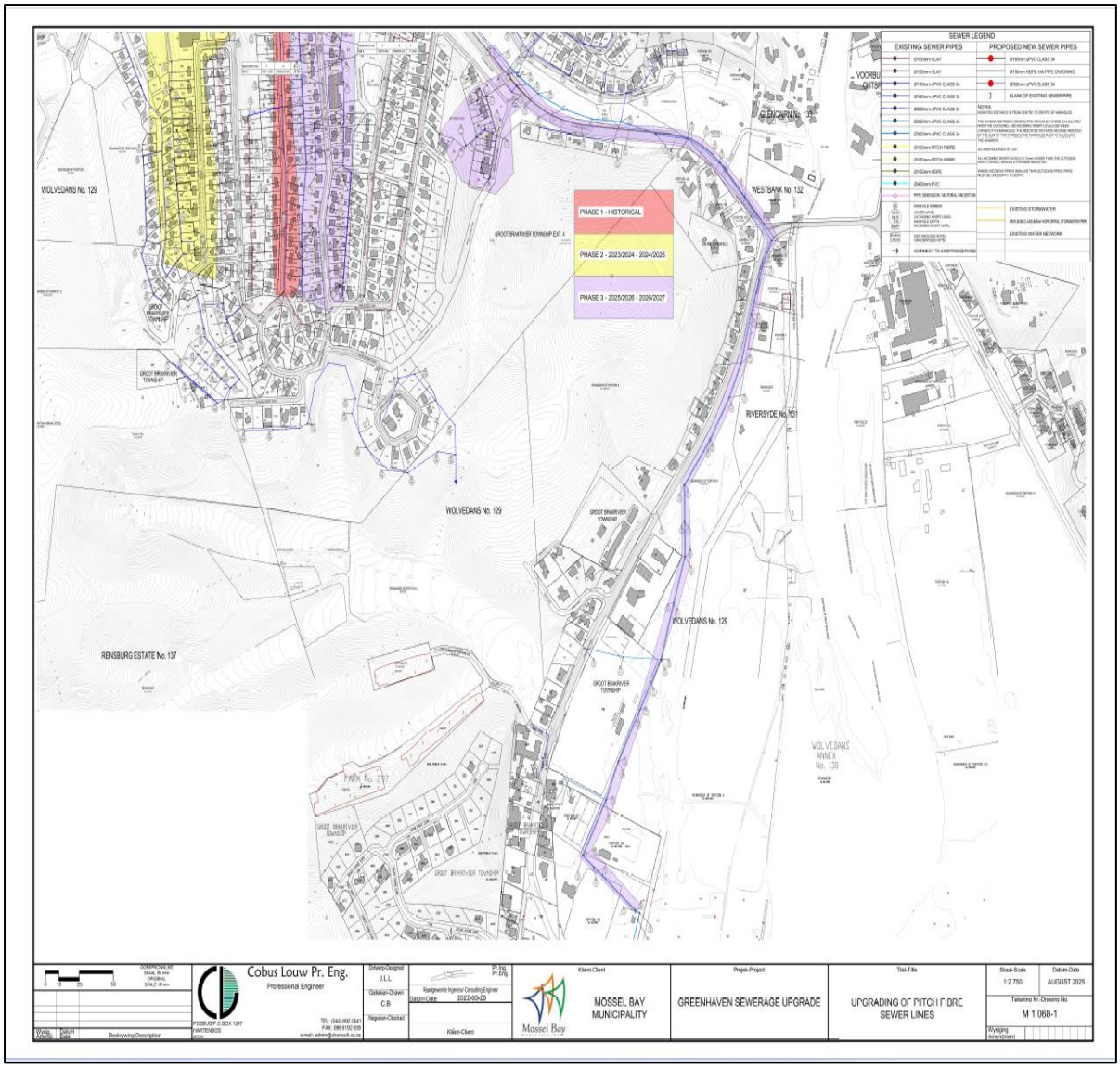



**Figure B:** The route of the proposed sewage pipeline upgrade is indicated with a purple polygon

## 5. METHODOLOGY

### 5.1 Desktop assessment

The specialist used various sources of information to assess the sensitivity of the terrestrial biodiversity within the proposed development footprint.

5.1.1 **The Environmental Screening Tool Report**: The environmental screening tool report indicates the sensitivity of the terrestrial biodiversity theme across the proposed development and lists sensitivity features that could potentially be impacted by the proposed development.

5.1.2 **CapeFarmMapper 3**: The following spatial data were obtained from CapeFarmMapper 3 (CFM 3). CMF 3 is GIS software provided by the Western Cape Department of Agriculture, available at https://gis.elsenburg.com/apps/cfm/.

- Vegetation units
- Vegetation unit threat status
- Spatial planning data: Critical Biodiversity Areas, Ecological Support Areas.

5.1.3 **iNaturalist**: iNaturalist is a crowdsourced species identification system and an organism occurrence recording tool. Sightings are graded, and only research-grade sighting is used in specialist assessments.

5.1.4 **Google Earth**: Google Earth is a web and computer program created by Google that renders a 3D representation of Earth based primarily on satellite imagery but also on street-level views. This imagery is useful when historical aerial imagery is needed of a proposed development footprint. It also gives a good perspective of the level of transformation before a field assessment is undertaken.

5.1.5 **Other sources of data**: Additional data were collected from a range of pertinent sources, including Mucina & Rutherford (2006), the National Vegetation Map (2018), and relevant biodiversity plans (Pool-Stanvliet 2017, SANBI 2021).

## 5.2 Field assessment

The field assessment was conducted over two days (19 and 20 July 2023). The specialist walked the proposed development footprint from west while collecting data. All plant and tree species were noted, photographed, and identified on-site if possible. Plants and trees that could not be identified during the field survey were later identified using available literature and taxonomic experts. The specialist also took drone imagery to give a better view of the proposed development footprint.

# 6. RESULTS: DESKTOP ASSESSMENT

## 6.1 Climate

The Mean Annual Precipitation (MAP) for Groot Brakrivier is approximately 459 mm, with approximately 40% of the rain falling in summer (October–March) and 60% in winter (April–September). Mean daily maximum and minimum temperatures are 26.8°C and 7.7°C for February and July, respectively (Mucina & Rutherford 2006).

## 6.2 Topography, geology, and soils

The proposed development footprint is located on a relatively flat area with a very slight gradient from west to east. The highest elevation on the proposed pipeline upgrade is at 10 metres above sea level (MASL), while the lowest point is at 1 MASL. The area is mostly underlain by the clastic sedimentary rocks of the Kirkwood Formation (Mesozoic Uitenhage Group). In the east, quartzite, schist, and phyllite of the Kaaimans Group (Namibian Erathem) and Cape Granite (edges of high coastal cliffs) are also present. In parts along the coast, these rocks are covered by the unconsolidated dune sand of the Strandveld. See **Figure C** for a map of the soil types present at the proposed development footprint (Mucina & Rutherford 2006).

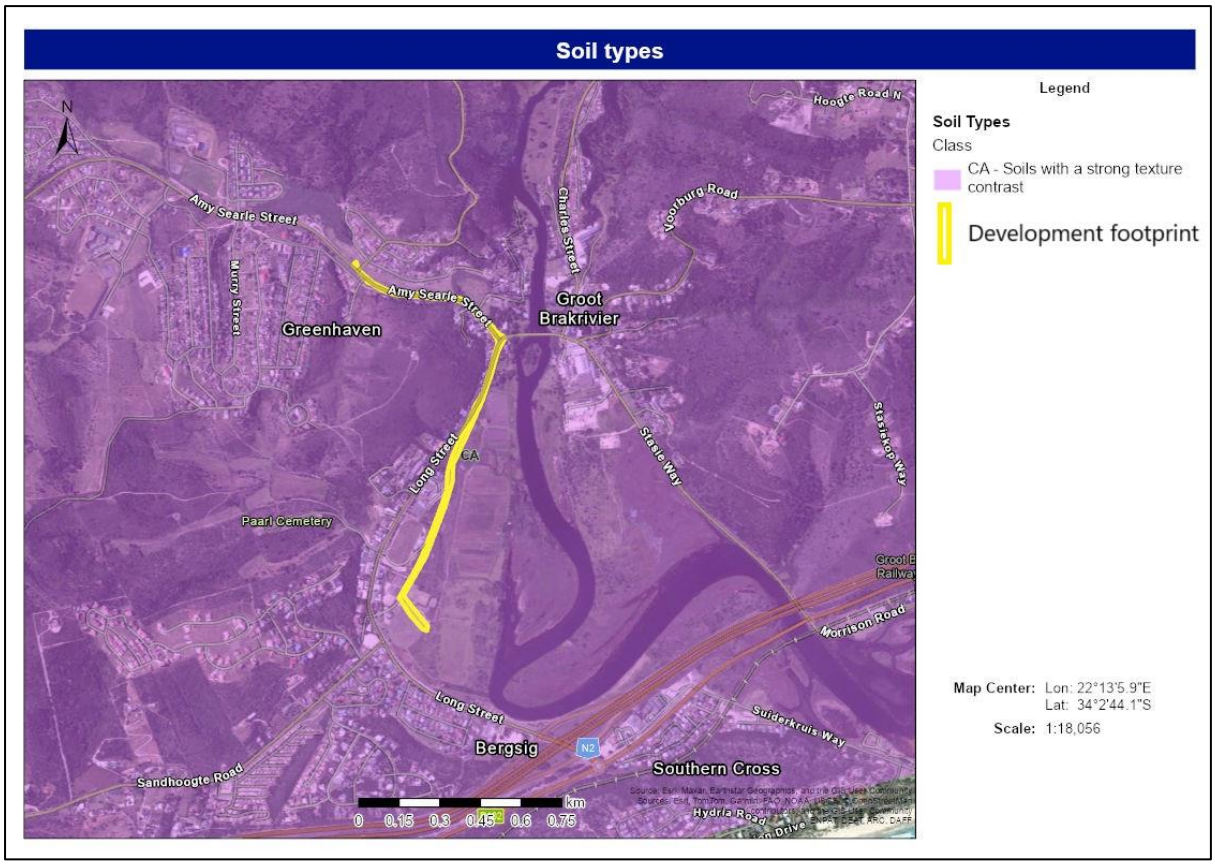



**Figure C:** Map indicating the different soil types on and near the proposed development footprint

## 6.3 VEGETATION

### 6.3.1 General Context

Groot Brakrivier town, where the proposed development is situated, is part of the Cape Floristic Region (CFR). The CFR is renowned for its botanical diversity, containing over 9,000 vascular plant species, 69% of which are endemic (Goldblatt & Manning 2000). The CFR encompasses most of the Cape Fold Mountains and coastal lowlands stretching from Niewoudtville to Gqeberha. The Fynbos Biome consists of three primary vegetation complexes: Fynbos, Renosterveld, and Western Strandveld. The Fynbos complex is the most extensive, covering 67% of the Fynbos Biome, while Western Strandveld covers the smallest area within the Fynbos Biome. The proposed development site is located within this Western Strandveld complex. The Western Strandveld complex is subdivided into nine different vegetation units, of which one, Groot Brak Dune Strandveld, is the mapped vegetation unit across the proposed development footprint.

### 6.3.2 Local vegetation context

Groot Brak Dune Strandveld (**Figure D**) is listed as Critically Endangered (CR), with a Target of 36%. None of it is protected in statutory conservation areas, and only about 1% is safeguarded in private reserves (George, Kanon, Blydskap, Kwelanga). Nearly half of the region has been transformed for agriculture, through road construction or coastal settlement development. Erosion levels vary, ranging from moderate to high, with some areas classified as low. In 1990, 53% of the original extent of this vegetation was still present, and in 2018, this had declined to 45%, placing the ecosystem type at risk of collapse.

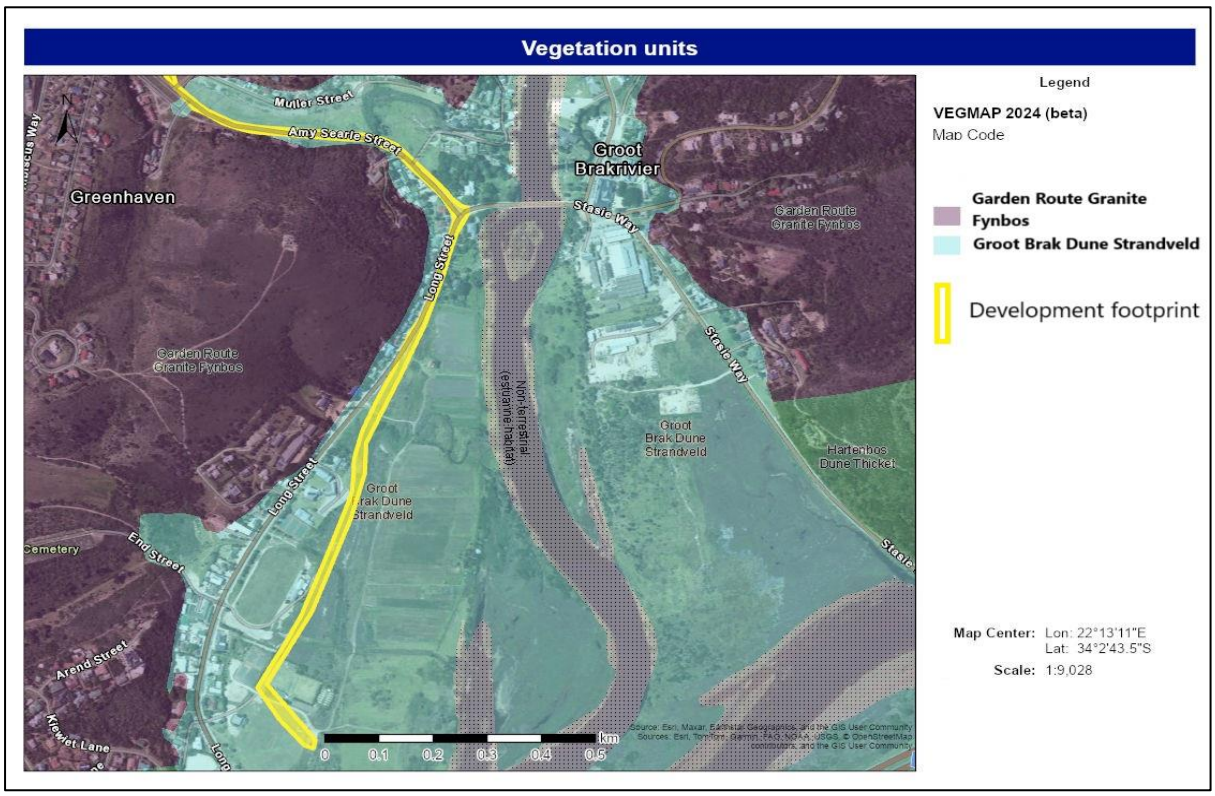



**Figure D:** Vegetation unit map for the proposed development footprint

### 6.3.3 Vlok Vegmap

The Vlok Vegmap composite vegetation map of the Riversdale, Little Karoo, Swartberg, and Garden Route regions of the Southern Cape, as classified by Jan Vlok, was mapped at a scale of 1:50,000 for various projects and combined into one continuous layer. The Vlok Vegmap mapped the vegetation unit along Amy Searle Street as Brandwag Fynbos Renosterveld Thicket and the section along Lang Street as Groot Brak River Saltmarsh, as displayed in **Figure E.** There is no conservation statuses linked to the vegetation units as mapped by the Vlok Vegmap.

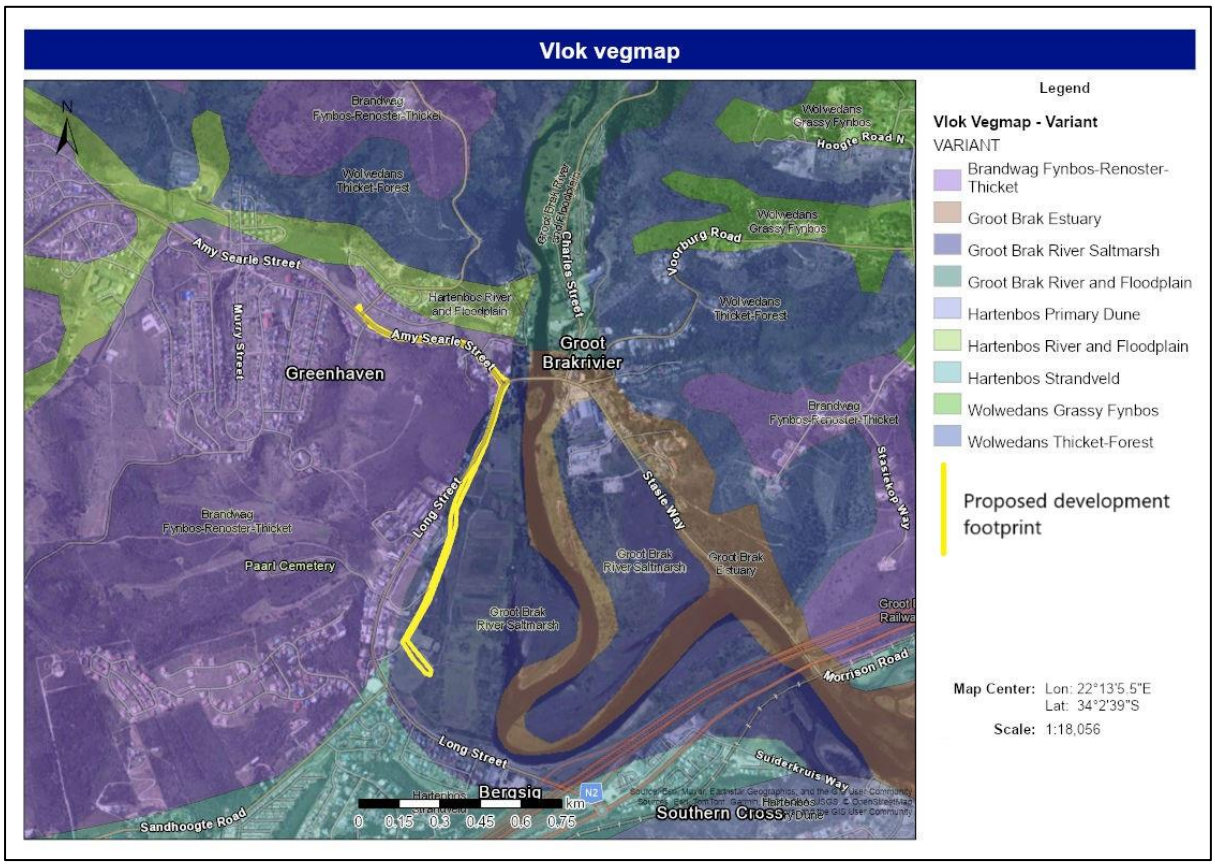



**Figure E:** The Vlok Vegmap for the proposed development footprint

### 6.4 Plant species

According to Mucina & Rutherford (2006), important taxa in Groot Brak Dune Strandveld include: **Important Taxa** Small Trees: *Chionanthus foveolatus*, *Clausena anisata*. Tall Shrubs: *Azima tetracantha*, *Cussonia thyrsiflora*, *Diospyros dichrophylla*, *Euclea racemosa* subsp. *racemosa*, *Grewia occidentalis*, *Gymnosporia buxifolia*, *Maytenus procumbens*, *Metalasia muricata*, *Morella cordifolia*, *Myrsine africana*, *Mystroxylon aethiopicum*, *Olea exasperata*, *Pterocelastrus tricuspidatus*, *Putterlickia pyracantha*, *Rhus crenata*, *R. glauca*, *R. longispina*, *R. lucida*, *Schotia afra* var. *afra*, *Sideroxylon inerme*, *Tarchonanthus littoralis*. Low Shrubs: *Asparagus suaveolens*, *Ballota africana*, *Carissa bispinosa* subsp. *bispinosa*, *Chironia baccifera*, *Clutia daphnoides*, *Eriocephalus africanus* var. *africanus*, *Helichrysum teretifolium*, *Lauridia tetragona*, *Phylica axillaris*, *Polygala myrtifolia*. Succulent Shrubs: *Aloe arborescens* (d), *Cotyledon orbiculata* var. *dactylopsis*, *Crassula perforata*, *C. pubescens* subsp. *pubescens*, *Euphorbia burmannii*, *E. mauritanica*, *Tetragonia fruticosa*, *Zygophyllum morgsana*. **Biogeographically Important Taxa**

(both South Coast endemics) Herb: Indigofera tomentosa. Geophytic Herb: Freesia alba (Mucina & Rutherford 2006).

### 6.5 Environmental Screening Tool results

Regulation 16(1)(b)(v) of the Environmental Impact Assessment Regulations requires an applicant for an Environmental Authorisation to submit a report generated by the Environmental Screening Tool as part of their application. This tool became operational on 5 July 2019, as announced in the Government Gazette. The screening tool report will identify the environmental sensitivities that intersect with the proposed development footprint, as defined by the applicant, as well as the relevant protocols that the applicant must follow. The screening tool is accessible at https://screening.environment.gov.za. The Environmental Screening Tool Report rated the terrestrial biodiversity theme as very high sensitivity for the proposed pipeline upgrade. The image from the Environmental Screening Tool Report is displayed in **Figure E.**

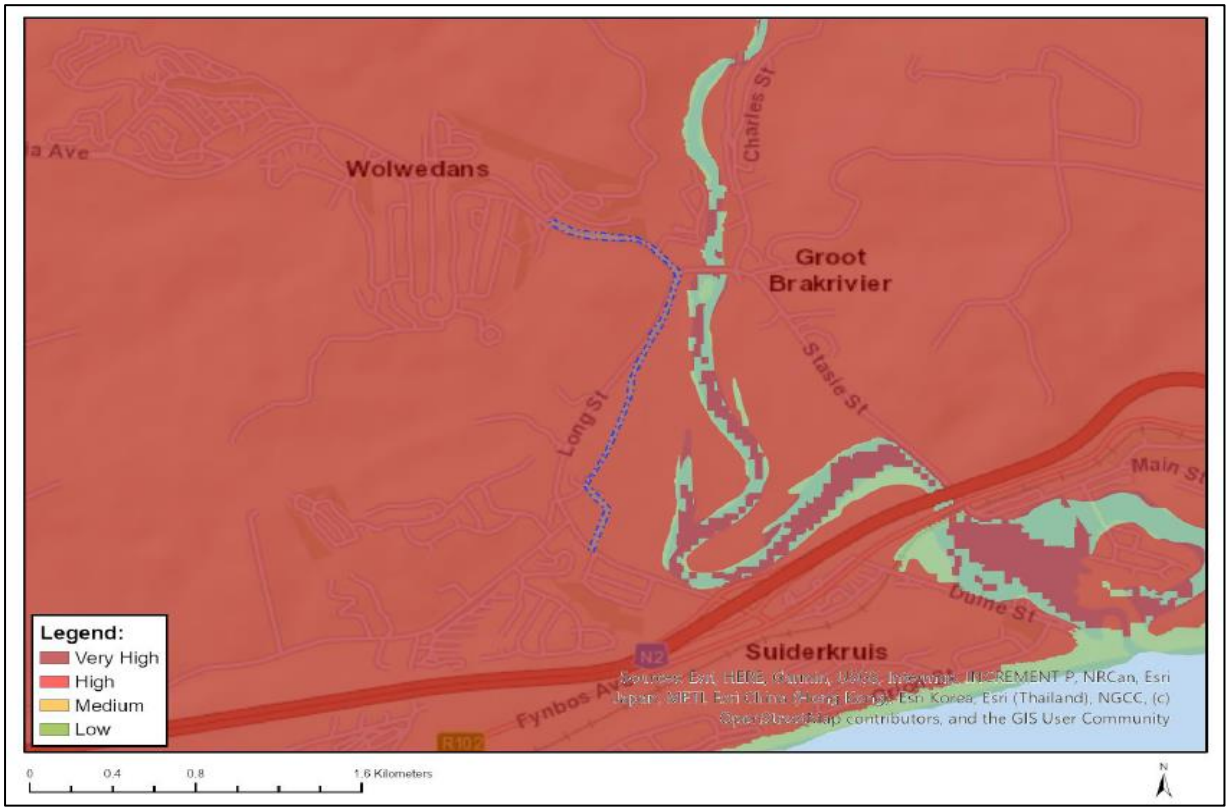



**Figure E:** Map indicating the terrestrial biodiversity theme sensitivity rating for the proposed development footprint and surrounding areas.

The environmental screening tool also lists the individual features that are responsible for the very high rating of the terrestrial biodiversity theme. These features are listed in **Table 1.**

**Table 1:** Sensitivity rating of the terrestrial biodiversity features as listed in the environmental screening tool report for the proposed development footprint

| Sensitivity rating | Feature | Conservation status |
|---|---|---|
| Very High | CBA2: Terrestrial | NA |
| Very High | Garden Route Granite Fynbos | Critically Endangered |
| Very High | Groot Brak Dune Strandveld | Critically Endangered |

## 6.6 Spatial Planning

### 6.6.1 Critical Biodiversity Areas and Ecological Support Areas

Critical Biodiversity Areas (CBAs) are areas that must be safeguarded in their natural or near-natural state because they are essential for conserving biodiversity and maintaining ecosystem functioning. The spatial planning map for Groot Brakrivier (**Figure F**) indicates that the proposed development footprint does not cross over any terrestrial CBA. The footprint does intersect with CBA Wetland and CBA Estuary near Lang Street. **Figure G** provides a zoomed-in version of **Figure F to** show more detail on the CBA Wetland demarcation. No Ecological Support Areas (ESAs) are mapped near the proposed development footprint. ESAs that are not essential for meeting biodiversity targets but play an important role in supporting the functioning of protected areas or critical biodiversity areas are often vital for delivering ecosystem services. The 2023 Western Cape Biodiversity Spatial Plan (WC BSP) was formally adopted into law on the 13th of December 2024 (Gazette Extraordinary 9017) in alignment with the Western Cape Biodiversity Act (No. 6 of 2021). This marks the replacement of the 2017 WC BSP with the 2023 WC BSP.

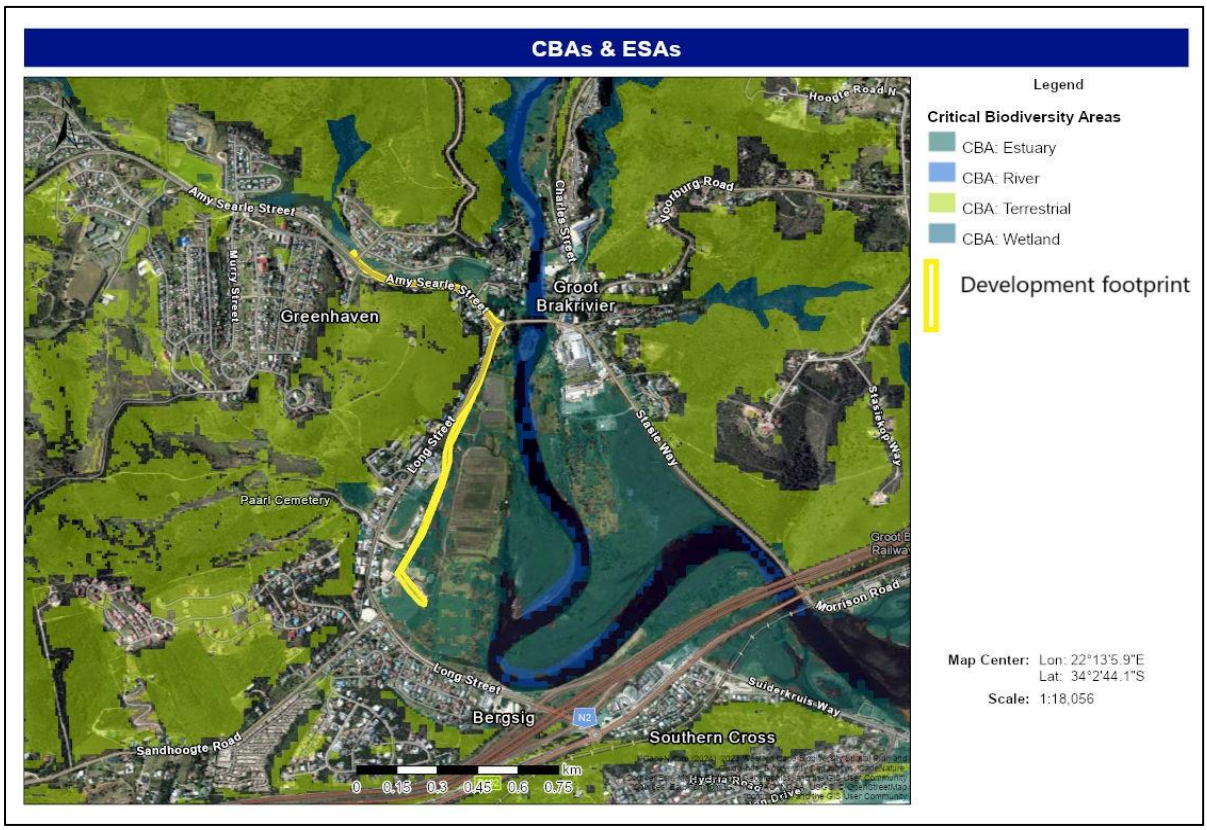



**Figure F:** Spatial planning map for Groot Brakrivier.

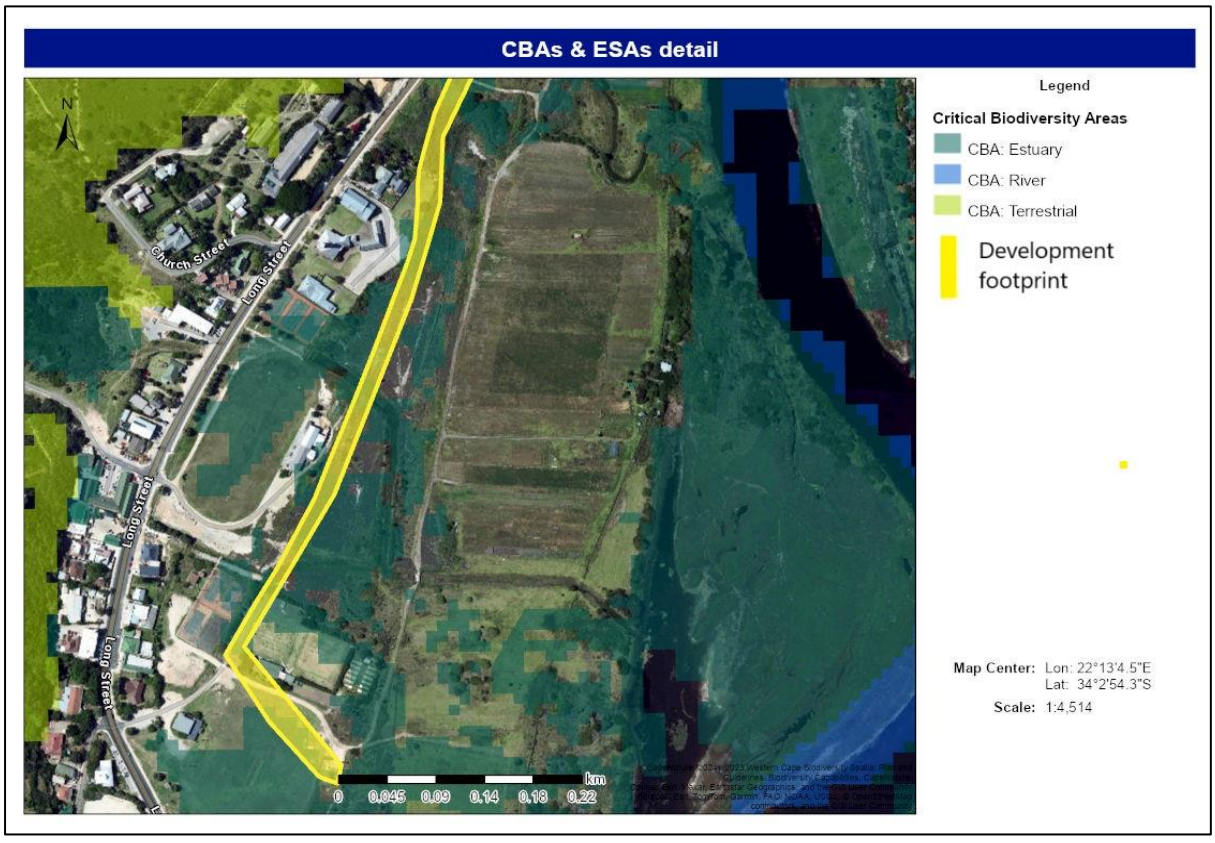



**Figure G:** Spatial planning map for the southern section of the proposed development footprint

### 6.6.2 Reasons for CBA status

The Biodiversity Spatial Plan (2017) for the Western Cape provides reasons for the inclusion of areas into CBAs. These reasons for the CBAs at the proposed development footprint are summarized in **Table 3**.

**Table 3:** Reasons for the inclusion of CBAs at the proposed development footprint

| | |
|---|---|
| Summary 1: | Climate adaptation corridor (14.28), Ecological processes (8.82), Estuary (14.29), River Type (3.21), SA Vegetation Type (2.32), Threatened SA Vegetation Type (8.13), Threatened Vertebrate (11.4), Water resource protection (7.69) |
| Feature 1: | Bontebok Extended Distribution Range |
| Feature 2: | Cape Coastal Lagoons (LT) |
| Feature 3: | Climate adaptation corridor |
| Feature 4: | FEPA River Corridor |
| Feature 5: | Groot Brak Dune Strandveld (EN) |
| Feature 6: | Groot Brak Estuary |
| Feature 7: | Southern Coastal Belt Permanent Lowland River |
| Feature 8: | Watercourse protection- Southern Coastal Belt |

### 6.6.3 Special Habitats, Indigenous Forest, Connectivity, and Corridors

The proposed southern section of the proposed development footprint is close to the Groot Brak estuary. The proposed development footprint is not within the estuary boundaries but part of a buffer zone between the estuary and urban development.

### 6.6.4 Protected Areas

There are no formally protected areas near the proposed development footprint. Groot Brakrivier does fall in the domain of the Gouritz Cluster Biosphere Reserve as indicated in **Figure H**. The proposed development footprint is also not in an area that forms part of a protected area expansion strategy.




**Figure H:** Protected areas map for the area that includes Groot Brakrivier

# 7. RESULTS: FIELD ASSESSMENT

## 7.1 Vegetation units

The natural vegetation (Groot Brak Dune Strandveld) has been historically transformed for urban development across most of the proposed development footprint. The range of photos and maps covers the proposed development footprint from north to south and is displayed in **Figures 1** to **17**. The yellow shaded area in the maps indicates the area visible in the adjoining photograph. There are small sections that retain elements of the original vegetation, but more than 75% of the area is fully transformed. Large sections are maintained as lawns, and sidewalks that are either paved or tarred. No visible natural plant communities are still intact.











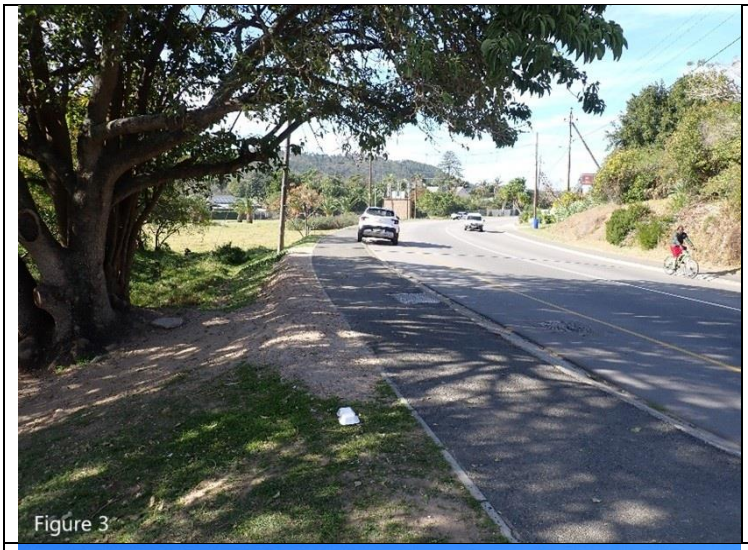


Figure 3





Figure 4



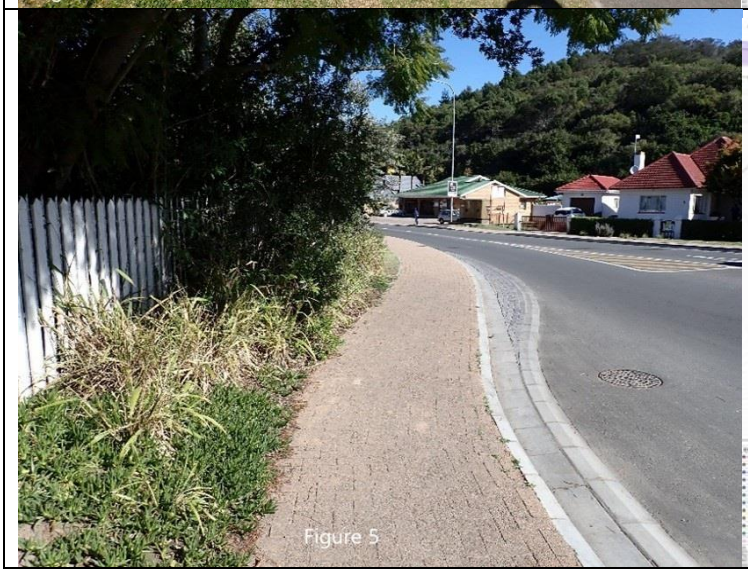



Figure 5



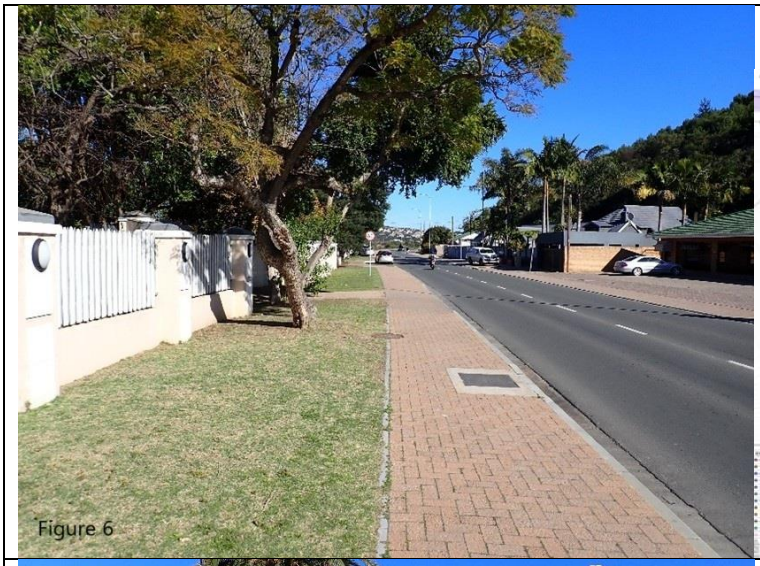


Figure 6






Figure 7

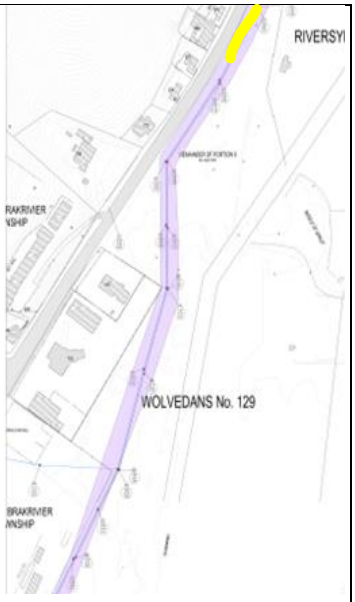


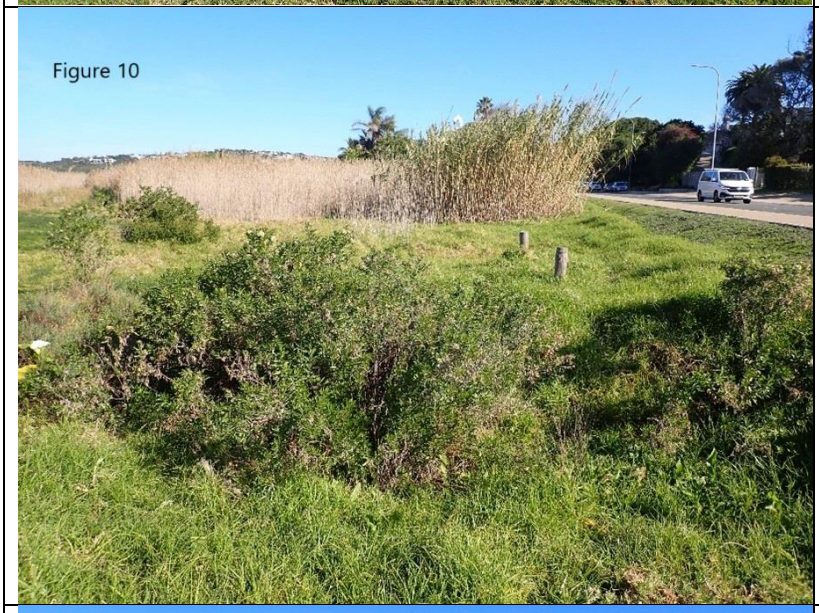



Figure 8




Figure 9


RIVERSY
WOLVEDANS No. 129


Figure 10

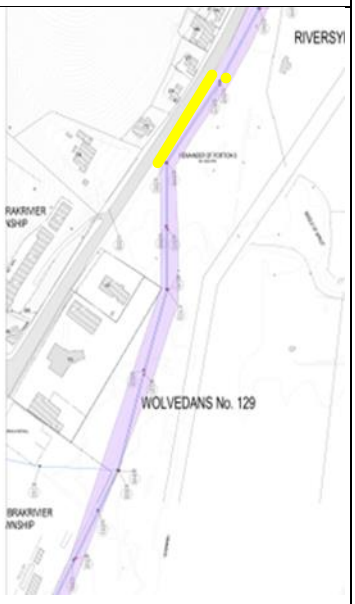

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Figure 11

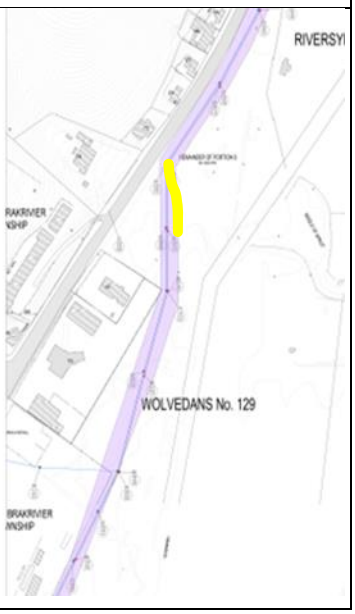

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Figure 12

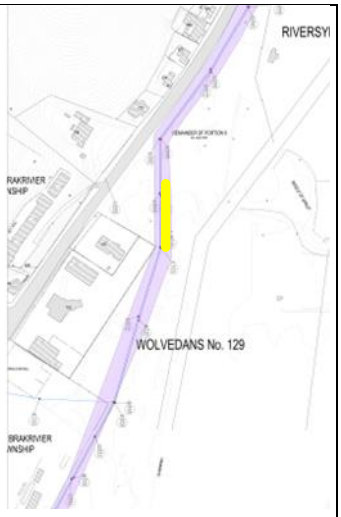

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Figure 13

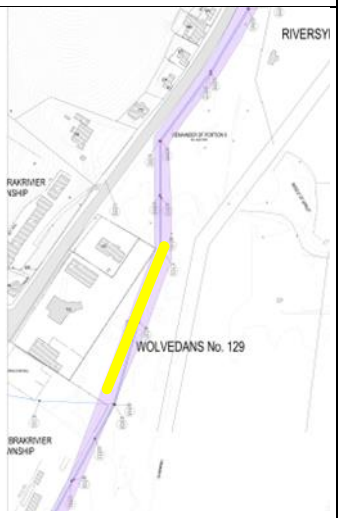

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Figure 14

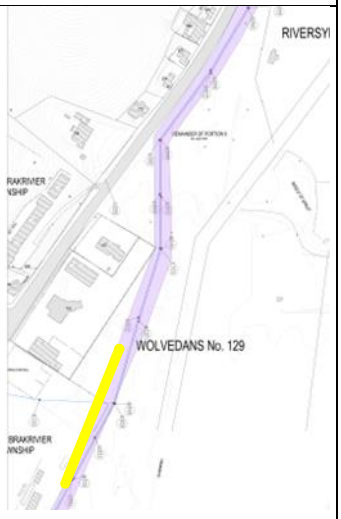

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Figure 15






Figure 16

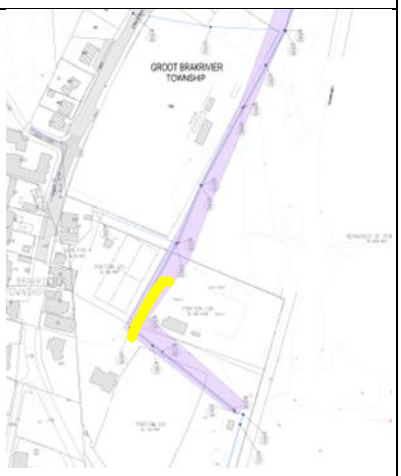





Figure 17



### 7.2 Critical Biodiversity areas reason verification

| Reasons for the CBA status within the proposed development footprint | Comment on the reason |
|---|---|
| Bontebok Extended Distribution Range | There are no Bontebok habitat within the proposed development footprint. |
| Cape Coastal Lagoons (LT) | The proposed development will have no impact. |
| Climate adaptation corridor | The linear activity will temporarily alter the already transformed environment, but the area should return to its current state within two years. |
| FEPA River Corridor | The linear activity will temporarily alter the already transformed environment, but the area should return to its current state within two years. |
| Groot Brak Dune Strandveld (EN) | Only a few elements of this vegetation unit exist, as most have been almost completely transformed |
| Groot Brak Estuary | The activity will not impact the Groot Brak Estuary. |
| Southern Coastal Belt Permanent Lowland River | The activity will not impact the Groot Brak River. |
| Watercourse protection- Southern Coastal Belt | The activity will temporarily impact the artificial drainage lines that cross the proposed development footprint. |

### 7.3 Plant species

No plant species of conservation concern were located within the proposed development footprint. More details are contained in the Plant Species Compliance statement.

### 7.4 Animal species

No animal species of conservation concern were located within the proposed development footprint. More details are contained in the Animal Species Compliance statement.

## 8. CONCLUSIONS

The site sensitivity is verified to be Low from a terrestrial biodiversity perspective and not Very High as rated in the Environmental Screening Tool. This finding is based on:

- No functional plant communities of the original vegetation unit (Groot Brak Dune Strandveld) remain in the proposed development footprint. The other vegetation unit listed in the environmental screening tool report, Garden Route Granite Fynbos, is not present in the proposed development footprint.
- The Critical Biodiversity Areas that are located within the proposed linear development footprint area are mostly transformed and would also return to their current state within two years.

The specialist therefore recommends that the development proceed as planned from a terrestrial biodiversity perspective if the mitigation measures in **Section 9** are captured in the Environmental Management Plan Report.

## 9. PROPOSED IMPACT MANAGEMENT OUTCOMES OR ANY MONITORING REQUIREMENTS FOR INCLUSION IN THE ENVIRONMENTAL MANAGEMENT PROGRAM.

- The proposed development footprint should be fully demarcated (stakes and danger tape) during the construction phase, and all construction activities must be done within this demarcated area.
- In the areas as displayed in Figures 11 to 14, the topsoil that is removed during construction must be kept separate from the lower soil and replaced accordingly.
- Alien invasive trees (Acacia spp.) within the proposed development footprint in the section, as displayed in Figures 11 to 14, should be removed.

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# APPENDIX H: PLANT SPECIES SITE VERIFICATION AND COMPLIANCE STATEMENT REPORT

# SITE VERIFICATION AND COMPLIANCE STATEMENT REPORT FOR THE PROPOSED UPGRADE OF A SEWERAGE PIPELINE IN GREAT BRAK, WESTERN CAPE

## Plant species



| | |
|---|---|
| **Date:** | 17 August 2025 |
| **Version:** | Final |
| **Author:** | JA van der Walt (Pr. Sci.Nat: 116549) |
| **EAP:** | Sharples Environmental Services |
| **Applicant:** | Mossel Bay Municipality |

ADVANCED ENVIRONMENTAL CORPORATION

# EXECUTIVE SUMMARY

| | |
|---|---|
| **VEGETATION UNITS** | **Groot Brak Dune Strandveld**: The original vegetation has been almost fully transformed into roads, pavements, and lawns. The remaining natural vegetation is dominated by non-native species, with no intact plant communities remaining. |
| **VEGETATION SIZE** | Limited intact natural vegetation remains within the proposed development footprint, which is approximately 2,100 meters long and 5 meters wide. |
| **LANDUSE PLANNING** | Smaller sections of the proposed development footprint fall within a CBA Estuary and CBA Wetland, but these areas are transformed and mostly dominated by non-native plant species. |
| **CONNECTIVITY** | Portions of the proposed development footprint can be regarded as a buffer for the Groot Brak estuary. |
| **PLANT SPECIES OF CONSERVATION CONCERN** | No plant species of conservation concern were recorded in the proposed development footprint |
| **WATER COURSES AND WETLANDS** | The proposed pipeline crosses artificial drainage ditches created to direct stormwater into low-lying areas between the Groot Brak estuary and the urban development along Lang Street. |
| **MAIN CONCLUSIONS** | The site has been assessed as having **low** sensitivity from a plant species perspective, contrary to the medium rating assigned in the Environmental Screening Tool. This determination is supported by the absence of plant species of conservation concern within the proposed development footprint, the significant degree of transformation observed in the area, and the predominance of alien vegetation within the site. |

**DECLARATION OF INDEPENDENCE IN TERMS OF CHAPTER 5 OF THE NATIONAL ENVIRONMENTAL MANAGEMENT (NEMA), ACT 107 OF 1998:**

I, Johannes Adriaan van der Walt, ID: 6706225172085, declare that:

• I act as the independent environmental specialist in this report;

• I will perform the work relating to the report objectively, even if this results in views and findings that are not favourable to the applicant;

• I declare that there are no circumstances that may compromise my objectivity in performing such work;

• I have expertise in conducting environmental impact assessments and specialist reports, including knowledge of the Act, Regulations, and any guidelines that have relevance to the proposed activity;

• I will comply with the Act, Regulations, and all other applicable legislation;

• I do not have and will not have any vested interest (either business, financial, personal, or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations

**ENVIRONMENTAL SPECIALIST:**

Johannes Adriaan van der Walt

Tel: +27 (82) 305 8945

Email: admin@aecorp.co.za

**Signature** **Date:** 17 August 2025



# Abridged Curriculum Vitae – Johannes Adriaan van der Walt

**PROFESSIONAL REGISTRATION**

Professional Natural Scientist: South African Council for Natural Science Professionals (SACNASP) nr116549

**QUALIFICATIONS**

MTech Nature Conservation (cum laude) 2014, CPUT

BTech Nature Conservation (cum laude) 2012, CPUT

NDip Nature Conservation (cum laude) 1994, CPUT

**LANGUAGES**

English – fluent
Afrikaans – fluent

**EXPERIENCE**

37 years of biodiversity conservation and botanical experience in the Fynbos and Succulent Karoo Biomes

**EMPLOYMENT**

1988 – 2006 CapeNature

2007 – 2010 Botanical Insight cc

2010 - 2017 CapeNature

2017 – present: Director at Advanced Environmental Corporation (Pty) Ltd and Fynbos Fish Trust Trustee

**BOTANICAL, ANIMAL, AND BIODIVERSITY EXPERTISE WAS GAINED THROUGH:**

- Employment as a nature conservationist with CapeNature for 25 years;
- biodiversity assessments (including botanical, animal species, and biodiversity) since 1994;
- participating as a SANBI-CREW volunteer for botanical assessments for threatened plants;
- participating in the Protea Atlas project as a volunteer;
- contributing as a Red-list assessor for a selection of Fynbos species;
- conservation initiatives for threatened flora with CapeNature;
- compliance monitoring of wildflower shows (Clanwilliam, Leipoldtville, Porterville, Tulbagh, and Darling) between 1994 and 2006;
- compilation of species lists for protected areas;
- compilation of specialist botanical assessments for DEA&DP and private landowners since 2017;
- discovering five new plant species in the CFR since 2019;
- keeping up to date with new plant descriptions and taxonomic revisions in the CFR and
- keeping an extensive private collection of applicable literature, including field guides and other botanical reference books.

**PUBLICATIONS:**

- Author and co-author of 14 biodiversity conservation and botanical scientific papers

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# 1. INTRODUCTION

## 1.1 Background

The Mossel Bay Municipality is in the process of upgrading its sewage system in Groot Brakrivier, and one of these upgrades includes the installation of a new Ø300mm pipeline from Amy Searle Street/Greenhaven to the cricket field sewerage pump station near Lang Street. The Environmental Assessment Practitioner (EAP) appointed by the municipality is Sharples Environmental Services. The proposed activities trigger environmental regulations promulgated under the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("NEMA") and require environmental authorization.

## 1.2 Environmental Screening Tool Report

Regulation 16(1)(b)(v) of the Environmental Impact Assessment Regulations requires an applicant for an Environmental Authorisation to submit a report generated by the Environmental Screening Tool as part of their application. This tool, developed by the Department of Forestry, Fisheries, and the Environment (DFFE), became operational on July 5, 2019, as announced in the Government Gazette. The screening tool report will identify the environmental sensitivities that intersect with the proposed development footprint as defined by the applicant, as well as the relevant protocols that the applicant would need to follow. The screening tool is accessible at https://screening.environment.gov.za.

An environmental screening tool report for the proposed development was completed on the 25th of July 2025. A **"Medium"** environmental sensitivity rating was indicated for the Plant Species theme. As per the procedures for the assessment and minimum criteria for reporting on identified environmental themes (Terrestrial Plant Species) in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation (October 2020), "*An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of "**medium sensitivity**" for terrestrial plant species, must submit either a Terrestrial Plant Species Specialist Assessment Report or a Terrestrial Plant Species Compliance Statement, depending on the outcome of a site inspection/site sensitivity verification undertaken*".

The site sensitivity verification was conducted on 19 and 20 July 2025, and the outcome, as reported in **Section 7** of this report, indicated a **low sensitivity** towards terrestrial plant species and therefore a terrestrial plant species compliance statement was compiled and included in this report.

# 2. TERMS OF REFERENCE

## 2.1 Site verification

-The assessment must contextualize the study area to provide a baseline description of the ecological system; the terrestrial plant biodiversity and any significant terrestrial features must be provided.

-The assessment must identify the following:

- Terrestrial critical biodiversity areas (CBAs)
- Terrestrial ecological support areas (ESAs)
- Protected areas as defined by the National Environmental Management: Protected Areas Act, 2004
- Priority areas for protected area expansion
- Indigenous forests

-Undertake a site visit and ground-truth biodiversity information. Where required, undertake baseline surveys and/or studies to supplement the information base and inform the assessment.

-Estimate the trajectory of change in the context of the 'No-Go' Alternative due to existing impacts.

-Assessment criteria to be aligned with the promulgated Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes (October 2020).

Following the site verification visit, in which the Specialist confirms the presence, likely presence or confirmed absence of a SCC identified within the site identified as "medium" sensitivity by the screening tool, the Specialist is to confirm the need for a Compliance Statement or a Terrestrial Plant Species Assessment and undertake this report/statement following the Gazetted Protocol (October 2020).

## 2.2 Compliance statement

The compliance statement must:

- be applicable within the study area;
- confirm that the study area is of "low" sensitivity for terrestrial plant species; and
- indicate whether or not the proposed development will have any impact on SCC.

Minimum Requirements Include:

- contact details, relevant experience, and the SACNASP registration number of the specialist preparing the compliance statement, including a curriculum vitae.
- a signed statement of independence by the specialist;

- a statement on the duration, date, and season of the site inspection and the relevance of the season to the outcome of the assessment;
- a description of the methodology used to undertake the site survey and prepare the compliance statement, including equipment and modelling used where relevant;
- where required, proposed impact management actions and outcomes or any monitoring requirements for inclusion in the EMPr;
- a description of the assumptions made and any uncertainties or gaps in knowledge or data;
- the mean density of observations/ number of sample sites per unit area; and
- any conditions to which the compliance statement is subjected.

### 2.3. Legal requirements applicable to the specialists conducting assessments

The Environmental Impact Assessment Regulations that were published on 4 December 2014 and amended on 7 April 2017, state that:

(1) an EAP and a specialist, appointed in terms of regulation 12(1) or 12(2), must-

(a) be independent;

(b) have expertise in conducting environmental impact assessments or undertaking specialist work as required, including knowledge of the Act, these Regulations, and any guidelines that have relevance to the proposed activity;

(c) ensure compliance with these Regulations;

(d) perform the work relating to the application objectively, even if this results in views and findings that are not favourable to the application;

(e) take into account, to the extent possible, the matters referred to in regulation 18 when preparing the application and any report, plan, or document relating to the application; and

(f) disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in the possession of the EAP and, where applicable, the specialist, that reasonably has or may have the potential of influencing-

(i) any decision to be taken concerning the application by the competent authority in terms of these Regulations; or

(ii) the objectivity of any report, plan or document to be prepared by the EAP or specialist, in terms of these Regulations for submission to the competent authority; unless access to that information is protected by law, in which case it must be indicated that such protected information exists and is only provided to the competent authority.

(2) In the event where the EAP or specialist does not comply with sub-regulation (1)(a), the proponent or applicant must, before conducting public participation as contemplated in chapter 5 of these Regulations, appoint another EAP or specialist to externally review all work undertaken by the EAP or specialist, at the applicant's cost.

(3) An EAP or specialist appointed to externally review the work of an EAP or specialist as contemplated in sub-regulation (2) must comply with sub-regulation (1).

### 2.4 Report Content Requirements

The following legislation and guideline documents are applicable and were adhered to in compiling this report:

#### 2.4.1 Guidelines documents

a) Department of Environmental Affairs and Development Planning (DEA&DP) Guidelines for Involving Biodiversity Specialists in the EIA Process (Brownlie 2005).

b) Ecosystem Guidelines for Environmental Assessments in the Western Cape (Cadman 2016).

c) The Western Cape Biodiversity Spatial Plan Handbook (Pool-Stanvliet *et al*. 2017)

d) South African National Biodiversity Institute (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.

#### 2.4.2 Legal documents

a) Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("NEMA"), when applying for Environmental Authorisation" ("the Protocols") (GN No. 320 as published in Government Gazette No. 43110 on 20 March 2020) came into effect on 09 May 2020 the Protocol.

b) Appendix 6 of the 2014 EIA Regulations (National Environmental Management Act, 1998 (Act No. 107 of 1998)

## 3. LIMITATIONS AND ASSUMPTIONS

The field surveys for this report were conducted on July 19 and 20, 2025. These surveys took place during the optimal period for botanical assessments (June to September). The findings from this specialist assessment are based on a two-day site visit, which means some plant species might not have been recorded. However, the proposed development footprint was highly altered, reducing the likelihood that species were missed. Confidence in the findings is high. It is unlikely that a full botanical assessment would reveal additional findings that would significantly impact the outcome.

# 4. STUDY AREA

## 4.1 Location

Groot Brakrivier is situated on the southern coast of the Western Cape Province, South Africa, as illustrated in **Figure A.** The town is located on both sides of the Groot Brakrivier estuary.

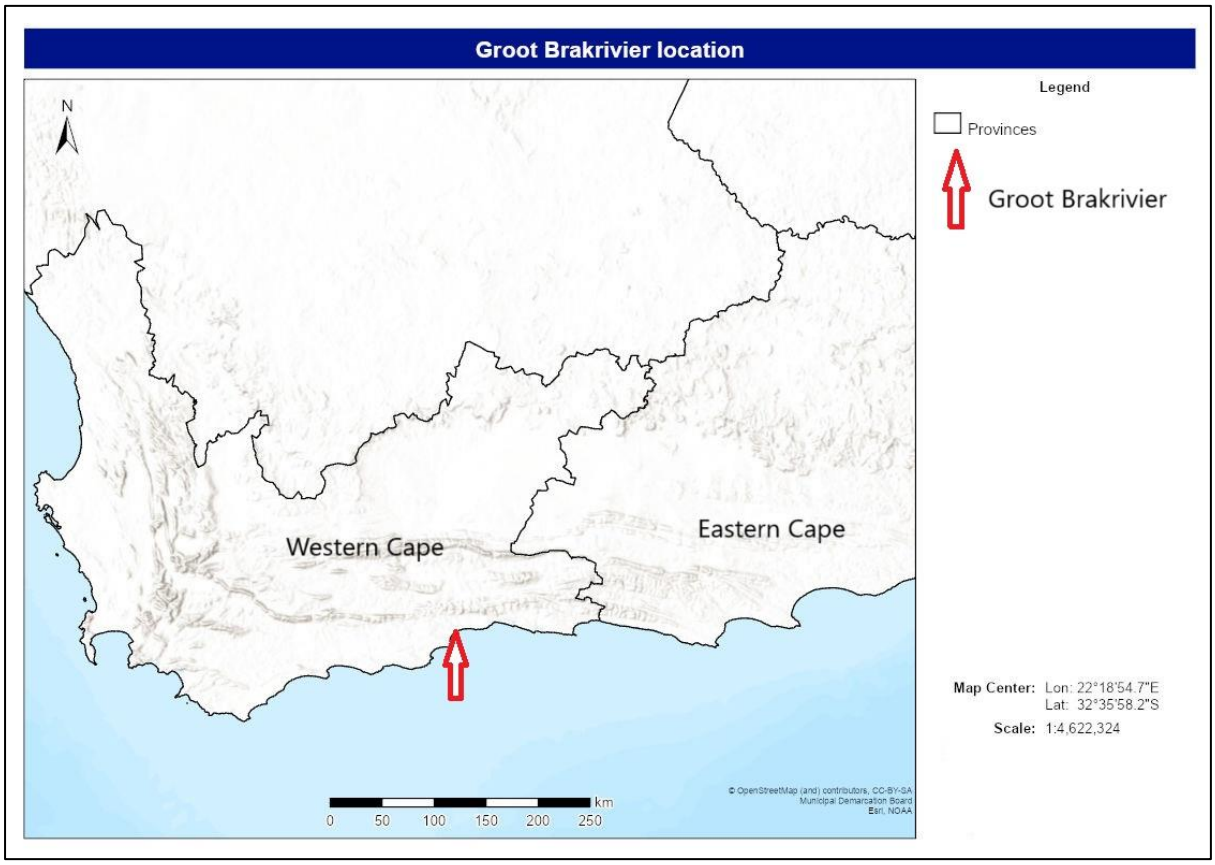



**Figure A.** Map showing the location of Groot Brakrivier

## 4.2 Proposed Development Footprint (PDI) and Project Area of Influence (PAOI)

The proposed development footprint is indicated as a purple polygon in **Figure B**. This purple polygon is the route of the old sewage pipeline that is due for an upgrade. The development footprint will The proposed sewage pipeline earmarked for this upgrade will be approximately 2,1 km in length, with a construction footprint of 5 m in width for installation during the construction phase. The anticipated impacts will mostly occur during the construction phase of the project when the municipality will dig a trench along the proposed development footprint for the replacement of the sewage pipeline. These impacts are not expected to extend beyond the demarcated footprint. The PAOI is therefore treated here as the development footprint within which direct impacts will occur.

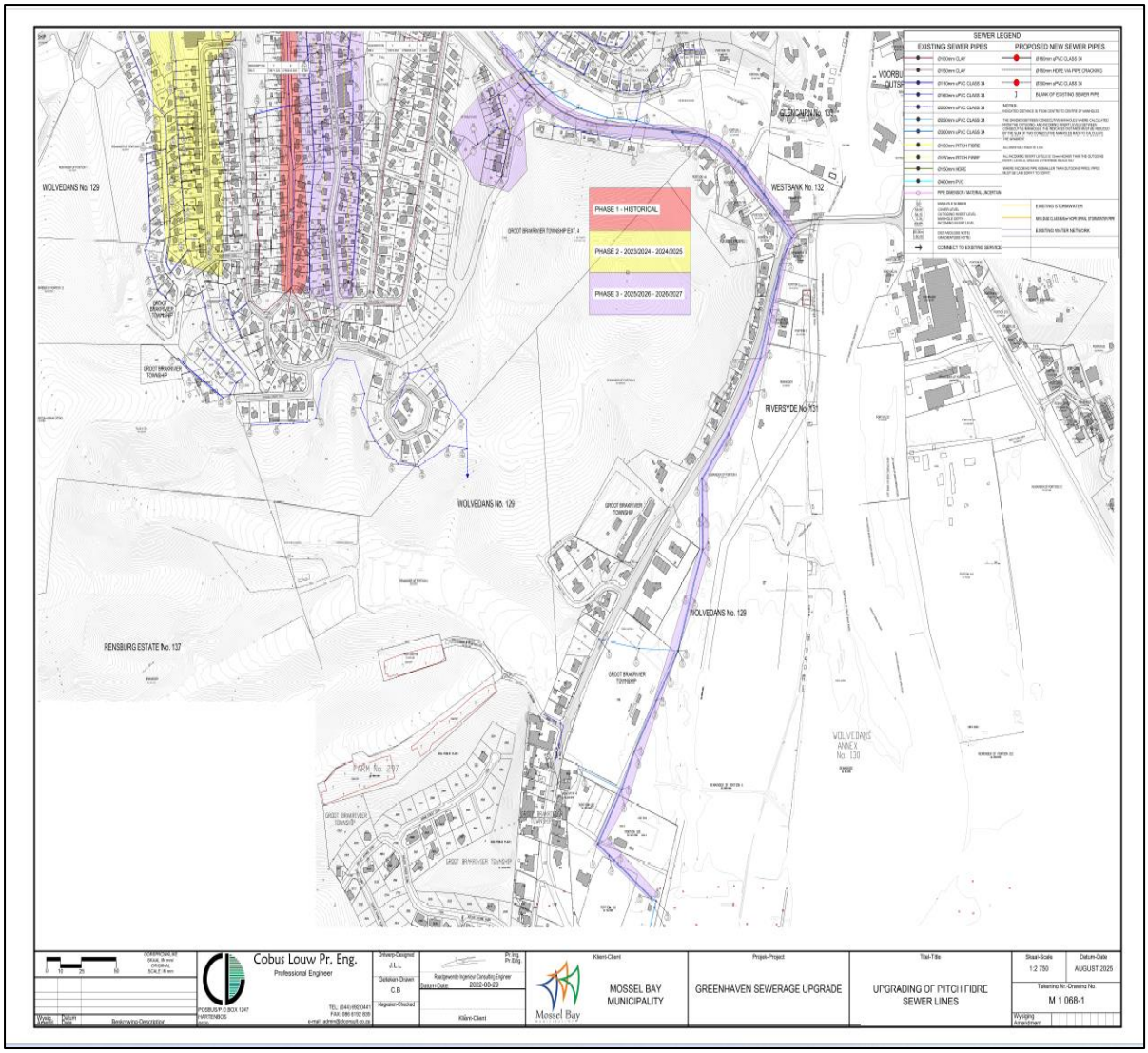



**Figure B:** The route of the proposed sewage pipeline upgrade is indicated with a purple polygon

# 5. METHODOLOGY

## 5.1 Desktop assessment

The specialist used various sources of information to assess the sensitivity of the vegetation and plant species within the proposed development footprint.

5.1.1 **The Environmental Screening Tool Report**: The environmental screening tool report indicates the sensitivity of the plant theme across the proposed development and lists threatened and sensitive plant species that could potentially occur within or near the proposed development footprint.

5.1.2 **CapeFarmMapper 3**: The following spatial data were obtained from CapeFarmMapper 3 (CFM 3). CMF 3 is GIS software provided by the Western Cape Department of Agriculture, available at https://gis.elsenburg.com/apps/cfm/.

- Vegetation units
- Vegetation unit threat status
- Spatial planning data: Critical Biodiversity Areas, Ecological Support Areas.

5.1.3 **iNaturalist**: iNaturalist is a crowdsourced species identification system and an organism occurrence recording tool. Sightings are graded, and only research-grade sighting is used in specialist assessments.

5.1.4 **Google Earth**: Google Earth is a web and computer program created by Google that renders a 3D representation of Earth based primarily on satellite imagery but also on street-level view. This imagery is useful when historical aerial imagery is needed of a proposed development footprint. It also gives a good perspective of the level of transformation before a field assessment is undertaken.

5.1.5 **Other sources of data**: Additional data were collected from a range of pertinent sources, including Mucina & Rutherford (2006), the National Vegetation Map (2018), and relevant biodiversity plans (Pool-Stanvliet 2017, SANBI 2021).

### 5.2 Field assessment

The field assessment was conducted over two days (19 and 20 July 2023). The specialist walked the proposed development footprint from west while collecting data. All plant and tree species were noted, photographed, and identified on-site if possible. Plants and trees that could not be identified during the field survey were later identified using available literature and taxonomic experts. The specialist also took drone imagery to give a better view of the proposed development footprint.

# 6. RESULTS: DESKTOP ASSESSMENT

## 6.1 Climate

The Mean Annual Precipitation (MAP) for Groot Brakrivier is approximately 459 mm, with approximately 40% of the rain falling in summer (October–March) and 60% in winter (April–September). Mean daily maximum and minimum temperatures are 26.8°C and 7.7°C for February and July, respectively (Mucina & Rutherford 2006).

## 6.2 Topography, geology, and soils

The proposed development footprint is located on a relatively flat area with a very slight gradient from west to east. The highest elevation on the proposed pipeline upgrade is at 10 metres above sea level (MASL), while the lowest point is at 1 MASL. The area is mostly underlain by the clastic sedimentary rocks of the Kirkwood Formation (Mesozoic Uitenhage Group). In the east, quartzite, schist, and phyllite of the Kaaimans Group (Namibian Erathem) and Cape Granite (edges of high coastal cliffs) are also present. In parts along the coast, these rocks are covered by the unconsolidated dune sand of the Strandveld. See **Figure C** for a map of the soil types present at the proposed development footprint (Mucina & Rutherford 2006).

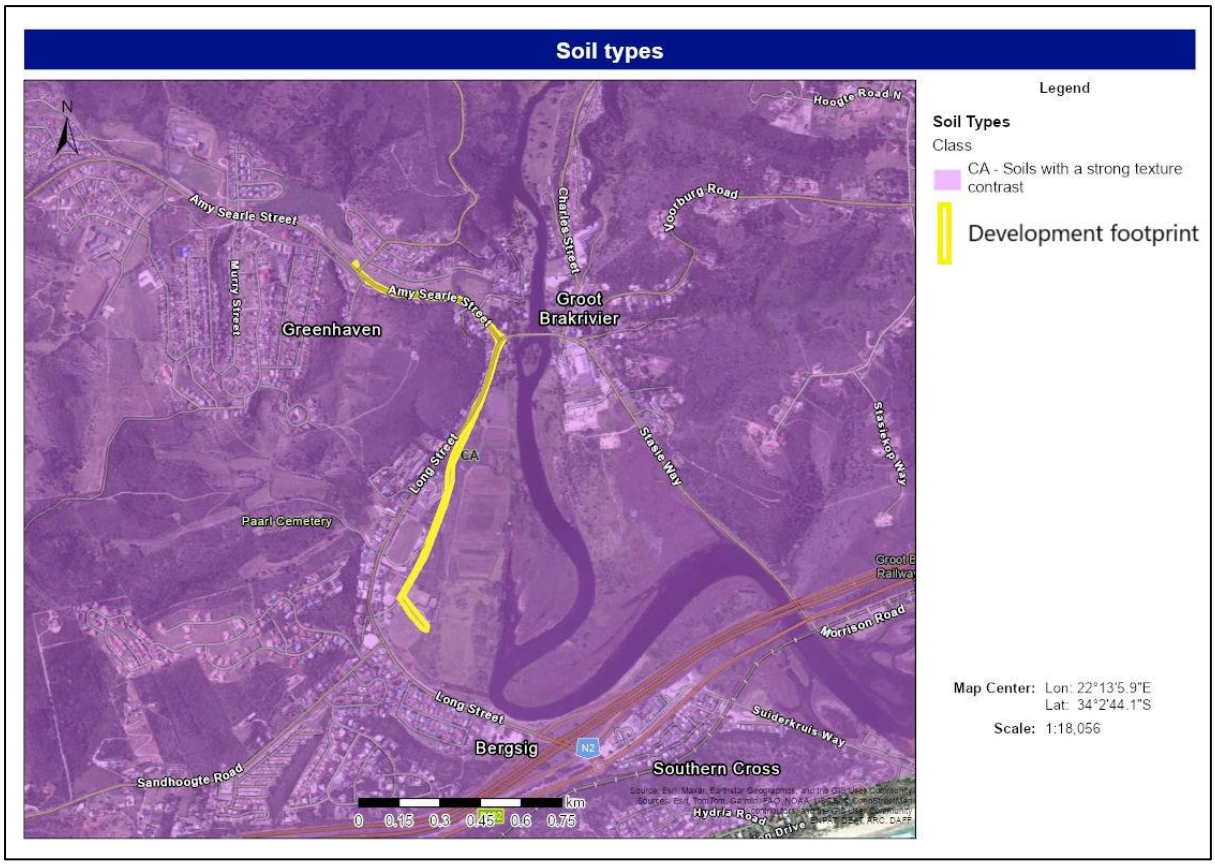



**Figure C:** Map indicating the different soil types on and near the proposed development footprint

## 6.3 VEGETATION

### 6.3.1 General Context

Groot Brakrivier town, where the proposed development is situated, is part of the Cape Floristic Region (CFR). The CFR is renowned for its botanical diversity, containing over 9,000 vascular plant species, 69% of which are endemic (Goldblatt & Manning 2000). The CFR encompasses most of the Cape Fold Mountains and coastal lowlands stretching from Niewoudtville to Gqeberha. The Fynbos Biome consists of three primary vegetation complexes: Fynbos, Renosterveld, and Western Strandveld. The Fynbos complex is the most extensive, covering 67% of the Fynbos Biome, while Western Strandveld covers the smallest area within the Fynbos Biome. The proposed development site is located within this Western Strandveld complex. The Western Strandveld complex is subdivided into nine different vegetation units, of which one, Groot Brak Dune Strandveld, is the mapped vegetation unit across the proposed development footprint.

### 6.3.2 Local vegetation context

Groot Brak Dune Strandveld (**Figure D**) is listed as Critically Endangered (CR), with a Target of 36%. None of it is protected in statutory conservation areas, and only about 1% is safeguarded in private reserves (George, Kanon, Blydskap, Kwelanga). Nearly half of the region has been transformed for agriculture, through road construction or coastal settlement development. Erosion levels vary, ranging from moderate to high, with some areas classified as low. In 1990, 53% of the original extent of this vegetation was still present, and in 2018, this had declined to 45%.

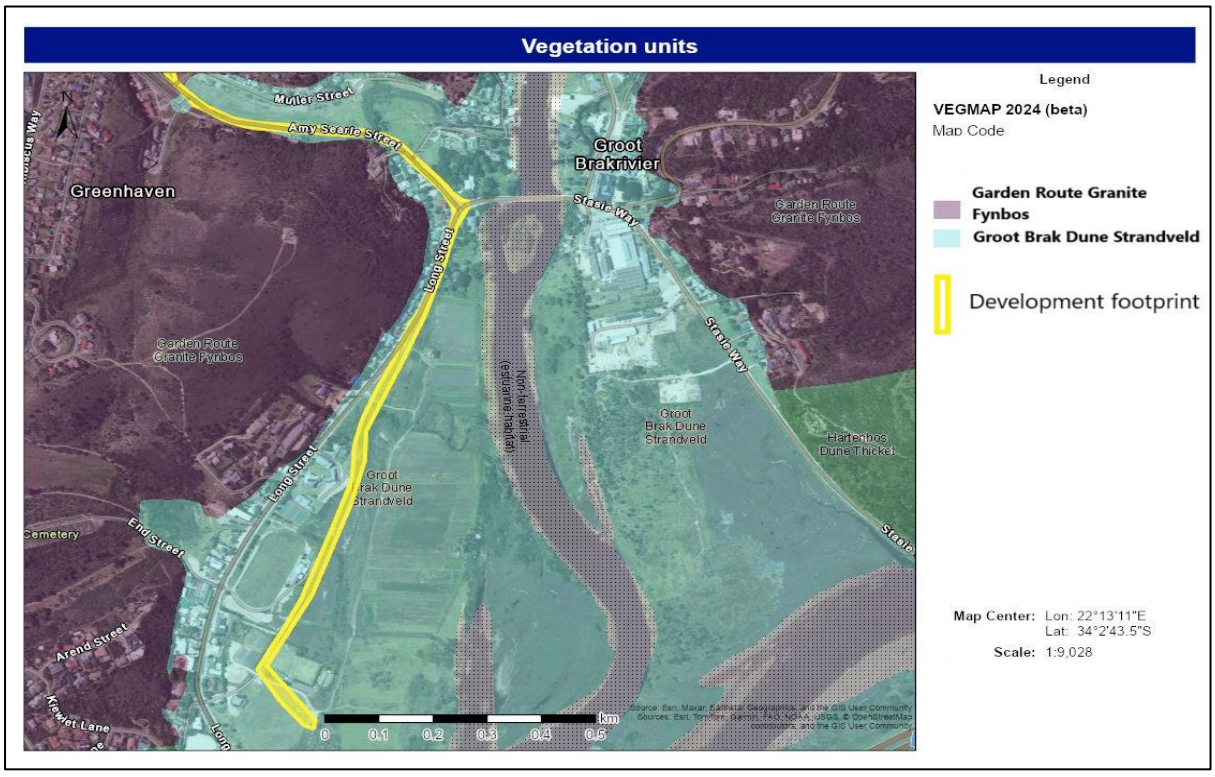



**Figure D:** Vegetation unit map for the proposed development footprint

### 6.3.3 Plant species

According to Mucina & Rutherford (2006), important taxa in Groot Brak Dune Strandveld include: **Important Taxa** Small Trees: *Chionanthus foveolatus*, *Clausena anisata*. Tall Shrubs: *Azima tetracantha*, *Cussonia thyrsiflora*, *Diospyros dichrophylla*, *Euclea racemosa* subsp. *racemosa*, *Grewia occidentalis*, *Gymnosporia buxifolia*, *Maytenus procumbens*, *Metalasia muricata*, *Morella cordifolia*, *Myrsine africana*, *Mystroxylon aethiopicum*, *Olea exasperata*, *Pterocelastrus tricuspidatus*, *Putterlickia pyracantha*, *Rhus crenata*, *R. glauca*, *R. longispina*, *R. lucida*, *Schotia afra* var. *afra*, *Sideroxylon inerme*, *Tarchonanthus littoralis*. Low Shrubs: *Asparagus suaveolens*, *Ballota africana*, *Carissa bispinosa* subsp. *bispinosa*, *Chironia baccifera*, *Clutia daphnoides*, *Eriocephalus africanus* var. *africanus*, *Helichrysum teretifolium*, *Lauridia tetragona*, *Phylica axillaris*, *Polygala myrtifolia*. Succulent Shrubs: *Aloe arborescens* (d), *Cotyledon orbiculata* var. *dactylopsis*, *Crassula perforata*, *C. pubescens* subsp. *pubescens*, *Euphorbia burmannii*, *E. mauritanica*, *Tetragonia fruticosa*, *Zygophyllum morgsana*. **Biogeographically Important Taxa** (both South Coast endemics) Herb: Indigofera tomentosa. Geophytic Herb: Freesia alba (Mucina & Rutherford 2006).

*Environmental Screening Tool results*

Regulation 16(1)(b)(v) of the Environmental Impact Assessment Regulations requires an applicant for an Environmental Authorisation to submit a report generated by the Environmental Screening Tool as part of their application. This tool became operational on 5 July 2019, as announced in the Government Gazette. The screening tool report will identify the environmental sensitivities that intersect with the proposed development footprint, as defined by the applicant, as well as the relevant protocols that the applicant must follow. The screening tool is accessible at https://screening.environment.gov.za. The Environmental Screening Tool Report rated the relative plant species theme as medium sensitivity for the proposed pipeline upgrade. The image from the Environmental Screening Tool Report is displayed in **Figure E.**

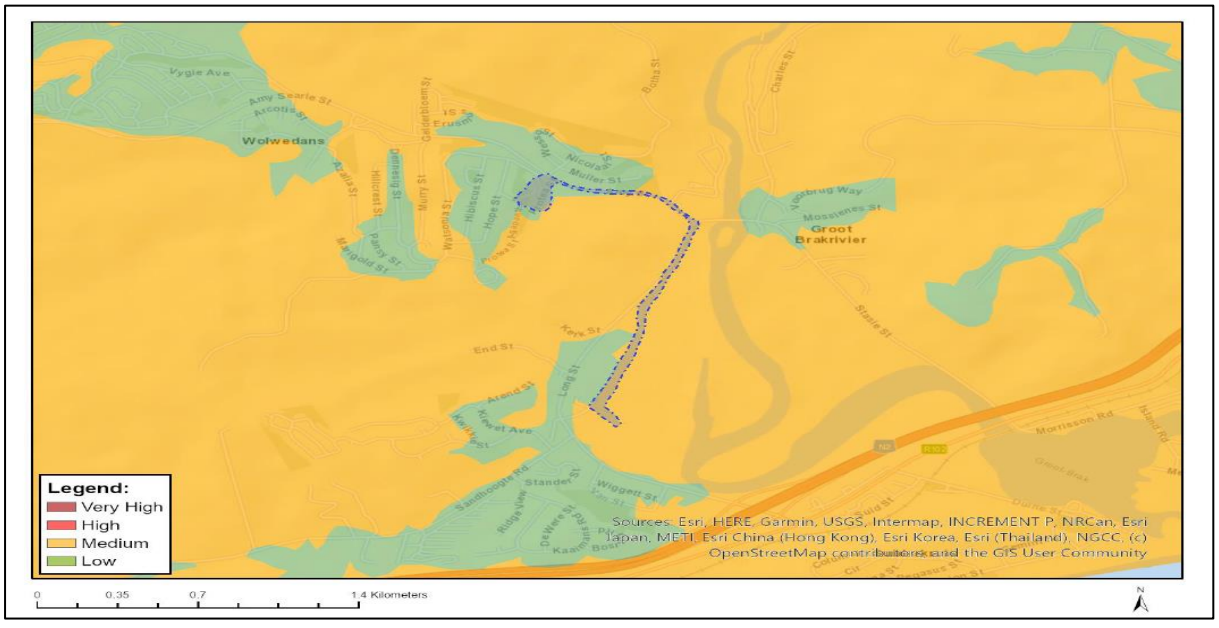



**Figure E:** Map indicating the relative plant theme sensitivity rating for the proposed development footprint and surrounding areas.

The Environmental Screening Tool report also lists threatened and sensitive species that could potentially occur at or near the proposed development footprint. These species are listed in **Table 1** below, and the table also indicates the SANBI Red List status of the species. The specialist also included a column that indicates the natural distribution of the species. The names of the sensitive species listed in the environmental screening tool report may not be displayed in this report, as this report will be available in the public domain. Sensitive species are targeted by collectors and/or illegal harvesting.

**Table 1:** Threatened and sensitive species listed for the proposed development footprint (CR Critically Endangered, EN Endangered, VU Vulnerable)

| Species | SANBI Red List status | Distribution |
|---|---|---|
| *Lampranthus pauciflorus* | EN | Cape Infanta to Plettenberg Bay |
| *Lebeckia gracilis* | EN | Agulhas to Gqeberha |
| *Erica unicolor subsp. mutica* | EN | Herbertsdale to George |
| *Erica glandulosa subsp. fourcadei* | VU | Mossel Bay to Cape St Francis. |
| *Hermannia lavandulifolia* | VU | Worcester to Plettenberg Bay |
| *Sensitive species 633* | CR | Groot Brak but not in Strandveld |
| *Sensitive species 268* | EN | Herbertsdale to Groot Brak (Renosterveld) |
| *Sensitive species 1024* | EN | Riversdale to Knysna (not in Strandveld) |
| *Cotula myriophylloides* | CR | Cape Peninsula, Bredasdorp, Plettenberg Bay |
| *Euchaetis albertiniana* | EN | Albertinia |
| *Sensitive species 516* | EN | Herbertsdale to Mossel Bay |
| *Sensitive species 800* | VU | Cape Peninsula to Knysna |
| *Sensitive species 500* | VU | Cape Flats to Gqeberha |
| *Diosma passerinoides* | VU | Caledon to Baviaanskloof |
| *Agathosma microcarpa* | VU | Potberg to Mossel Bay |

### *iNaturalist*

There were seven research-grade iNaturalist plant sightings within or very near to the proposed development footprint. The low number of iNaturalist sightings is an indication that the proposed development footprint has been transformed.

**Table 2:** Research grade observations from iNaturalist within or very near to the proposed development footprint.

| Family | Species | Common name | Red List status |
|---|---|---|---|
| ASTERACEAE | *Osteospermum moniliferum* | Bitou | LC |
| CONVOLVULACEAE | *Falkia repens* | Pink Ear | LC |
| ERICACEAE | *Erica afra* | heath | LC |
| IRADACEAE | *Gladiolus tristis* | Marsh Afrikaner | LC |

| | | | |
|---|---|---|---|
| OXALIDACEAE | *Oxalis pes-caprae* | Sorrel | LC |
| POACEAE | *Cenchrus clandestinus* | Kikuyu Grass | ALIEN |
| RUTACEAE | *Calodendrum capense* | Cape-Chestnut | LC |

## 6.4 Spatial Planning

### 6.4.1 Critical Biodiversity Areas and Ecological Support Areas

Critical Biodiversity Areas (CBAs) are areas that must be safeguarded in their natural or near-natural state because they are essential for conserving biodiversity and maintaining ecosystem functioning. The spatial planning map for Groot Brakrivier (**Figure F**) indicates that the proposed development footprint does not cross over any terrestrial CBA. The footprint does intersect with CBA Wetland and CBA Estuary near Lang Street. **Figure G** provides a zoomed-in version of **Figure F to** show more detail on the CBA Wetland demarcation. No Ecological Support Areas (ESAs) are mapped near the proposed development footprint. ESAs that are not essential for meeting biodiversity targets but play an important role in supporting the functioning of protected areas or critical biodiversity areas are often vital for delivering ecosystem services. The 2023 Western Cape Biodiversity Spatial Plan (WC BSP) was formally adopted into law on the 13th of December 2024 (Gazette Extraordinary 9017) in alignment with the Western Cape Biodiversity Act (No. 6 of 2021). This marks the replacement of the 2017 WC BSP with the 2023 WC BSP.

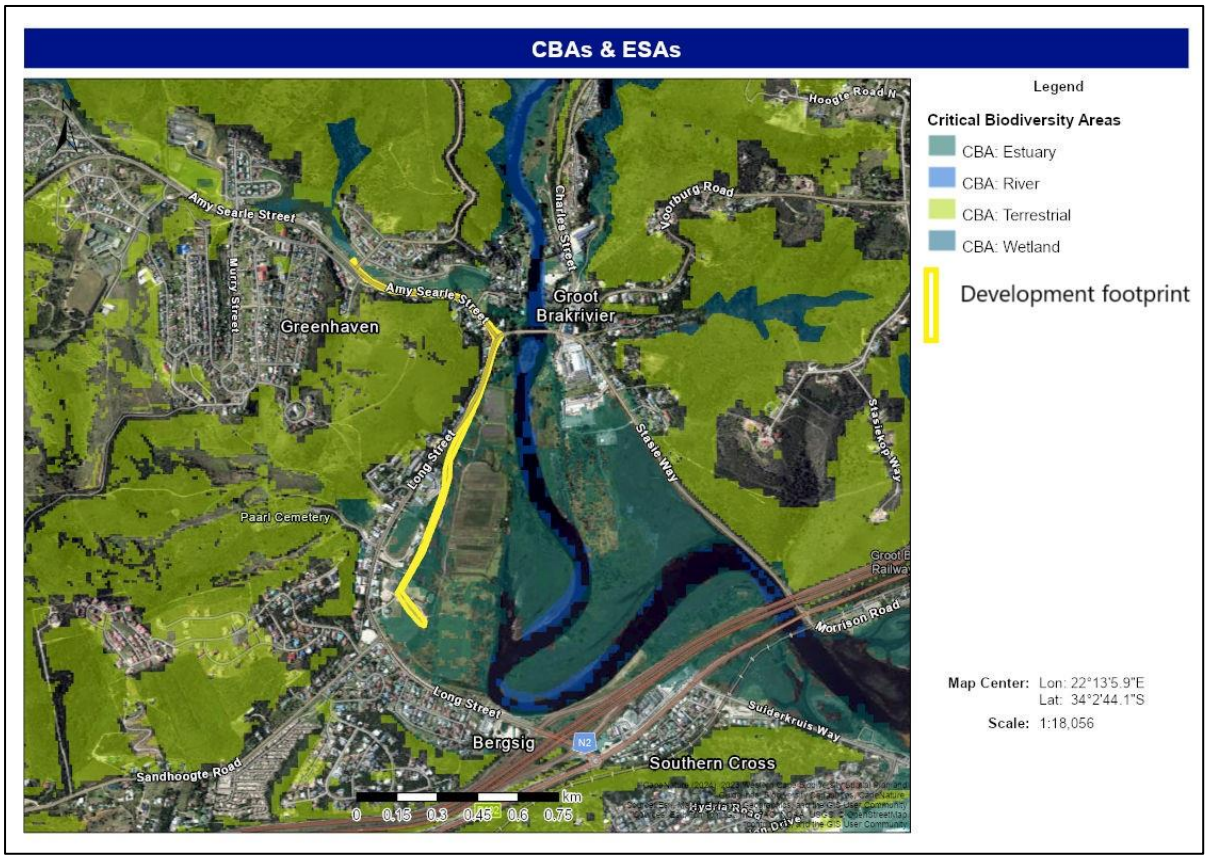


**Figure F:** Spatial planning map for Groot Brakrivier.

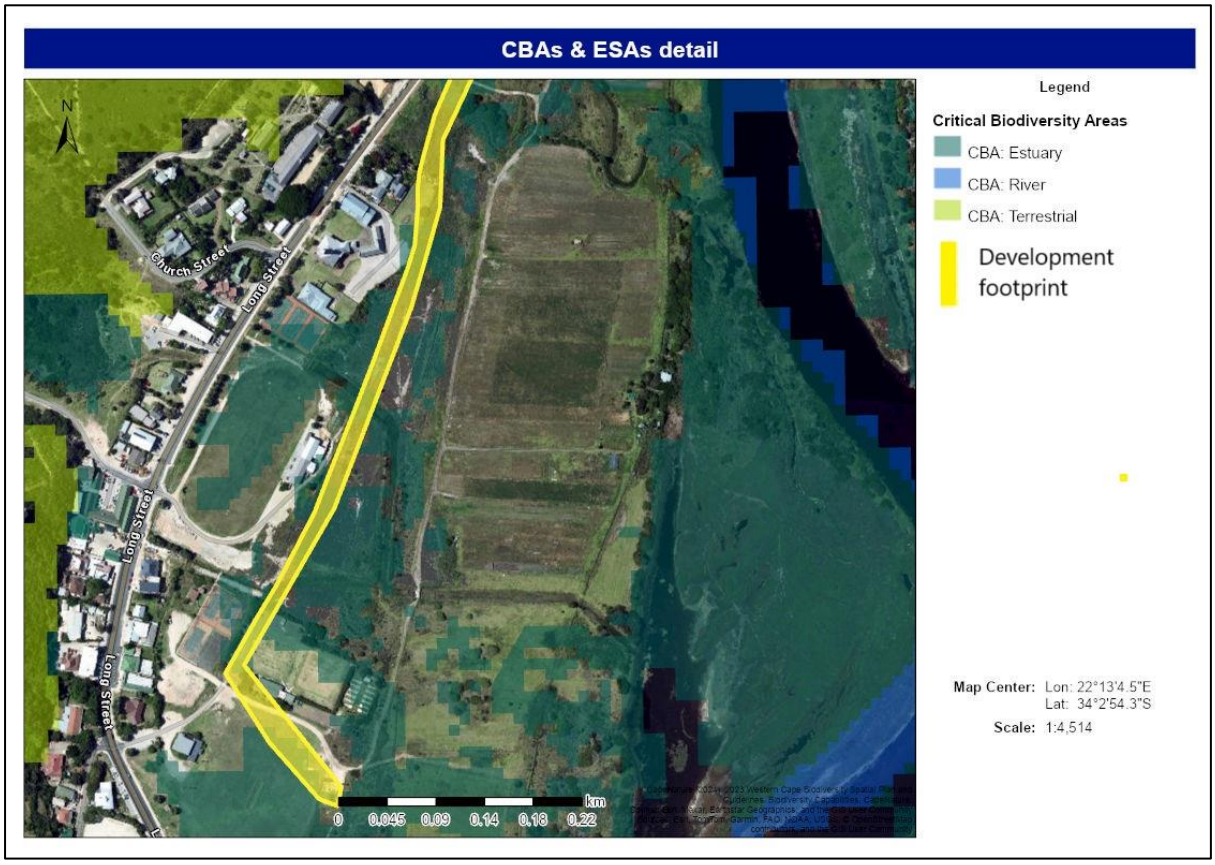



**Figure G:** Spatial planning map for the southern section of the proposed development footprint

### 6.4.2 Reasons for CBA status

The Biodiversity Spatial Plan (2017) for the Western Cape provides reasons for the inclusion of areas into CBAs. These reasons for the CBAs at the proposed development footprint are summarized in **Table 3**.

**Table 3:** Reasons for the inclusion of CBAs at the proposed development footprint

| | |
|---|---|
| Summary 1: | Climate adaptation corridor (14.28), Ecological processes (8.82), Estuary (14.29), River Type (3.21), SA Vegetation Type (2.32), Threatened SA Vegetation Type (8.13), Threatened Vertebrate (11.4), Water resource protection (7.69) |
| Feature 1: | Bontebok Extended Distribution Range |
| Feature 2: | Cape Coastal Lagoons (LT) |
| Feature 3: | Climate adaptation corridor |
| Feature 4: | FEPA River Corridor |
| Feature 5: | Groot Brak Dune Strandveld (EN) |
| Feature 6: | Groot Brak Estuary |
| Feature 7: | Southern Coastal Belt Permanent Lowland River |
| Feature 8: | Watercourse protection- Southern Coastal Belt |

### 6.4.3 Special Habitats, Indigenous Forest, Connectivity, and Corridors

The proposed southern section of the proposed development footprint is close to the Groot Brak estuary. The proposed development footprint is not within the estuary boundaries but part of a buffer zone between the estuary and urban development.

### 6.4.4 Protected Areas

There are no formally protected areas near the proposed development footprint. Groot Brakrivier does fall in the domain of the Gouritz Cluster Biosphere Reserve as indicated in **Figure H**.

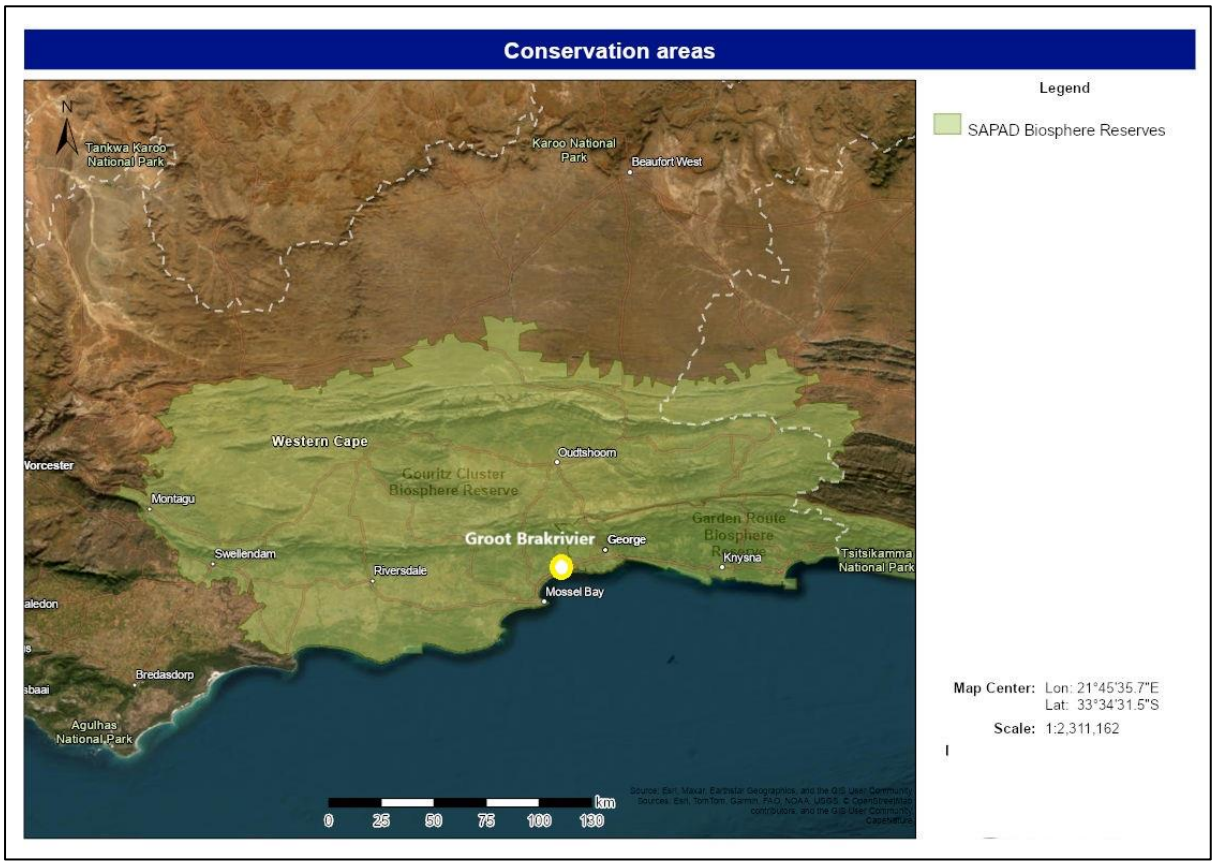



**Figure H:** Protected areas map for the area that includes Groot Brakrivier

The proposed development footprint is also not part of an area earmarked for protected area expansion, as it is located within an urban environment. The CBA status of sections of the footprint will protect further expansion of urban development.

# 7. RESULTS: FIELD ASSESSMENT

## 7.1 Vegetation

The natural vegetation (Groot Brak Dune Strandveld) has been historically transformed for urban development across most of the proposed development footprint. The range of photos and maps covers the proposed development footprint from north to south and is displayed in **Figures 1** to **17**. The yellow shaded area in the maps indicates the area visible in the adjoining photograph. There are small sections that retain elements of the original vegetation, but more than 75% of the area is fully transformed. Large sections are maintained as lawns and sidewalks that are either paved or tarred. No visible natural plant communities are still intact.











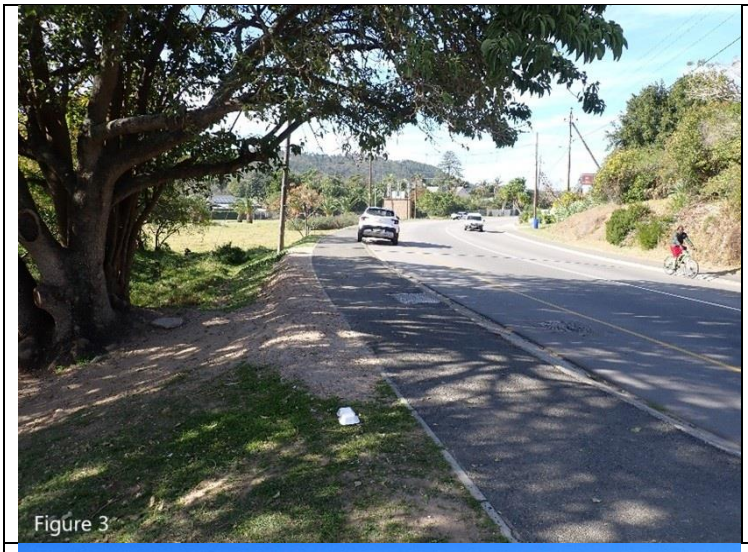


Figure 3





Figure 4






Figure 5



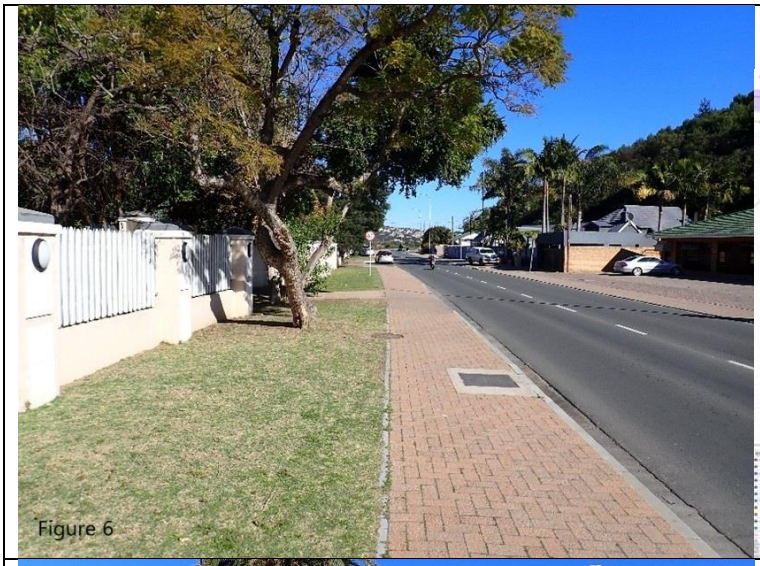


Figure 6






Figure 7

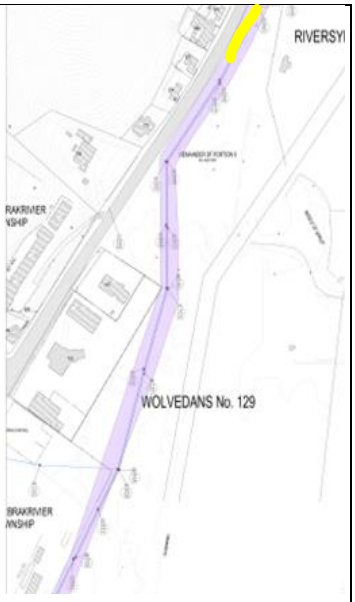


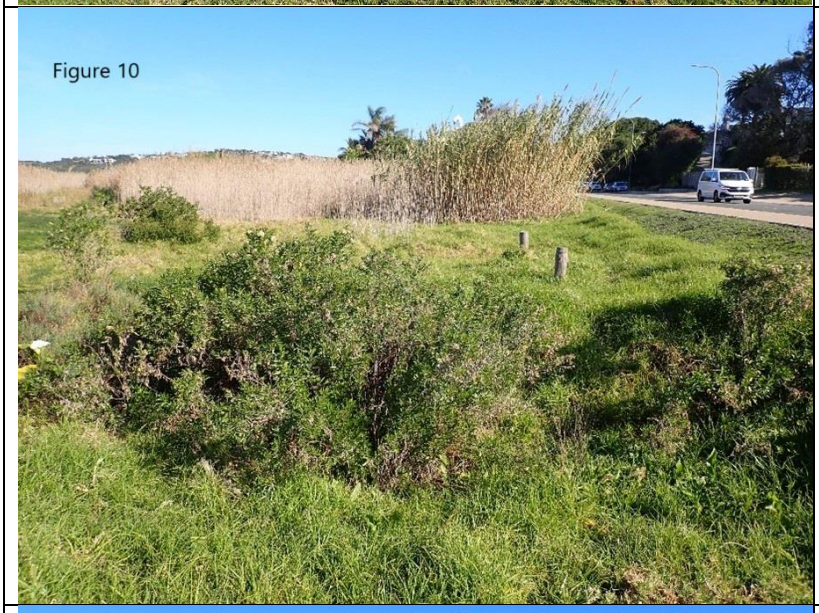



Figure 8




Figure 9


RIVERSYI
WOLVEDANS No. 129


Figure 10

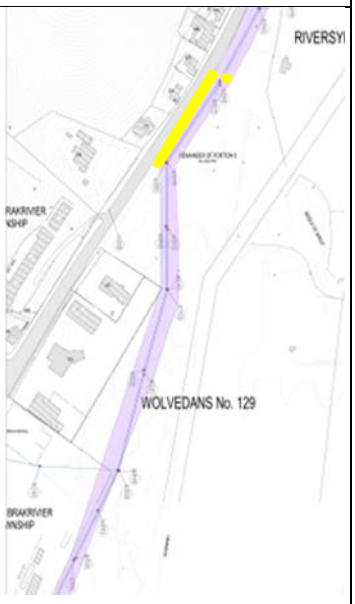

RIVERSYI
WOLVEDANS No. 129


Figure 11

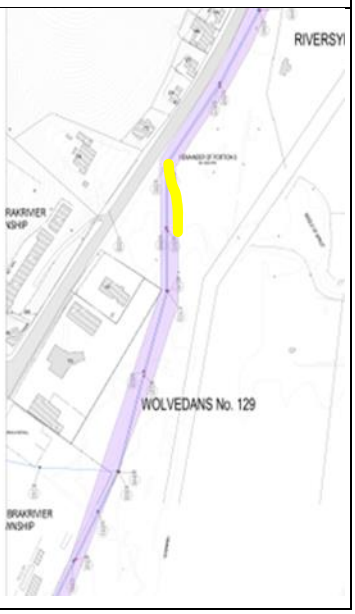

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Figure 12

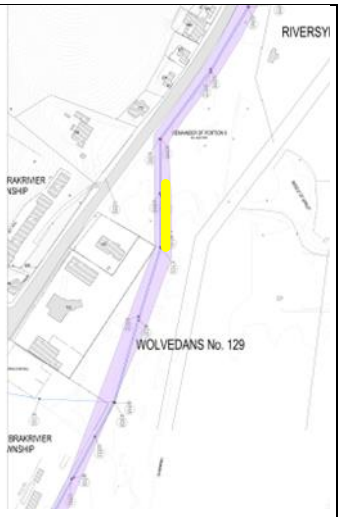

RIVERSYI
WOLVEDANS No. 129


Figure 13

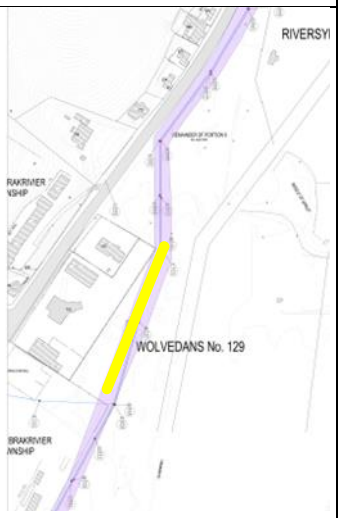

RIVERSYI
WOLVEDANS No. 129


Figure 14

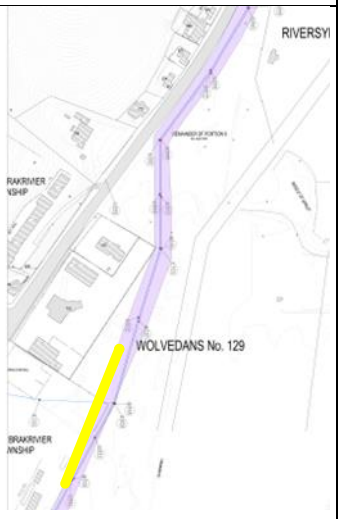

RIVERSYI
WOLVEDANS No. 129



Figure 15






Figure 16

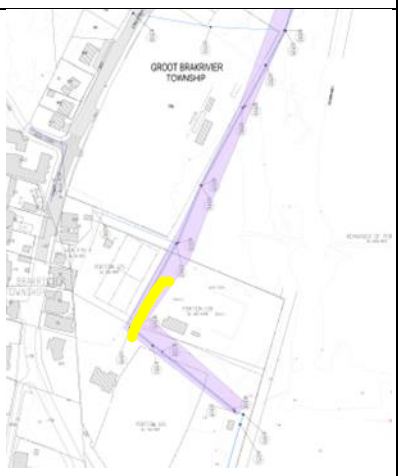





Figure 17



### 7.2 Plant species

The specialist identified 43 plant species from 27 families during a two-day survey of the proposed development site (**Table 4**). Due to prior transformation, overall species diversity was low as anticipated.

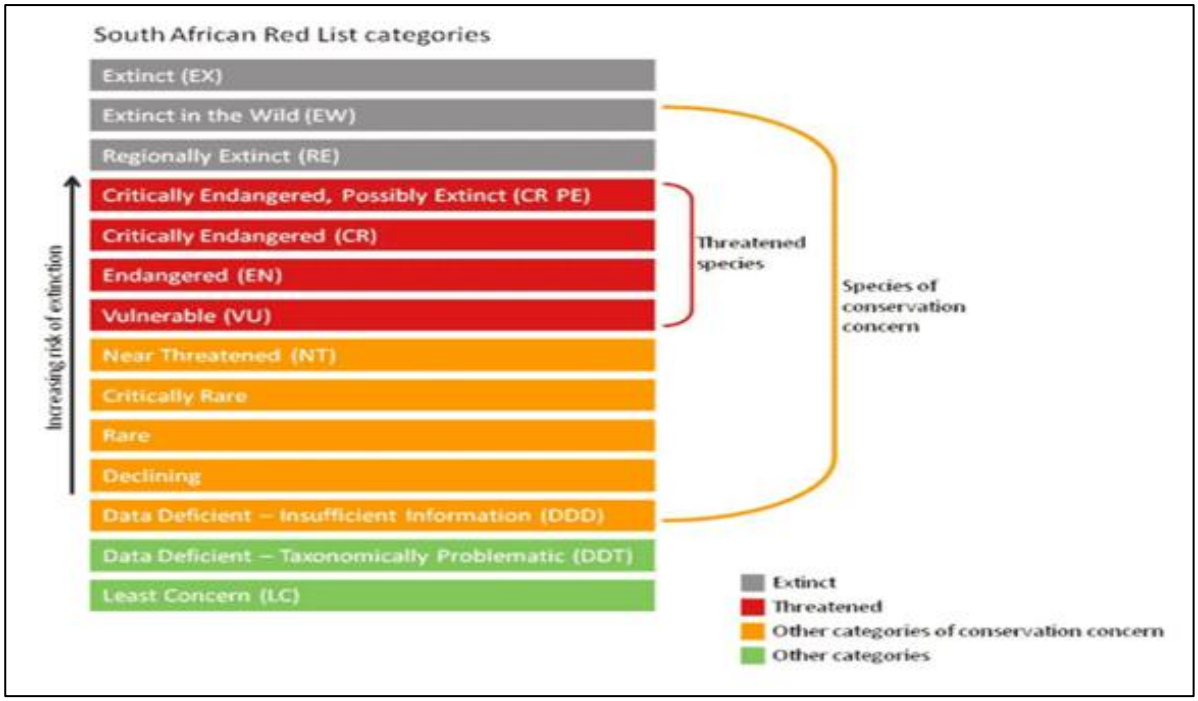
No threatened plant species were recorded within the proposed development footprint. None of the 15 threatened and sensitive plant species listed in the Environmental Screening Tool Report was recorded within the proposed development footprint. The conservation status of the plants is also presented in **Table 4**, and the various categories of conservation status are listed in **Table 5.**

**Table 4:** Plant species recorded during the field survey on 19 and 20 July 2025

| FAMILY | SPECIES | COMMON NAME | SANBI Red List status |
|---|---|---|---|
| AIZOACEAE | *Carpobrotus edulis* | Common Sourfig | LC |
| AIZOACEAE | *Carpobrotus deliciosus* | Delicious Sourfig | LC |
| AIZOACEAE | *Disphyma crassifolium* | Purple Dewplant | LC |
| AMARANTHACEAE | *Salicornia decumbens* | Dense Glasswort | LC |
| ANACARDIACEAE | *Searsia lucida* | Glossy Currantrhus | LC |
| ANACARDIACEAE | *Schinus terebinthifolia* | Brazilian pepper | alien |
| APOCYNACEAE | *Gomphocarpus physocarpus* | Balloonplant | LC |
| ARACEAE | *Zantedeschia aethiopica* | Arum Lily | LC |
| ASPARAGACEAE | *Agave attenuata* | Foxtail agave | LC |
| ASTERACEAE | *Arctotheca prostrata* | Prostrate Capeweed | LC |
| ASTERACEAE | *Helichrysum cymosum* | Fume Everlasting | LC |
| ASTERACEAE | *Helminthotheca echioides* | Bristly oxtongue | alien |
| ASTERACEAE | *Metalasia acuta* | Pointy Blombush | LC |
| ASTERACEAE | *Nidorella ivifolia* | Ovenbush | LC |
| ASTERACEAE | *Oedera pungens* | Perdekaroos | LC |
| ASTERACEAE | *Osteospermum moniliferum* | Bitou | LC |
| ASTERACEAE | *Senecio inaequidens* | Ragwort | LC |
| ASTERACEAE | *Taraxacum officinale* | Common dandelion | alien |
| BASELLACEAE | *Anredera cordifolia* | Mignonette vine | alien |
| BIGONIACEAE | *Tecomaria capensis* | Cape honeysuckle | LC |
| CASUARINACEAE | *Casuarina cunninghamiana* | Beefwood | alien |
| COMMELINACEAE | *Commelina africana* | Yellow Dayflower | LC |
| CONVOLVULACEAE | *Falkia repens* | Pink Ear | LC |
| CYPERACEAE | *Cyperus albostriatus* | Dwarf striped sedge | LC |
| CYPERACEAE | *Cyperus textilis* | Mat Sedge | LC |
| EBENACEAE | *Diospyros dichrophylla* | Poison Starapple | LC |
| FABACEAE | *Acacia mearnsii* | Black Wattle | alien |
| FABACEAE | *Acacia cyclops* | Rooikrans | alien |
| GERANIACEAE | *Pelargonium capitatum* | fleshy-stalk pelargonium | LC |
| GERANIACEAE | *Pelargonium zonale* | Zonal Storkbill | LC |

| | | | |
|---|---|---|---|
| HYPOXIDACEAE | *Hypoxis setosa* | Stargrasses | LC |
| IRADACEAE | *Bobartia robusta* | Giant Rushiris | LC |
| JUNCACEAE | *Juncus acutus* | Spiny rush | LC |
| JUNCACEAE | *Juncus effusus* | Common rush | LC |
| JUNCAGINACEAE | *Triglochin maritima* | Common arrow-grass | LC |
| MAVACEAE | *Hermannia flammea* | Flaming dollsrose | LC |
| OXALIDACEAE | *Oxalis pes-caprae* | klawersuring | LC |
| POACEAE | *Stenotaphrum secundatum* | Buffalo grass | LC |
| RUTACEAE | *Calodendrum capense* | Cape-Chestnut | LC |
| SCROPHULARIACEAE | *Myoporum laetum* | Myoporum | alien |
| TYPHACEAE | *Typha capensis* | Cape bulrush | LC |
| VERBENIACEAE | *Verbena bonariensis* | Purple top | alien |
| VISCACEAE | *Viscum capense* | Voëlent | LC |

**Table 5:** South African Red List categories as prescribed by the International Union for Conservation of Nature (IUCN**)**




### 7.3 Alien plant species present

Alien species were dominant in certain sections of the proposed development footprint. The alien species is listed in **Table 4** above.

## 8. CONCLUSIONS

The site sensitivity is verified to be Low from a plant species perspective and not Medium as rated in the Environmental Screening Tool. This finding is based on:

- No plant species of conservation concern is located within the proposed development footprint.
- The severe state of transformation of the proposed development footprint.
- The high percentage of alien vegetation located within the proposed development footprint.

The specialist therefore recommends that the development proceed as planned from a plant species perspective if the mitigation measures in **Section 9** are captured in the Environmental Management Program.

## 9. PROPOSED IMPACT MANAGEMENT OUTCOMES OR ANY MONITORING REQUIREMENTS FOR INCLUSION IN THE ENVIRONMENTAL MANAGEMENT PROGRAM.

- The proposed development footprint should be fully demarcated (stakes and danger tape) during the construction phase, and all construction activities must be done within this demarcated area.
- In the areas as displayed in Figures 11 to 14, the topsoil that is removed during construction must be kept separate from the lower soil and replaced accordingly.
- Alien invasive trees (*Acacia* spp.) within the proposed development footprint in the section, as displayed in Figures 11 to 14, should be removed.

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# APPENDIX I: FOSSIL FINDS PROCEDURE

**HWC PROCEDURE: CHANCE FINDS OF PALAEONTOLOGICAL MATERIAL**
***June 2016***

**Introduction**
This document is aimed to inform workmen and foremen working on a construction and/or mining site. It describes the procedure to follow in instances of accidental discovery of palaeontological material (please see attached poster with descriptions of palaeontological material) during construction/mining activities. This protocol does not apply to resources already identified under an assessment undertaken under s. 38 of the National Heritage Resources Act (no 25 of 1999).

Fossils are rare and irreplaceable. Fossils tell us about the environmental conditions that existed in a specific geographical area millions of years ago. As heritage resources that inform us of the history of a place, fossils are public property that the State is required to manage and conserve on behalf of all the citizens of South Africa. Fossils are therefore protected by the National Heritage Resources Act and are the property of the State. Ideally, a qualified person should be responsible for the recovery of fossils noticed during construction/mining to ensure that all relevant contextual information is recorded.

Heritage Authorities often rely on workmen and foremen to report finds, and thereby contribute to our knowledge of South Africa's past and contribute to its conservation for future generations.

**Training**
Workmen and foremen need to be trained in the procedure to follow in instances of accidental discovery of fossil material, in a similar way to the Health and Safety protocol. A brief introduction to the process to follow in the event of possible accidental discovery of fossils should be conducted by the designated Environmental Control Officer (ECO) for the project, or the foreman or site agent in the absence of the ECO

It is recommended that copies of the attached poster and procedure are printed out and displayed at the site office so that workmen may familiarise themselves with them and are thereby prepared in the event that accidental discovery of fossil material takes place.

**Actions to be taken**
One person in the staff must be identified and appointed as responsible for the implementation of the attached protocol in instances of accidental fossil discovery and must report to the ECO or site agent. If the ECO or site agent is not present on site, then the responsible person on site should follow the protocol correctly in order to not jeopardize the conservation and well-being of the fossil material.

Once a workman notices possible fossil material, he/she should report this to the ECO or site agent.

**Procedure to follow if it is likely that the material identified is a fossil:**

i. The ECO or site agent must ensure that all **work ceases** immediately in the vicinity of the area where the fossil or fossils have been found;

ii. The ECO or site agent must **inform HWC of the find immediately.** This information must include photographs of the findings and GPS co-ordinates**;**

iii. The ECO or site agent must compile a **Preliminary Report and fill in the *Fossil Discoveries: HWC Preliminary Record Form*** within 24 hours without removing the fossil from its original position. The **Preliminary Report** records basic information about the find including:

- The date
- A description of the discovery
- A description of the fossil and its context (e.g. position and depth of find)
- Where and how the find has been stored
- Photographs to accompany the preliminary report (the more the better):
  - ➔ A scale must be used
  - ➔ Photos of location from several angles
  - ➔ Photos of vertical section should be provided
  - ➔ Digital images of hole showing vertical section (side);
  - ➔ Digital images of fossil or fossils.

Upon receipt of this **Preliminary Report**, HWC will inform the ECO or site agent whether or not a rescue excavation or rescue collection by a palaeontologist is necessary.

v. **Exposed finds must be stabilised where they are unstable and the site capped, e.g. with a plastic sheet or sand bags.** This protection should allow for the later excavation of the finds with due scientific care and diligence. HWC can advise on the most appropriate method for stabilisation.

vi. If the find cannot be stabilised, **the fossil may be collect with extreme care** by the ECO or the site agent and put aside and protected until HWC advises on further action. Finds collected in this way must be safely and securely stored in tissue paper and an appropriate box. Care must be taken to remove the all fossil material and any breakage of fossil material must be avoided at all costs.

No work may continue in the vicinity of the find until HWC has indicated, in writing, that it is appropriate to proceed.

iLifa leMveli leNtshona Koloni
Heritage Western Cape

| FOSSIL DISCOVERIES: HWC PRELIMINARY RECORDING FORM | | |
|---|---|---|
| **Name of project:** | | |
| **Name of fossil location:** | | |
| **Date of discovery:** | | |
| **Description of situation in which the fossil was found:** | | |
| **Description of context in which the fossil was found:** | | |
| **Description and condition of fossil identified:** | | |
| **GPS coordinates:** | Lat: | Long: |
| **If no co-ordinates available then please describe the location:** | | |
| **Time of discovery:** | | |
| **Depth of find in hole** | | |
| **Photographs (tick as appropriate and indicate number of the photograph)** | Digital image of vertical section (side) | |
| | Fossil from different angles | |
| | Wider context of the find | |
| **Temporary storage (where it is located and how it is conserved)** | | |
| **Person identifying the fossil** | Name:<br>Contact: | |
| **Recorder** | Name:<br>Contact: | |
| **Photographer** | Name:<br>Contact: | |

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# APPENDIX J: SITE SPECIFIC ALIEN AND INVASIVE SPECIES MANAGEMENT PROGRAMME

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# SITE SPECIFIC ALIEN AND INVASIVE SPECIES MANAGEMENT PROGRAMME

## FOR THE

## PROPOSED UPGRADING OF THE BULK SEWERAGE LINE FROM AMY SEARLE STREET / GREENHAVEN TO THE CRICKET FIELD SEWERAGE PUMPSTATION, ON ERVEN 4808, 4809, 4807, 770, 733, 83, REMAINDER OF FARM 4812, STREET PARCEL RE/131 AND STREET PARCEL RE/4893, GROOT BRAKRIVIER, MOSSEL BAY MUNICIPALITY, WESTERN CAPE PROVINCE.

Produced as part of a Basic Assessment EIA Application for Environmental Authorisation in terms of the National Environmental Management Act (Act 107 of 1998) and the amended (April 2017) Environmental Impact Assessment Regulations, 2014

**SUBMITTED TO STIAAN KOTZE (skotze@dffe.gov.za) FOR APPROVAL**

**PREPARED FOR:** *Mossel Bay Municipality*
Private Bag X29
Mossel Bay
6500

**DATE:** 16 February 2026

**SES REF NO:** AMP/ASGC /MB/02/26
**DEA&DP REF.NO.:** 16/3/3/6/7/1/D6/17/0356/25

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**Appendix A2**: EAPASA Registration of Author
**Appendix B**: Plant Species Site Verification and Compliance Statement Report
**Appendix C**: DFFE Pesticide Policy

| Section 1 | PROJECT DETAILS |
|---|---|

| PROJECT DETAILS: | | |
|---|---|---|
| **Project Name:** | **The proposed upgrading of the bulk sewerage line from Amy Searle Street / Greenhaven to the cricket field sewerage pumpstation, on Erven 4808, 4809, 4807, 770, 733, 83, Remainder of Farm 4812, Street Parcel RE/131 and Street Parcel RE/4893, Groot Brakrivier, Mossel Bay Municipality, Western Cape Province.** | |
| **DEADP Reference Number:** | **16/3/3/6/7/1/D6/17/0356/25** | |
| **Erf Name and Portion Number:** | • **Erf 4808;**<br>• **Erf 4809;**<br>• **Erf 4807;**<br>• **RE/4812;**<br>• **Erf 770;**<br>• **Erf 733;**<br>• **Erf 83;**<br>• **Street Parcel RE/131;**<br>• **Street Parcel RE/4893** | |
| **SG Codes:** | **Erf 4808** | **C05100030000480800000** |
| | **Erf 4809** | **C05100030000480900000** |
| | **Erf 4807** | **C05100030000480700000** |
| | **RE/4812** | **C05100030000481200000** |
| | **Erf 770** | **C05100030000077000000** |
| | **Erf 733** | **C05100030000073300000** |
| | **Erf 83** | **C05100030000008300000** |
| | **Street Parcel RE/131** | **C05100000000013100000** |
| | **Street Parcel RE/4893** | **C05100030000489300000** |
| **GPS Co-ordinates of Pipeline Route:** | **Starting point co-ordinates** | **34 ° 3' 4.01" S<br>22° 12' 59.52'' E** |
| | **Middle point co-ordinates** | **34° 2' 37.75" S<br>22° 13' 7.42" E** |
| | **End point co-ordinates** | **34° 2' 22.32" S<br>22° 12' 51.14" E** |
| **Municipality:** | **Mossel Bay Municipality** | |
| **Province:** | **Western Cape** | |
| **Applicant:** | **Mossel Bay Municipality** | |
| **EAP:** | **Sharples Environmental Services cc<br>EAP: Michael Jon Bennett (EAPASA: 2021/3163)<br>Candidate EAP: Christiaan Smit (EAPASA: 2024/8297)** | |
| **Date:** | **16 February 2026** | |
| **Conditions of Use:** | **This report is the intellectual property of Environmental Services cc (SES), who may make allowance to publish it, in whole provided that:<br>a) Approval for copy is obtained from SES.<br>b) SES is acknowledged in the publication.<br>c) SES is indemnified against and claim for damages that may result from publication of specifications, recommendations or statements that is not administered or controlled by SES.<br>d) That approval is obtained from SES if this report is to be used for the purposes of sale, publicity or advertisement.<br>SES accepts no responsibility for failure to follow the recommended program.** | |

| Section | |
|---|---|
| 2 | **PURPOSE OF THIS ALIEN AND INVASIVE SPECIES MANAGEMENT PLAN** |

This Alien and Invasive Species Management Plan has been prepared for the Mossel Bay Municipality, for the construction and post construction rehabilitation activities associated with the proposed upgrading of the bulk sewerage line from Amy Searle Street / Greenhaven to the cricket field sewerage pumpstation, on Erven 4808, 4809, 4807, 770, 733, 83, Remainder of Farm 4812, Street Parcel RE/131 and Street Parcel RE/4893, Groot Brakrivier, Mossel Bay Municipality, Western Cape Province.

This Aline and Invasive Species Management Plan has been compiled in accordance with:

- The National Environmental Management: Biodiversity Act (Act 10 of 2004);
- The Alien and Invasive Species Regulations, 2014 (as Amended);
- And the EMPr.

The purpose of this Alien and Invasive Species Management Plan is to:

- Identify listed alien invasive species present on site;
- Provide a method statement for clearing of alien and invasive species;
- Prevent further spread of alien and invasive species;
- Ensure legal compliance;
- Promote indigenous vegetation recovery.

| Section | |
|---|---|
| 3 | **LEGISLATIVE CONTEXT** |

This plan complies with:

- **The Constitution of South Africa:**

Section 4 of the Constitution guarantees everyone the right to an environment that is not harmful to their health or well-being. The constitution also mandates that the environment be protected for present and future generations through reasonable legislative and other measures, which includes preventing pollution and degradation. It promotes sustainable development and, where appropriate, the sustainable use of natural resources to ensure "ecologically sustainable development".

- **The National Environmental Management Act, 1998 (Act No. 107 of 1998):**

The Duty of Care is contained in Section 28 of the National Environmental Management Act, 1998 (Act 107 of 1998). In terms of Section 28(1), every person who causes, has caused, or may cause significant pollution or environmental degradation has a legal obligation to take reasonable measures to prevent such pollution or degradation from occurring, continuing, or recurring. Where harm to the environment cannot be prevented, Section 28(2) requires that reasonable measures be taken to minimise and rectify the pollution or degradation.

- **The National Environmental Management: Biodiversity Act (Act No. 10 of 2004):**

In terms of Section 73 of the National Environmental Management: Biodiversity Act (NEMBA), the landowner or person in control of land has a legal duty of care to take reasonable steps to prevent the spread of listed invasive species occurring on the property and to control or eradicate such species in accordance with the Alien and Invasive Species Regulations. Failure to comply with this obligation may result in enforcement action by the competent authority.

The implementation of this Alien and Invasive Species Management Plan is intended to give effect to the landowner's statutory duty under Section 73 of NEMBA.

- **NEMBA: Alien Species Regulations:**

**Category 1a Listed Invasive Species:**
(1) Category 1a Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be combatted or eradicated.
(2) A person in control of a Category 1a Listed Invasive Species must—
(a) immediately take steps to combat or eradicate listed invasive species in compliance with sections 75(1), (2) and (3) of the Act; and
(b) allow an authorised official to inspect a property as provided for in terms of section 31K of the National Environmental Management Act and to monitor, assist with or implement the combatting or eradication of the listed invasive species.
(3) If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must combat or eradicate the listed invasive species in accordance with such programme.

**Category 1b Listed Invasive Species**
(1) Category 1b Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be controlled.
(2) A person in control of a Category 1b Listed Invasive Species must control the listed invasive species in compliance with sections 75(1), (2) and (3) of the Act.
(3) If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.
(4) A person contemplated in sub-regulation (2) must allow an authorised official to inspect a property as provided for in terms of section 31K of the National Environmental Management Act and to monitor, assist with or implement the control of the listed invasive species, or compliance with the Invasive Species Management Programme contemplated in section 75(4) of the Act.
(5) The Minister may require any person to develop a Category 1b Control Plan for one or more Category 1b species, which plan must be submitted to the Minister for approval, and such Control Plan must include the following:
(a) species identification;
(b) extent of invasion;
(c) control measures to be used;
(d) an action plan or schedule including time-frames for the clearing of each species;
(e) whether or not any species can be utilised as biomass; and
(g) any other information which the Minister may require.

**Category 2 Listed Invasive Species**
(1) Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be.
(2) Unless otherwise indicated in the Notice, no person may carry out a restricted activity in respect of a Category 2 Listed Invasive Species without a permit.
(3) A person in control of a Category 2 Listed Invasive Species, or person in possession of a permit, must ensure that the specimens of the species do not spread outside of the land or the area specified in the Notice or permit.
(4) Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in sub-regulation (1), must, for purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to Regulation 3.
(5) Notwithstanding the specific exemptions relating to existing plantations in respect of Listed Invasive Plant Species, any person or organ of state must ensure that the specimens of such Listed Invasive Plant Species do not spread outside of the land over which they have control, or the specified area on such land, where any restricted activity is authorised in respect of any Listed Invasive Plant Species

**Category 3 Listed Invasive Species**
Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of Act, as specified in the Notice.

(2) Any plant species identified as a Category 3 Listed Invasive Species that occurs in riparian areas, must, for the purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to regulation 3.

- **Regulation 7 (Control of listed invasive species)**

Regulation 7 of the Alien and Invasive Species Regulations under the National Environmental Management: Biodiversity Act requires that listed invasive species must be controlled in a manner that reduces their population, prevents their spread, and minimises their ecological and socio-economic impacts.

Control measures must be appropriate to the species concerned and may include mechanical, chemical or biological methods, implemented in accordance with best environmental practice and applicable permit conditions. Ongoing monitoring and follow-up clearing are required to ensure that regrowth is addressed and long-term control is achieved.

The implementation of this Management Plan ensures compliance with the control obligations prescribed under Regulation 7.

| Section 4 | SITE DESCRIPTION |
|---|---|

**Locality and Project Description:**
The proposed development entails the installation of a sewage pipeline from the pump station south east of Long Street to the connection point located towards the north along Amy Searl Street. Please see the figures below for the proposed pipeline route and Site Development Plan (SDP). The pipe to be installed has a diameter of 300mm and the pipeline route will be approximately 1100m. Please refer to the Figure below for the locality of the pipeline route and construction footprint. The pipeline has an internal diameter of 300mm and the proposed route is approximately 1100m long, therefore the development footprint will equal 330m$^2$.

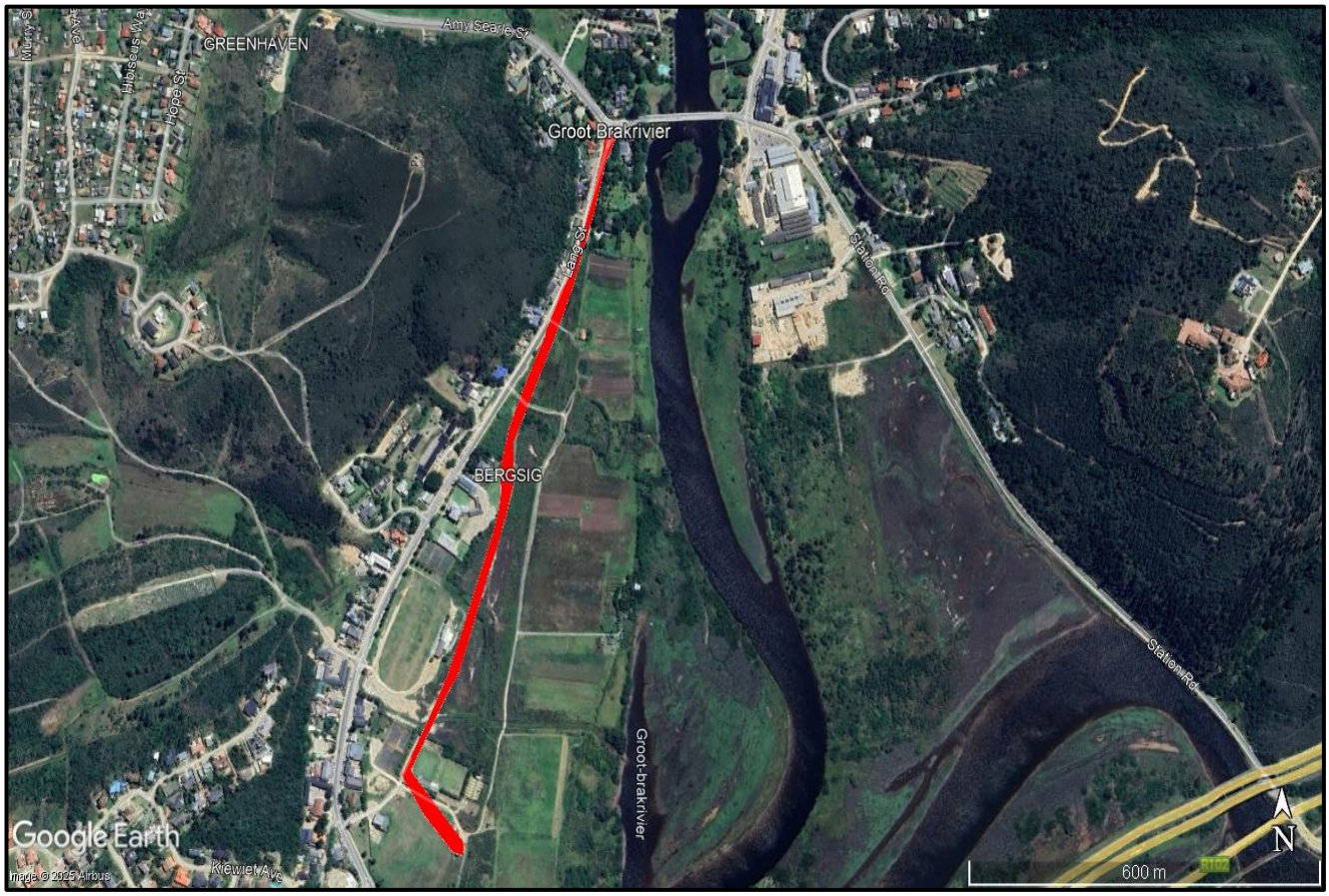



**Figure 1: Locality of pipeline route and construction footprint.**

**Vegetation on Site:**
JA van der Walt from Advanced Environmental Corporation was appointed to compile a Site Verification and Compliance Statement Report for the project as part of the Basic Assessment Report process being undertaken by Sharples Environmental Services cc. The specialist has determined the following regarding the vegetation present on site:

- **Vegetation:**

The natural vegetation (Groot Brak Dune Strandveld) has been historically transformed for urban development across most of the proposed development footprint. The range of photos and maps covers the proposed development footprint from north to south and is displayed in Figures 2 to 18. The yellow shaded area in the maps indicates the area visible in the adjoining photograph. There are small sections that retain elements of the original vegetation, but more than 75% of the area is fully transformed. Large sections are maintained as lawns and sidewalks that are either paved or tarred. No visible natural plant communities are still intact.

Figure 2:





Figure 3:





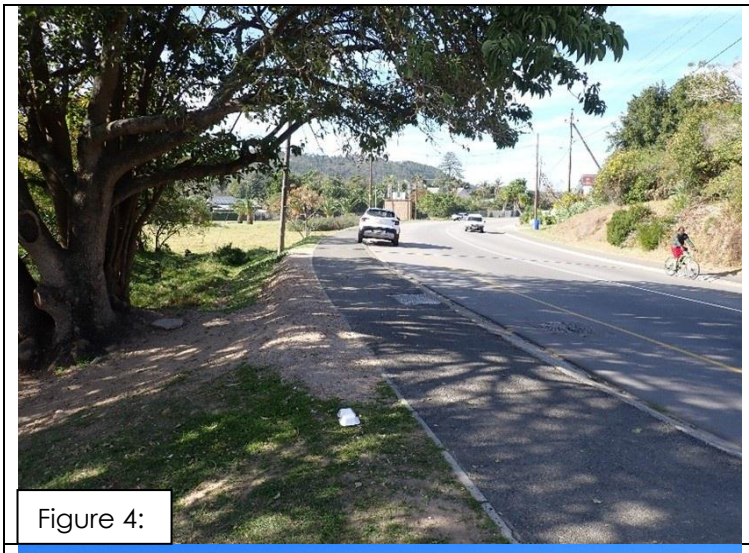


Figure 4:





Figure 5:






Figure 6:



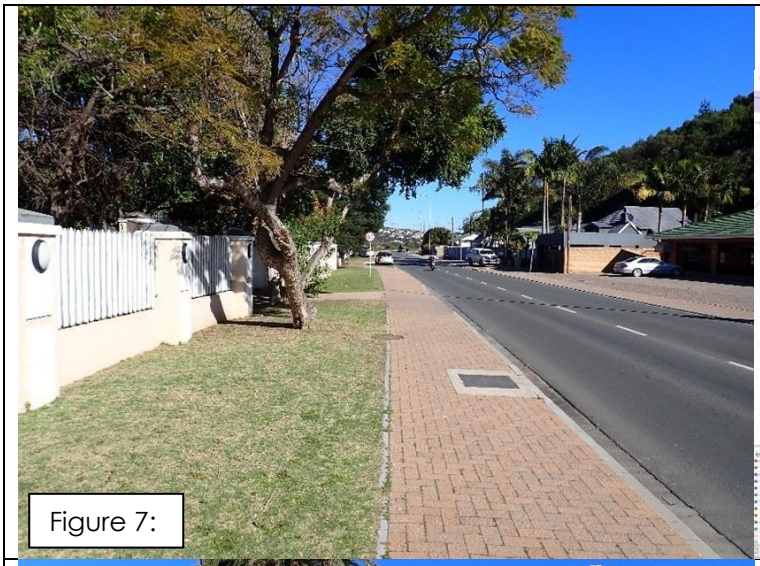


Figure 7:




Figure 8:

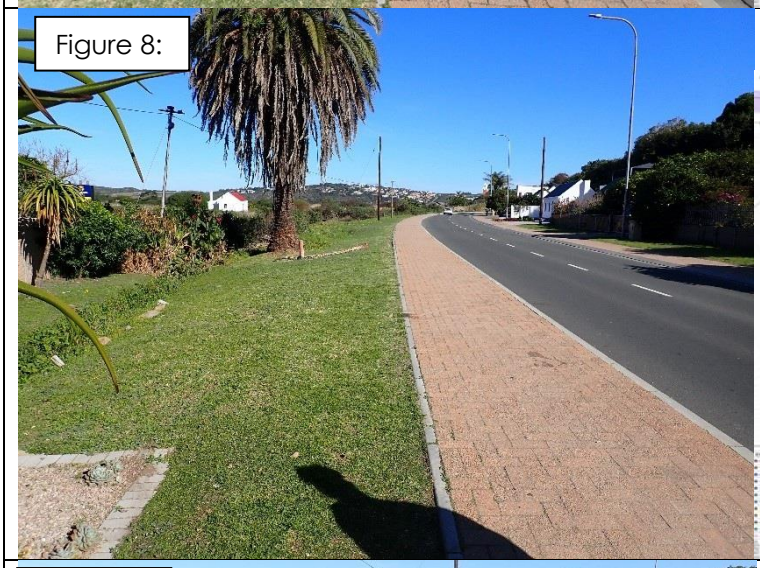





Figure 9:





Figure 10:



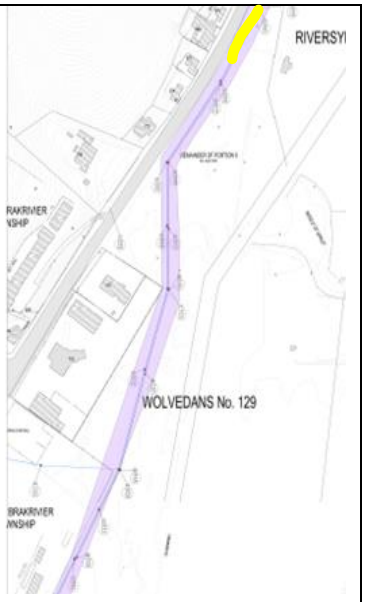



Figure 11:



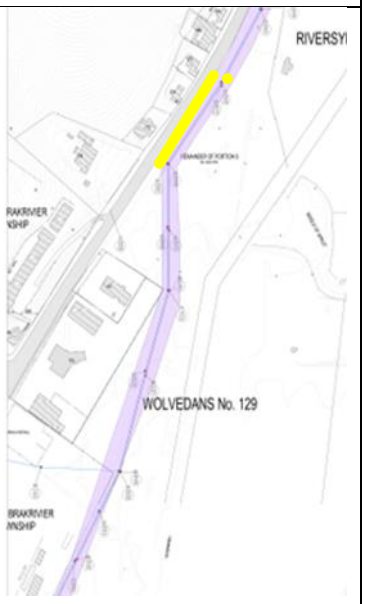



Figure 12:



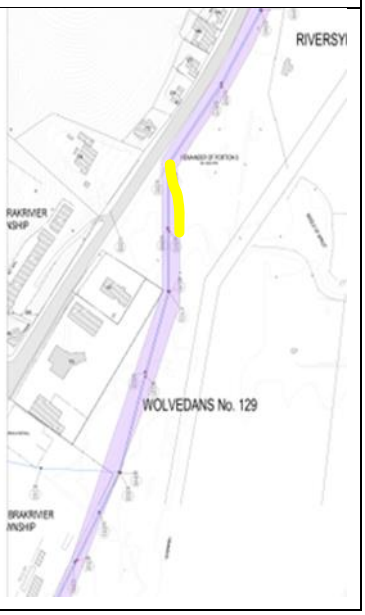


Figure 13:



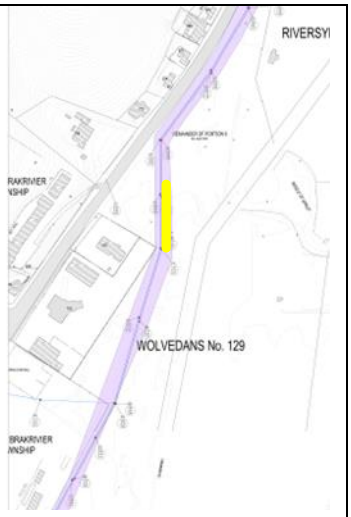



Figure 14:



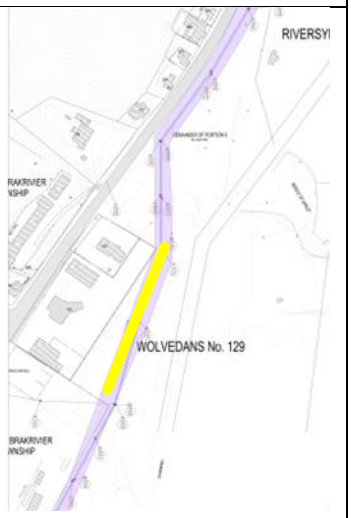



Figure 15:



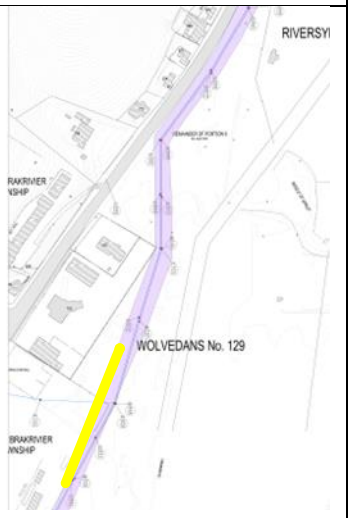




Figure 16:

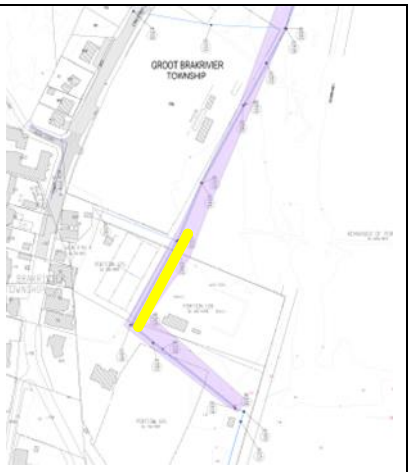





Figure 17:

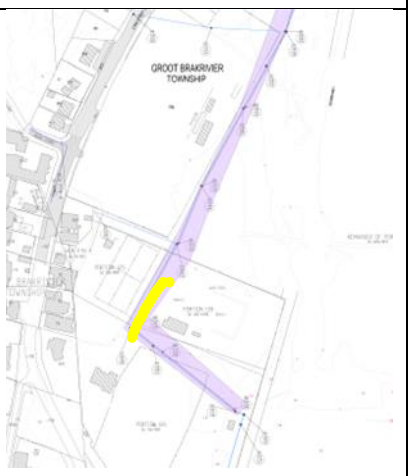
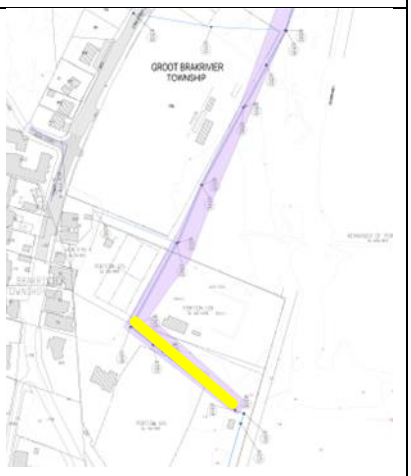



Figure 18:





- **Plant Species:**

The specialist identified 43 plant species from 27 families during a two-day survey of the proposed development site (**Table 1**). Due to prior transformation, overall species diversity was low as anticipated.

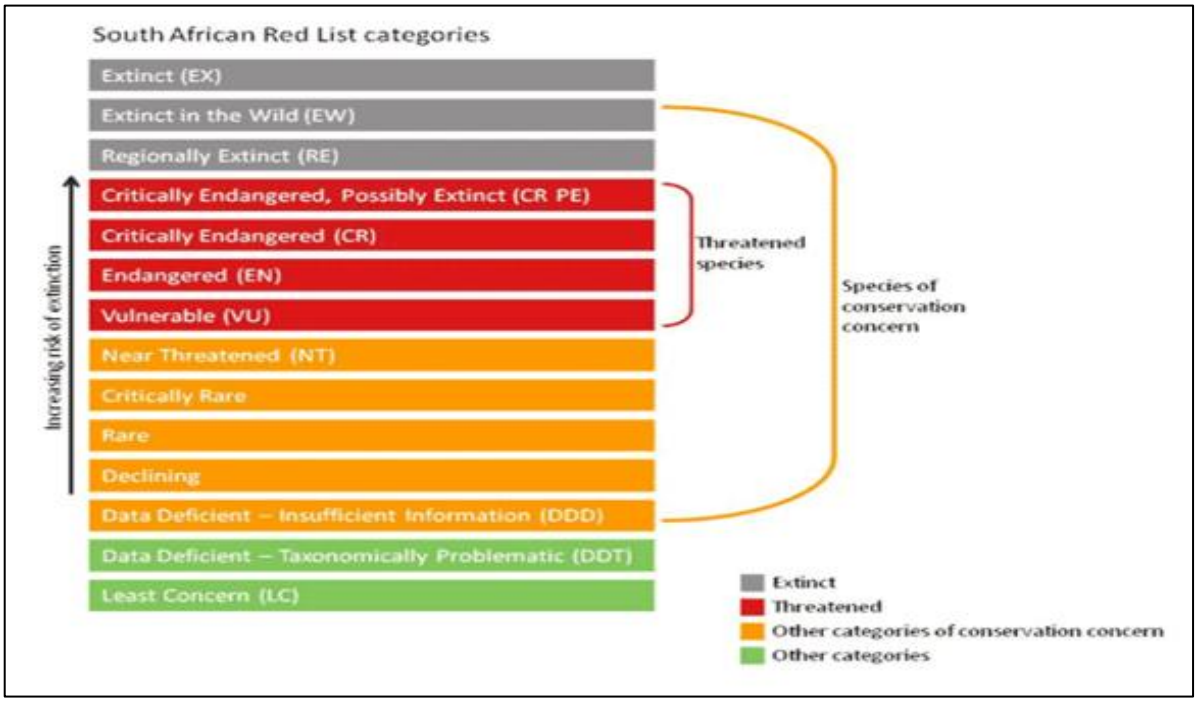
No threatened plant species were recorded within the proposed development footprint. None of the 15 threatened and sensitive plant species listed in the Environmental Screening Tool Report was recorded within the proposed development footprint. The conservation status of the plants is also presented in **Table 1**, and the various categories of conservation status are listed in **Table 2.**

**Table 1: Plant species recorded during the field survey on 19 and 20 July 2025**

| FAMILY | SPECIES | COMMON NAME | SANBI Red List status |
|---|---|---|---|
| AIZOACEAE | *Carpobrotus edulis* | Common Sourfig | LC |
| AIZOACEAE | *Carpobrotus deliciosus* | Delicious Sourfig | LC |
| AIZOACEAE | *Disphyma crassifolium* | Purple Dewplant | LC |
| AMARANTHACEAE | *Salicornia decumbens* | Dense Glasswort | LC |
| ANACARDIACEAE | *Searsia lucida* | Glossy Currantrhus | LC |
| ANACARDIACEAE | *Schinus terebinthifolia* | Brazilian pepper | alien (Category 1b) |
| APOCYNACEAE | *Gomphocarpus physocarpus* | Balloonplant | LC |
| ARACEAE | *Zantedeschia aethiopica* | Arum Lily | LC |
| ASPARAGACEAE | *Agave attenuata* | Foxtail agave | LC |
| ASTERACEAE | *Arctotheca prostrata* | Prostrate Capeweed | LC |
| ASTERACEAE | *Helichrysum cymosum* | Fume Everlasting | LC |
| ASTERACEAE | *Helminthotheca echioides* | Bristly oxtongue | Alien (Category 1b) |
| ASTERACEAE | *Metalasia acuta* | Pointy Blombush | LC |
| ASTERACEAE | *Nidorella ivifolia* | Ovenbush | LC |
| ASTERACEAE | *Oedera pungens* | Perdekaroos | LC |
| ASTERACEAE | *Osteospermum moniliferum* | Bitou | LC |
| ASTERACEAE | *Senecio inaequidens* | Ragwort | LC |
| ASTERACEAE | *Taraxacum officinale* | Common dandelion | alien |
| BASELLACEAE | *Anredera cordifolia* | Mignonette vine | alien (Category 1b) |
| BIGONIACEAE | *Tecomaria capensis* | Cape honeysuckle | LC |
| CASUARINACEAE | *Casuarina cunninghamiana* | Beefwood | alien (Category 1b) |
| COMMELINACEAE | *Commelina africana* | Yellow Dayflower | LC |
| CONVOLVULACEAE | *Falkia repens* | Pink Ear | LC |
| CYPERACEAE | *Cyperus albostriatus* | Dwarf striped sedge | LC |
| CYPERACEAE | *Cyperus textilis* | Mat Sedge | LC |
| EBENACEAE | *Diospyros dichrophylla* | Poison Starapple | LC |
| FABACEAE | *Acacia mearnsii* | Black Wattle | alien (Category 1b) |
| FABACEAE | *Acacia cyclops* | Rooikrans | alien (Category 1b) |
| GERANIACEAE | *Pelargonium capitatum* | fleshy-stalk pelargonium | LC |
| GERANIACEAE | *Pelargonium zonale* | Zonal Storkbill | LC |
| HYPOXIDACEAE | *Hypoxis setosa* | Stargrasses | LC |
| IRADACEAE | *Bobartia robusta* | Giant Rushiris | LC |
| JUNCACEAE | *Juncus acutus* | Spiny rush | LC |
| JUNCACEAE | *Juncus effusus* | Common rush | LC |

| | | | |
|---|---|---|---|
| JUNCAGINACEAE | *Triglochin maritima* | Common arrow-grass | LC |
| MAVACEAE | *Hermannia flammea* | Flaming dollsrose | LC |
| OXALIDACEAE | *Oxalis pes-caprae* | klawersuring | LC |
| POACEAE | *Stenotaphrum secundatum* | Buffalo grass | LC |
| RUTACEAE | *Calodendrum capense* | Cape-Chestnut | LC |
| SCROPHULARIACEAE | *Myoporum laetum* | Myoporum | alien (Category 1b) |
| TYPHACEAE | *Typha capensis* | Cape bulrush | LC |
| VERBENIACEAE | *Verbena bonariensis* | Purple top | alien (Category 1b) |
| VISCACEAE | *Viscum capense* | Voëlent | LC |

**Table 2: South African Red List categories as prescribed by the International Union for Conservation of Nature (IUCN)**




**Critical Biodiversity Areas and Ecological Support Areas on Site:**

Critical Biodiversity Areas (CBAs) are areas that must be safeguarded in their natural or near-natural state because they are essential for conserving biodiversity and maintaining ecosystem functioning. The spatial planning map for Groot Brakrivier (Figure 19) indicates that the proposed development footprint does not cross over any terrestrial CBA. The footprint does intersect with CBA Wetland and CBA Estuary near Lang Street. Figure 20 provides a zoomed-in version of Figure 19 to show more detail on the CBA Wetland demarcation. No Ecological Support Areas (ESAs) are mapped near the proposed development footprint. ESAs that are not essential for meeting biodiversity targets but play an important role in supporting the functioning of protected areas or critical biodiversity areas are often vital for delivering ecosystem services. The 2023 Western Cape Biodiversity Spatial Plan (WC BSP) was formally adopted into law on the 13th of December 2024 (Gazette Extraordinary 9017) in alignment with the Western Cape Biodiversity Act (No. 6 of 2021). This marks the replacement of the 2017 WC BSP with the 2023 WC BSP.

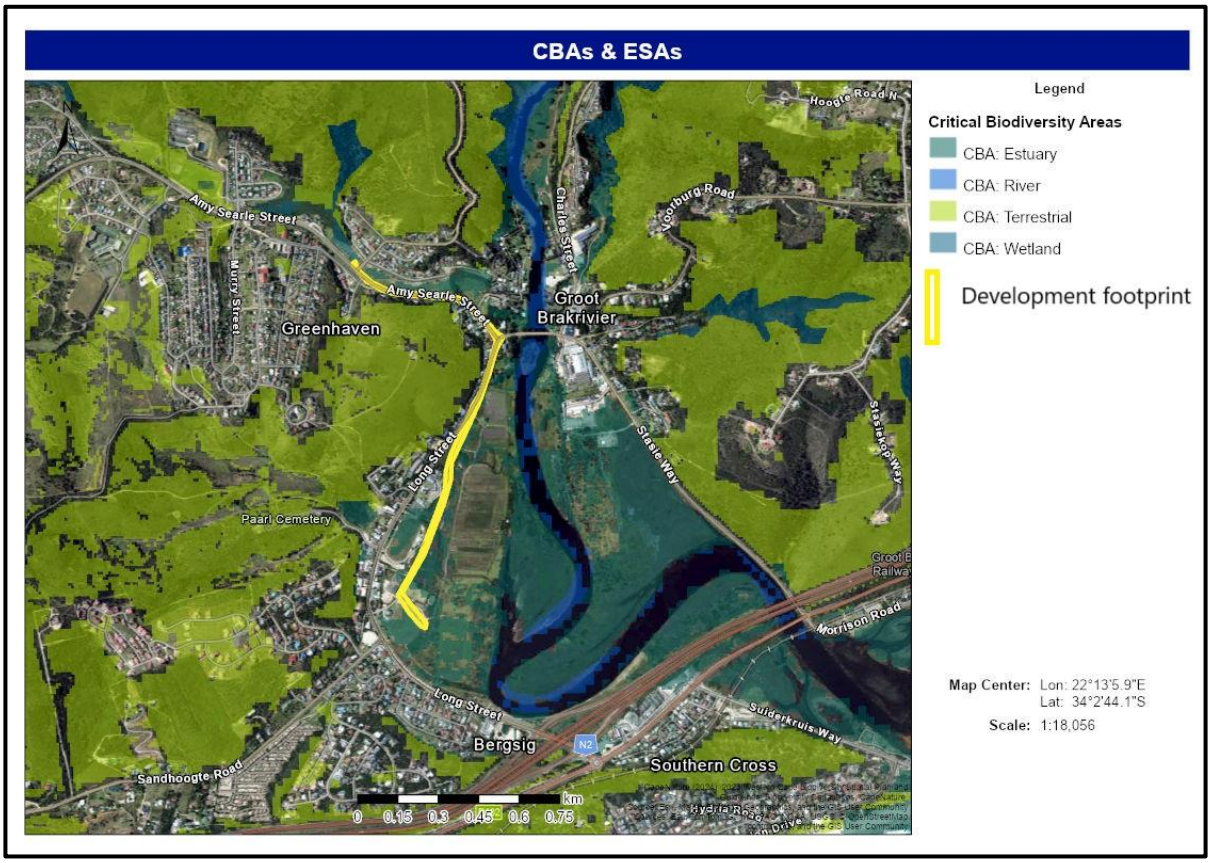



**Figure 19: Spatial Planning Map for Grootbrak Rivier.**

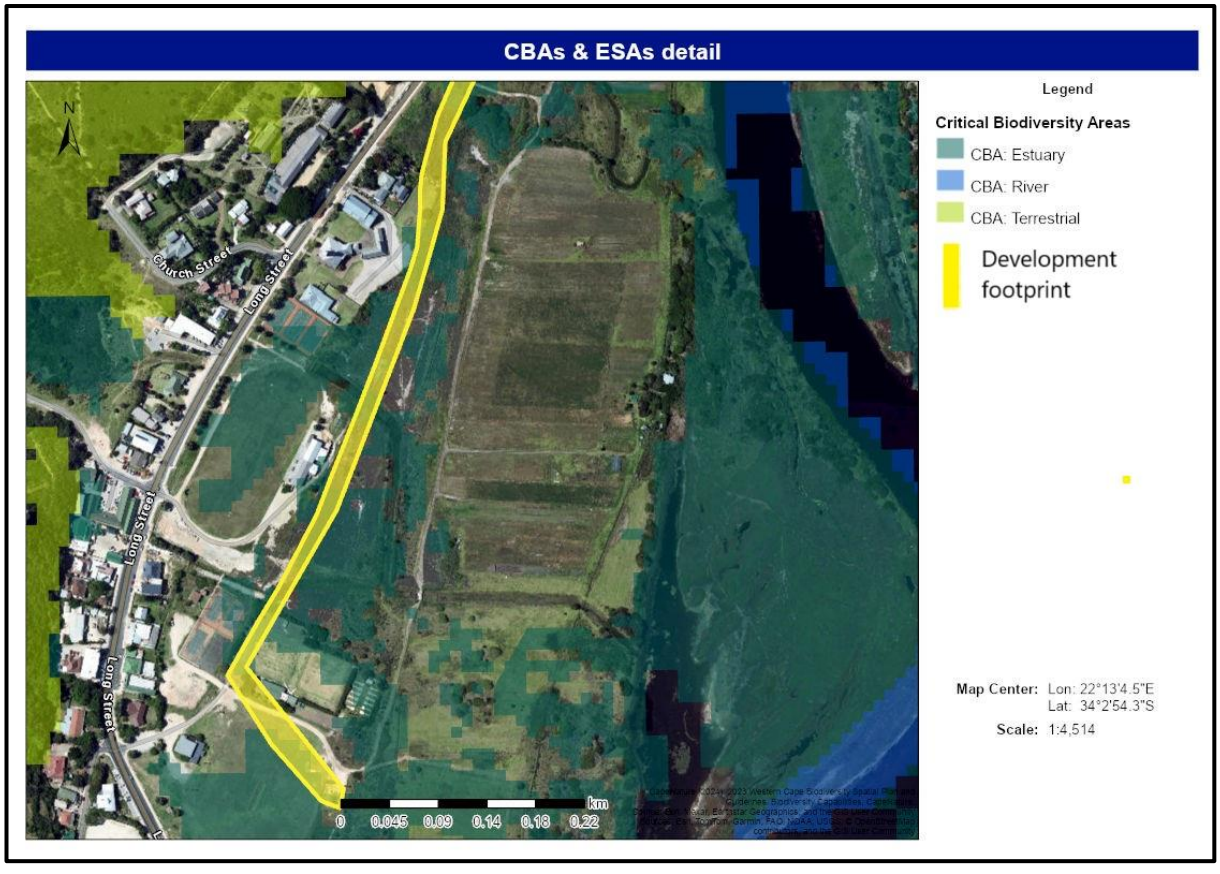



**Figure 20: Spatial Planning Map for the southern section of the proposed development footprint.**

**Reasons for CBA status**

The Biodiversity Spatial Plan (2017) for the Western Cape provides reasons for the inclusion of areas into CBAs. These reasons for the CBAs at the proposed development footprint are summarized in **Table 3**.

**Table 3: Reasons for the inclusion of CBAs at the proposed development footprint**

| | |
|---|---|
| Summary 1: | Climate adaptation corridor (14.28), Ecological processes (8.82), Estuary (14.29), River Type (3.21), SA Vegetation Type (2.32), Threatened SA Vegetation Type (8.13), Threatened Vertebrate (11.4), Water resource protection (7.69) |
| Feature 1: | Bontebok Extended Distribution Range |
| Feature 2: | Cape Coastal Lagoons (LT) |
| Feature 3: | Climate adaptation corridor |
| Feature 4: | FEPA River Corridor |
| Feature 5: | Groot Brak Dune Strandveld (EN) |
| Feature 6: | Groot Brak Estuary |
| Feature 7: | Southern Coastal Belt Permanent Lowland River |
| Feature 8: | Watercourse protection- Southern Coastal Belt |

Section 5

# ALIEN SPECIES IDENTIFIED ON SITE

The following alien species were identified by the specialist as occurring on site;

| Alien Species | Category |
|---|---|
| *Schinus terebinthifolia (Brazilian pepper)* | Category 1b |
| *Helminthotheca echioides (Bristly oxtongue)* | Category 1b |
| *Taraxacum officinale (*Common dandelion*)* | not subject to compulsory control |
| *Anredera cordifolia (Mignonette vine)* | Category 1b |
| *Casuarina cunninghamiana (Beefwood)* | Category 1b |
| *Acacia mearnsii (Black Wattle)* | Category 1b |
| *Acacia cyclops (Rooikrans)* | Category 1b |
| *Myoporum laetum (Myoporum)* | Category 1b |
| *Verbena bonariensis (Purple top)* | Category 1b |

Section 6

# MANAGEMENT OBJECTIVES

| | | |
|---|---|---|
| **OBJECTIVE 1:ERADICATE CATEGORY 1B SPECIES:** | | |
| Category 1b species identified on site must be controlled and eradicated in terms of the Alien and Invasive Species Regulations. | | |
| **Management Actions:** | | |
| 1. | Baseline Survey | • Conduct a site walk-through prior to vegetation clearing.<br>• Identify and map all Category 1b species.<br>• Record density and extent (GPS and photo record). |
| 2. | Control Methods | • Control methods must adhere to Section 7 of this Alien Management Plan.<br>• Chemical treatment (registered herbicides only) applied to cut stumps where required. It is important to note that Chemical treatment (pesticides and herbicides) must adhere to the DFFE Pesticide Policy attached as Appendix C to this Alien Management Plan. |
| 3. | Timing of Clearing | • Prioritise removal before seed set.<br>• Avoid clearing during heavy rainfall periods to prevent soil erosion. |
| 4. | Disposal | All plant material must be:<br>• Removed from site, or<br>• Stacked and dried in a demarcated area (if safe), or<br>• Disposed of at a registered waste facility where necessary.<br>• No dumping in natural areas or watercourses. |
| 5. | Monitoring | • Clearing activities to be supervised by the ECO.<br>• Monthly monitoring during construction.<br>• Biannual monitoring post-construction (recommended for 3 years). |
| **OBJECTIVE 2: PREVENT REGROWTH** | | |
| Regrowth is common due to seed banks and stump resprouting. | | |
| **Management Actions:** | | |
| 1. | Follow-Up Clearing: | • First follow-up within 6–8 weeks of initial clearing.<br>• Subsequent follow-ups every 3–6 months during first year.<br>• Thereafter annually for at least 3 years. |
| 2. | Stump Treatment: | • Immediate application of systemic herbicide to cut surfaces.<br>• Ensure no untreated stumps remain. |
| 3. | Seed Bank Management | • Disturbed soil areas must be stabilised quickly.<br>• Avoid unnecessary soil disturbance. |
| 4. | Record Keeping: | • Maintain register of cleared areas. |

| | |
|---|---|
| | • Record regrowth hotspots and treatment dates. |
| **OBJECTIVE 3: PREVENT SPREAD TO ADJACENT NATURAL VEGETATION** | |
| Special care must be taken to protect surrounding indigenous vegetation and aquatic buffers. | |
| **Management Actions:** | |
| 1. Demarcation: | • Clearly demarcate approved development footprint.<br>• No clearing outside approved areas. |
| 2. Vehicle & Equipment Hygiene: | • Construction vehicles must arrive free of soil and plant material.<br>• No storage of contaminated soil near natural vegetation |
| 3. Stockpile Management: | • No stockpiling within 10–20 m of watercourses or buffers.<br>• Prevent wind or water dispersal of seeds. |
| 4. Stormwater Control | • Install erosion control measures.<br>• Prevent runoff transporting invasive seeds. |
| 5. Immediate Removal | • Any new alien growth in buffer areas must be removed immediately. |
| **OBJECTIVE 4: RESTORE INDIGENOUS VEGETATION** | |
| Rehabilitation reduces invasion risk and promotes ecological stability. | |
| **Management Actions:** | |
| 1. Topsoil Management: | • Strip and stockpile topsoil separately.<br>• Replace topsoil during rehabilitation phase. |
| 2. Revegetation: | • Encourage natural regeneration where feasible.<br>• Supplement with locally indigenous species if required.<br>• Avoid planting invasive or ornamental species. |
| 3. Erosion Control: | • Use brush packing where appropriate.<br>• Install silt fencing and berms where necessary. |
| 4. Rehabilitation Monitoring: | • Assess vegetation cover percentage.<br>• Ensure no new alien dominance. |
| 5. Success Criteria: | • No Category 1b regrowth.<br>• Indigenous vegetation cover stabilised.<br>• No active erosion. |
| **OBJECTIVE 5: ENSURE COMPLIANCE WITH DFFE CONDITIONS** | |
| The Alien Management Plan forms part of the EMPr and must comply with DFFE requirements. | |
| **Management Actions:** | |
| 1. Integration into EMPr: | • This Alien Management Plan forms part of the approved EMPr.<br>• Binding on the Applicant and all contractors. |
| 2. ECO Monitoring: | • Monthly monitoring during construction.<br>• Post-construction monitoring every 6 months for 3 years (recommended). |
| 3. Reporting: | • Alien clearing activities to be included in ECO reports.<br>• Non-compliance to be recorded and corrective action implemented immediately. |
| 4. Training: | • Contractors and workers must receive environmental induction.<br>• Awareness of listed invasive species and legal obligations. |

| | | |
|---|---|---|
| 5. | Legal Compliance: | • Compliance with:<br>o NEMBA (Act 10 of 2004)<br>o Alien & Invasive Species Regulations<br>o NEMA Duty of Care (Section 28) |
| 6. | Responsibility: | • The Applicant remains legally responsible for ongoing control of invasive species. |

| Section 7 | CLEARING METHODOLOGY |
|---|---|

**Management measures for the site**
All vegetation clearance must be undertaken with utmost care to ensure that only that vegetation, which needs to be removed, is removed.

Eradication of alien plants must be completed in such a manner that indigenous vegetation is not damaged.

It is important to remove both young plants (saplings) and old trees that are seed bearing. Different strategies can be employed to remove different species, but all methods will involve manual labour as mechanical means other than chain saws and brush cutters, should be used where necessary. It is important to tackle the smaller, more dispersed plants first, and then the larger stands of alien vegetation.

To ease the removal of the alien plants present on the site, it is recommended that all alien plants be removed during the initial site clearing activities at the start of the construction process rather than during the operational phase of the development.

**1. Clearing of small alien plants**
The best method of clearing small plants is by hand pulling them. They must then be stacked for removal to a recognised waste site, or alternatively mulched on site. Mulched material can be used as a ground cover where necessary.

**2. Clearing of alien trees**
Alien trees must be cut down with chain saws and then chopped into smaller portions. Some species of alien plants like Black Wattle trees are coppicing species and will re-grow from roots and stumps. This means that a chemical such as Roundup or Garlon will need to be used to prevent the trees from re-sprouting. These chemicals can either be sprayed onto the stump with a knapsack sprayer or painted on with a paintbrush. Another alternative to prevent re-growth is to strip the bark from the remaining part of the stump.

**3. Methods for controlling alien vegetation**
Biological control, chemical control, mechanical clearing, and burning have all been used with varying results. Each method has been successful but nearly all require follow-up control. The most successful clearing projects have included an integrated approach to account for initial clearing and continued management.

**3.1 Mechanical control:**

- Mature non-coppicing trees must be cut as low as possible and no herbicide treatment is needed on the cut stumps.

- Debris may be removed immediately from site to be burned in a safe area, mulched or used as firewood.
- Large branches should be used as firewood.
- Smaller branches should be mulched.
- Alien material containing seed must be removed from the site and burned.
- Should debris be left on site:
- In sparser areas, where felled debris will not hinder follow-up operations, plants can be felled and left in situ.
- In dense areas, stack debris in rows five metres apart parallel to the contours to facilitate follow-up operations.
- Low density seedling regeneration must be hand pulled.
- Hand pulling around pockets of indigenous vegetation (1m swathe around clumps) is important so as to not damage indigenous vegetation pockets.

**3.2 Chemical control**

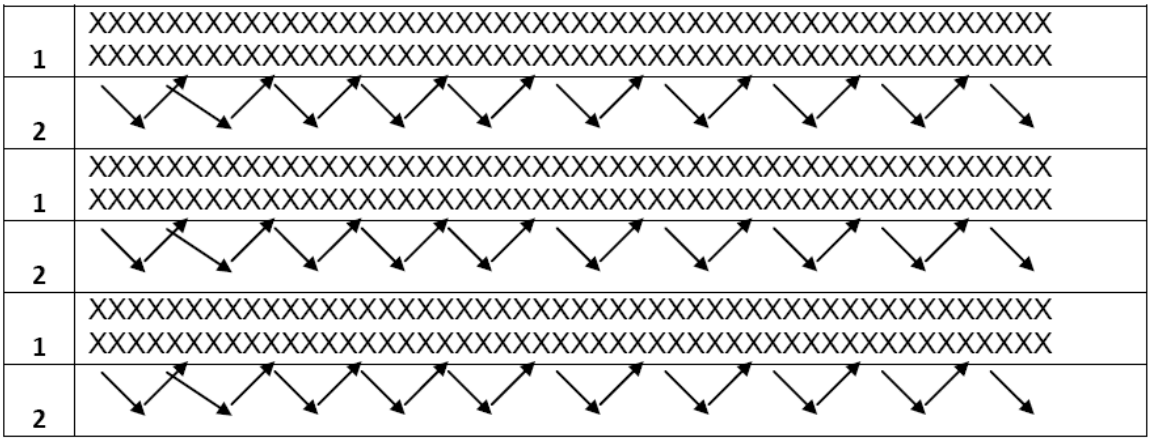
- Follow-up visitation no later than three months after initial operation.
- Follow-up control will be needed because soil stored seed may stay dormant in soil for up to 50 years.
- Follow-up control will involve a combination of hand pulling and foliar spraying.
- Seedlings, saplings and coppice can be foliar sprayed.
- Follow-up spray operation when sufficient regeneration has taken place.
- Blanket or foliar spray.
- All chemical control must adhere to the DFFE Pesticide Policy attached as Appendix C to this report.

**3.3 Tools**

- Loppers, bow saws and chainsaws
- 12 –15 litre back pack spray units
- Flat fan nozzles or solid cone and 1 bar constant flow valves.

**3.4 Team composition**

- 6 persons, each being equipped with a lopping shear, bow saw and herbicide applicator, must first sweep through the area in individual lanes 5 metres apart. These persons target all plants less than 8 cm in basal diameter, felling, stacking and applying herbicide. De-branching should only be used to facilitate stacking of larger branches.
- 2 chainsaw operators thereafter follow through these lanes felling all plants more than 8 cm in basal diameter. Two assistants are responsible for stacking and herbicide application.
- For the denser areas, methodology must follow the illustration below. All rows are five metres wide. Swathes labelled 1 must be cut first and the debris placed back into these swathes. Thereafter debris generated in swathes labelled 2, must be placed into swathes labelled 1.




**3.5 Follow up**

Once the source of the problem has been removed, namely the seed bearing trees, it is important to follow up on any seedlings and saplings that may have grown in the interim. If this is not done the effort of the removal of the adult trees will have been wasted, as the alien vegetation problem will intensify.

## Section 8 IMPLEMENTATION PROGRAMME

| Phase | Activity | Timeframe |
|---|---|---|
| Construction Phase | Initial clearing | Construction duration - ongoing |
| Post Construction Rehabilitation Phase | Follow up clearing and rehabilitation | 3 months post construction |
| Monitoring Phase | Annual monitoring | 1-3 years post construction |

## Section 9 MONITORING AND REPORTING

Monitoring of alien clearing activities will be undertaken by the appointed Environmental Control Officer (ECO) during the monthly ECO site inspections conducted for the duration of the construction phase. This Alien and Invasive Species Management Plan forms part of the Environmental Management Programme (EMPr) and will be implemented and monitored as part of the broader environmental compliance monitoring framework for the project.

During construction, the ECO will:

- Verify that clearing is undertaken in accordance with the approved methodology;
- Confirm correct herbicide application and disposal of plant material;
- Record areas cleared and any regrowth observed;
- Include findings and recommendations in the monthly ECO compliance reports.

Post-construction monitoring will also be undertaken by the ECO. It is recommended that the ECO be appointed to monitor and report on the implementation of the Alien and Invasive Species Management Plan at least once every six (6) months for a minimum period of three (3) years following completion of construction.

Post-construction monitoring will focus on:

- Identification and treatment of regrowth;
- Monitoring of seed bank emergence;
- Verification of rehabilitation success;
- Ensuring no new infestations establish on site.

Where regrowth is identified, follow-up clearing shall be undertaken promptly to ensure long-term control and compliance with Section 73 of the National Environmental Management: Biodiversity Act.

## Section 10 RESPONSIBILITIES

**Applicant – Mossel Bay Municipality**

Mossel Bay Municipality, as the Applicant and landowner (or authority responsible for the project), shall:

- Ensure implementation of this Alien and Invasive Species Management Plan;
- Allocate adequate financial and human resources for clearing and follow-up activities;
- Appoint a suitably qualified contractor to undertake alien clearing;
- Appoint an independent Environmental Control Officer (ECO) to monitor compliance;
- Ensure that clearing operations comply with the approved EMPr, NEMBA, and AIS Regulations;
- Ensure post-construction monitoring is undertaken for a minimum period of three (3) years;
- Ensure corrective action is taken where non-compliance or regrowth is identified.

**Contractor**

The appointed Contractor shall:

- Implement clearing strictly in accordance with this Management Plan;
- Ensure workers are informed of alien species identification and control methods;
- Apply herbicides in accordance with manufacturer specifications and legal requirements;
- Prevent the spread of seeds or vegetative material during clearing;
- Dispose of cleared biomass responsibly;
- Undertake follow-up clearing where instructed;
- Maintain records of clearing activities for submission to the ECO.

**Environmental Control Officer (ECO)**

The appointed ECO shall:

- Monitor implementation of this Plan during monthly construction site visits;
- Verify that clearing methods are appropriate and legally compliant;
- Record areas cleared and any regrowth observed;
- Include compliance findings in monthly ECO reports;
- Conduct post-construction monitoring at least once every six (6) months for three (3) years;
- Provide recommendations for corrective action where necessary.

**Environmental Assessment Practitioner (EAP)**

The EAP shall:

- Ensure this Plan forms part of the approved EMPr;
- Provide guidance where amendments are required;
- Assist the Applicant in ensuring compliance with regulatory requirements where necessary.

# Appendix A1: CV of Author

**GEORGE**
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# CURRICULUM VITAE

## MICHAEL JON BENNETT

### PERSONAL

**Profession:** Principle Environmental Assessment Practitioner and Senior Environmental Control Officer, Sharples Environmental Services cc, George
**Possion:** Director – George
**Nationality:** South African
**Date of Birth:** 22 October 1985
**Languages:** English (read, write and speak) & Afrikaans (read, write and speak)
**Marital Status:** Single
**Drivers License:** Code B
**Health:** Excellent
**EAPASA Reg:** 2021/3163
**IAIASA Membership**: 7334

### WORK EXPERIENCE

**2014 – Present:** Sharples Environmental Services cc, George, WC
*Environmental Assessment Practitioner*

I have gained extensive experience in assessments and monitoring and have worked on a variety of multidisciplinary projects and am proficient in:

- Basic Assessments Reports
- Water Use Authorisation Applications
- Environmental Monitoring and Reporting
- Environmental Management Programmes
- Environmental Control Officer Training
- Conducting Outeniqua Sensitive Coastal Area licensing applications

**2016 – 2017:** Sharples Environmental Services cc, Cape Town, WC
*Intrim Office Manager, Environmental Assessment Practitioner*

**2011 – 2014:** Peninsula Permits & NCC Group, Cape Town, WC
*Environmental Control Officer*

### TERTIARY EDUCATION

**2010** University of Cape Town

- I hold a Bachelor of Science Degree specialising in Environmental and Geographic Science & Ocean and Atmospheric Science

## PROJECTS

**2024** George George Municipality

- Basic Assessment Report for the proposed upgrade of the Gwaing wastewater treatment works on the remainder of erf 464, George, Western Cape

**2024** George 3MP Sales and Education Services

- Basic Assessment Report for the proposed mixed-use development on erf 998 and the remainder of the farm zandhoogte no. 139, Tergniet, Mossel Bay, Western Cape

**2024** Mossel Bay Hartland lifestyle estate

- Part II amendment of the appeal environmental authorisation issued on 18 august 2009 (as amended) and the EMPr for the proposed residential development on a portion of the farm vaale valley 219, Mossel Bay - Hartland lifestyle estate

**2024** George George Municipality

- Basic Assessment Report for the proposed upgrading of the Herold's Bay pump station and associated rising main as well as the development of new associated infrastructure on erf 116, remainder of erf 95, remainder of farms 236 and 237 and portions 10, 35 and 37 of farm brakfontein no. 236, Herold's Bay, George, Western Cape

**2024** George George Municipality

- Part II Amendment of Environmental Authorisation for proposed development of a Photovoltaic Solar Plant on erf 2819, George, Western Cape

**2024** George George Municipality

- Basic Assessment Report for the proposed repair and rehabilitation of flood damage along the Camphersdrift River in the Van Riebeeck Park (Project 28(3)), George, Western Cape

**2024** Plettenberg Bay The More Family Collection

- Basic Assessment Report for the proposed expansion of the Milkwood Manor and parking on erf 10190, remainder of erf 2066 and the remainder of erf 706, Plettenberg Bay, Western Cape

**2023** George Urban Country Estate (Pty) Ltd

- Basic Assessment Report for the proposed residential development on erf 19374 (remainder erf 6182, erven 6179 and 6156), George, Western Cape

**2023** George George Municipality

- Basic Assessment Report for the Upgrading of the Eden Pumpstation, George, Western Cape

**2023** Mossel Bay Paprenax Trading 6 cc

- Amendment of Environmental Authorisation (Part 2, Substantive amendment) for the proposed establishment of a filling station and associated business infrastructure on a portion of erf 13996, Kwanonqaba, Mossel Bay, Western Cape

**2023** George George Municipality

- Basic Assessment Report for proposed upgrade of the Schaapkop Pumpstation rising main on remainder of erf 464 and erf 13486, George, Western Cape

**2023** George Garden Route Gateway Plaza

- Basic Assessment Report for proposed mixed-use development on portions 278 and 282 of farm Kraaibosch no. 195, George, Western Cape

**2023** George George Municipality

- Basic Assessment Report for proposed development of a Photovoltaic Solar Plant on erf 2819, George, Western Cape

**2023** George EARP Construction

- Basic Assessment Report for the proposed commercial development on portion 49 of Farm Hansmoeskraal 202, George, Western Cape

**2022** George Pieter Koen Development Company

- Basic Assessment Report for the proposed residential development on Portion 21 of the Farm Kraaibosch No. 195 (Pieter Koen), George, Western Cape

**2022** Mossel Bay Dalmar

- Amendment of Environmental Authorisation (Part 2, Substantive amendment) for the Proposed Residential Development On A Portion Of The Farm Vaale Valley 219, Mossel Bay (Hartenbos Landgoed II), Western Cape

**2022** George Dalmar

- Amendment of Environmental Authorisation Proposed Development of Herold's Bay Country Estate on A Portion of Portion 7 of The Farm Buffelsfontein No. 204, Herold's Bay, Western Cape

**2022** George Pieterkoen Trust

- Basic Assessment Report for the proposed residential development on Portion 21 of the Farm Kraaibosch No. 195 (Pieter Koen), George, Western Cape

**2022** Still Bay W. Nel & Irma Oosthuizen Trust IT 1596/2008

- Basic Assessment Report for the development of 5 residential units on erven 4139, 4140, 4141, 4142, 4143, 4144, 4145 (Erf 3997), Still Bay West, Western Cape

**2022** George Octo Trading 377 cc

- Section 24 G Retrospective Environmental Authorisation for the alleged unlawful construction of a road clearance of vegetation to establish a house on remainder of Farm Holle Kloof 91 and Portion 1 of the Farm Plattekloof 131, Waboomskraal, George, Western Cape

**2022** Knysna CapeNature

- Basic Assessment Report for the Proposed development on Portions 38 and 39 of Farm 205 and Remainder of Farm 211, Goukamma Nature Reserve, Knysna, Western Cape

**2021** Prince Albert Jurie Klue

- Section 24 G Retrospective Environmental Authorisation for the alleged unlawful clearance of vegetation on Farm Angliers Bosch (Fernkloof), Remainder of Farm 157, Klaarstroom, Prince Albert, Western Cape

**2021** Mossel Bay Mossel Bay Municipality

- Basic Assessment Report for the proposed Dana Bay Emergency Access Road on Remainder of Portion 7 of the Farm 225, Dana Bay, Mossel Bay, Western Cape

**2021** Willowmore LEZMIN 2087cc

- Basic Assessment Report for the proposed development of Portion 1 of the Farm Matjiesfontein No. 206, Baviaanskloof, Division Willowmore, Eastern Cape

**2020** Sedgefield Knysna Municipality

- Basic Assessment Report for the proposed housing development on erven 3861, 3865, 3866, 3917, 3918 and 5010 in Sedgefield, Knysna, Western Cape

**2020** Mossel Bay Paprenax Trading 6 cc

- Basic Assessment Report for the proposed establishment of a filling station and associated business infrastructure on a portion of erf 13996, Kwanonqaba, Mossel Bay, Western Cape

**2020** Ladismith Department of Transport and Public Works

- Maintenance Management Plan for the periodic maintenance of Trunk Road 31, section 4, km 30.8 to km 76.06, Barrydale to Ladismith, Western Cape

**2020** Knysna Knysna Municipality

- Maintenance Management Plan for the Maintenance of the potable water pipeline system on Erven 4197, RE/1352, RE/1351, RE/1146 and 1316 in Knysna, Western Cape

**2020** Humansdorp Kouga Municipality

- Environmental Control Officer for the Phase 1A of New municipal 66kV double circuit overhead line between the Melkhout substation at Humansdorp and the main intake substation at Jefferys Bay, Eastern Cape

**2020** Humansdorp Kouga Municipality

- Environmental Control Officer for the Construction of a new 22kv overhead powerline between Melkhout substation and Allison Street, Humansdorp, Eastern Cape

**2020** Knysna Knysna Municipality

- Environmental Control Officer for the Charlesford raw water pumping scheme: Upgrade and refurbishment of pumpstation: Mechanical and electrical, Knysna, Western Cape

**2020** Seweweekspoort, Department of Transport & Public Works

- Amendment of Environmental Authorisation (Part 2, Substantive amendment) for the flood damage repairs to road structures on MR309 in Seweweekspoort, Western Cape

**2019 – 2021** Seweweekspoort, Department of Transport & Public Works

- Environmental Control Officer for the flood damage repairs to road structures on MR309 in Seweweekspoort, Western Cape

**2019** George George Municpality

- Environmental Control Officer for the Raising of the Garden Route Dam Spillway on Portion 3/352, Remainder of 536 of Erf 221, Erf 3055 and Erf 3056, George, Western Cape

**2019** Laingsburg Department of Agriculture

- Environmental Control Officer for the Construction Of Erosion Prevention Structures Within The One In Ten Year Flood Line Of The Buffels River, Laingsburg, Western Cape

**2019** Williston Williston Municipality

- Environmental Control Officer for the Upgrading of bulk water network in Williston – Phase 3, Williston, Northern Cape

**2019** George George Municipality

- Environmental Control Officer for the construction of new 66kV overhead line between Ballots Bay and Glanwood substations, George, Western Cape

**2019** Oudtshoorn Department of Transport & Public Works

- Environmental Control Officer for the Periodic maintenance of Trunk Road 31, Section 6, km 23.3 to km 47.8 Calitzdorp to Oudtshoorn, Western Cape

**2019** Kleinbrak Mossel Bay Municipality

- Environmental Control Officer for the Upgrading of Beyers Street, Klienbrak River, Western Cape

**2019** George Outeniqua Eye Clinic Body Corporate

- Environmental Control Officer for the proposed expansion of parking area on erf 5950 and part of remainder erf 464, George, Western Cape

**2019** Mossel Bay Hey Innovations

- Basic Assessment Report for the proposed establishment of a residential development on Erf 2839, Great Brak River, Western Cape

**2019** Oudtshoorn Oudtshoorn Municipality

- Environmental Management Programme for the Blossoms Emergency Supply Scheme, Oudtshoorn, Western Cape

**2019** Humansdorp Clinkscales Maughan-Brown

- Environmental Management Programme for the proposed construction of a new 22kV overhead powerline between Melkhout Substation and Allison Street, Humansdorp, Eastern Cape

**2019** George PN&MR Lotter Family Trust

- Addendum to the Environmetnal Management Programme for the Establishment of a Township (Rivendale) on Portions 5, 15, 16 and 31 of the Farm Hansmoeskraal 202, Western Cape

**2019** Oudtshoorn Department of Transport and Public Works

- Basic Assessment Report for the Proposed Maintenance Activities of Trunk Road 33/4 between km 4.6 and km 14.4, Meiringspoort, Western Cape

**2019** George Dynarc Capital

- Substantive amendment of environmental authorisation for the proposed Development of Portion 130, 131 and 132 of the Farm Gwayang 208

**2019** George Department of Transport & Public Works

- Basic Assessment Report for the proposed Upgrading of Bridge No. 2221 on Trunk Road 2/9 at km 15.1 over the Maalgate River.

**2018 - 2019** Oudtshoorn Department of Transport and Public Works

- Maintenance Management Plan for the proposed periodic maintenance of Trunk Road 31, section 6, km 23.3 to km 47.8, Western Cape

**2018 - 2019** Humansdorp Clinkscales Maughan-Brown

- Applicability of the EIA regulations Checklist for the proposed new 22kV overhead line between Melkhout Substation and Allison Street, Eastern Cape

**2018 - 2019** Knysna Knysna local Municipality

- Applicability of the EIA regulations Checklist for the proposed Rheenendal infill housing, subdivision and rezoning of portions of erf 42, 36 and 387 as well as erven 535, 536, 553, 54, 393, 406, 672, 673 and 68, Rheenendal, Western Cape

**2018 - 2019** Knysna Knysna local Municipality

- Applicability of the EIA regulations Checklist for the proposed infill housing and subdivision of erven in Welsyndorp and the rezoning and subdivision of erven in Bosdorp, Karatara, Western Cape.

**2018** Port Elizabeth ACSA P.E.

- Applicability of the EIA regulations Checklist for the proposed ACSA Port Elizabeth Airport Photovoltaic Plant, Eastern Cape Province

**2018** Mossel Bay TopUp Prop Inv.

- Applicability of the EIA regulations Checklist for the proposed Farm Stall Centre and filing Station on Portion 65 of the Farm Hartenbosch 217, Hartenbos

**2018** George Outeniqua Eye Clinic Body Corporate

- Basic Assessment Report for the proposed expansion of parking area on erf 5950 and part of remainder erf 464

**2018** Beaufort West Beaufort West Municipality

- Environmental Control Officer for the First and Second Environmental Audit for the provision of adequate water supply within the jurisdiction of the Beaufort West municipality

**2018** Mossel Bay Element Consulting Engineers

- Environmental Management Programme update for the replacement of 22kV overhead powerline between Power Town and Hartenbos and between Hartenbos and the Hartenbos sewage substation and the construction of a new 22kV overhead power line between the Midbrak and Kleinbrak Substations.

**2018** Mossel Bay Element Consulting Engineers

- Environmental Control Officer for the construction of a new 22kV overhead power line between the Midbrak and Kleinbrak Substations

**2018** Mossel Bay Element Consulting Engineers

- Environmental Control Officer for the Upgrade of Amy Searle Canal – Phase 5, Great Brak River

**2018** Gouritsmond Hessequa Consulting Engineers

- Environmental Control Officer for the Upgrade and expansion of the Gouritsmond Water Water Treatment Works on remainder of erf 140, Gouritsmond

**2018** George Biprops 14

- Environmental Control Officer for the residential development on portion 5 of the farm Kraaibosch No. 195, Groenkloof Woods: Phase C & D

**2018** Knynsa Knysna Municipality

- Environmental Control Officer for upgrading of Knysna bulk water supply scheme: phase 2B

**2018** Plettenberg Bay Bitou Municipality

- Environmental Control Officer for the upgrade of the Kranshoek Bulk Water Supply Scheme: Construction of Pipelines, reservoirs and associated infrastructure near Plettenberg Bay.

**2018** Mossel Bay SMEC

- Environmental Control Officer for the Upgrade of Kusweg and associated infrastructure in Rheebok

**2017** George EARP Construction

- Invasive Alien Management Plan for the proposed residential development on portions 21, 23, 24 & 48 of Farm Hansmoeskraal 202 near George

**2017** Mossel Bay Mossel Bay Municipality

- Environmental Control Officer for the development of the new Mossel Bay municipal cemetery on erf 2001/0

**2017** Knynsa Knysna Municipality

- Environmental Control Officer for the remedial work to prevent further settlement of the low-lift pump sump and retaining wall at Gouna River Pump Station

**2017** Knynsa Knysna Municipality

- Environmental Control Officer for upgrading of Knysna bulk water supply scheme: phase 1

**2017** George Biprops 14 (Pty) Ltd

- Environmental Control Officer for the residential development on portion 5 of the farm Kraaibosch No. 195

**2017** Still Bay Hessequa Municipality

- Environmental Control Officer for the construction of a reservoir, booster pump station and associated infrastructure in Melkhoutfontein near Still Bay

**2016 - 2017** Heidelberg Department of Transport & Public Works

- Environmental Control Officer for the flood damage repairs to structures in the Central Eden District Municipality Region, Heidelberg North

**2016 - 2017** Riversdale Department of Transport & Public Works

- Environmental Control Officer for the flood damage repairs to structures in the Central Eden District Municipality Region, Riversdale East area

**2016 - 2017** Still Bay Department of Transport & Public Works

- Environmental Control Officer for the upgrade of main road 332 near Still Bay

**2016 - 2017** Mossel Bay The South Cape College

- Environmental Control Officer for the extension of the South Cape College: Phase 3, Mossel Bay Campus

**2016 - 2017** Klein Brak Mossel Bay Municipality

- Environmental Control Officer for the removal of obstructions in the lower floodplain of the Klein Brak River Estuary

**2016** Prince Albert Milway Trade and Invest 1014cc

- Basic Assessment for the proposed guest lodge on remainder of Farm Rietpoort 13

**2016** Plettenberg Bay Bitou Municipality

- Basic Assessment for the proposed Qolweni phase 5 development near Plettenberg Bay

**2016** Mossel Bay Element Consulting Engineers

- Environmental Management Programme for the replacement of 22kV overhead powerline between Power Town and Hartenbos and between Hartenbos and the Hartenbos sewage substation

**2016** George SMEC

- Environmental Policy for the resurfacing of York Street, George

**2016** Mossel Bay Department of Transport & Public Works

- Maintenance Management Plan for proposed upgrade of Louis Fourie Road.

**2016** George Oaklands Bridge Country Estate HOA

- Maintenance Management Plan for proposed repair and maintenance of the riverbank at Oaklands Bridge Country Estate in Heather Park

**2016** Gouritz Department of Transport & Public Works

- Update of the Maintenance Management Plan for proposed repair and maintenance of the Gouritz River Bridge bank protection along the R325 near Gouritzmond

**2016** George Ivorybell Investment (Pty) Ltd

- Outeniqua Sensitive Coastal Area Environmental Impact Report for the proposed new house on erf 379 in Heralds Bay

**2016** George George Municipality

- Environmental Assessment Report for the substantive amendment of environmental authorisation of the proposed upgrade and extension of the overhead power lines and associated substations

**2016** Oudtshoorn SA Army Infantry School

- Environmental Control Officer for the construction of a fighting in built up areas (FIBUA) range on portion 10 of the farm Blaauwtjes Drift 110 in Oudtshoorn

**2015 - 2016** Gouritz Department of Transport & Public Works

- Environmental Control Officer for the repair and maintenance of the Gouritz River Bridge bank protection along the R325 near Gouritzmond

**2015 - 2016** Albertinia Garden Route Game Lodge (Pty) Ltd

- Environmental Control Officer for the five new units at the Garden Route Game Lodge

**2015 - 2016** Mossel Bay Element Consulting Engineers

- Environmental Control Officer for the replacement of 22kV overhead powerline between Power Town and Hartenbos and between Hartenbos and the Hartenbos sewage substation

**2014 - 2016** Plettenberg Bay Chauke Quanity Surveyers

- Environmental Control Officer for the Qolweni and Kwanokuthula High Density Units and engineering services

**2016** Plettenberg Bay Bitou Municipality

- Environmental Control Officer for the civil engineering works for Kwanokuthula Phase 4 and the extension of Sishuba Street

**2014 - 2016** Mossel Bay The South Cape College

- Environmental Control Officer for the extension of the South Cape College, Mossel Bay Campus

**2016** George SMEC

- Environmental Control Officer for the resurfacing of York Street

**2014 - 2015** Mossel bay The Muller Murray Trust

- Environmental Control Officer for the construction of gravity pipeline from the Nautilus take-off to the Boggomsbaai Reservoir phase 2

**2015** Swellendam Casidra SOC Ltd

- Environmental Control Officer for the Grootvaderbos Groynes in the Buffeljags River

**2015** George Element Consulting Engineers

- Environmental Control Officer for the upgrading and extension of overhead power lines and substations: construction of a new 66kV overhead line between Protea and Ballots Bay substation

**2014 - 2015** George Department of Transport & Public Works

- Environmental Control Officer for the flood damage repair projects in the George and Knysna local municipal areas

**2015** George BDE Consulting Engineers (Pty) Ltd

- Environmental Control Officer for the photovoltaic solar plant for the ACSA George Airport

**2015** Heidelberg Bergstan South Africa

- Environmental Control Officer for the Duiwenhoks River stabilization works: Sites B31, B38 and B39

**2015** Krakeel Element Consulting Engineers

- Environmental Control Officer for the construction of filling station at SSK Tuinrote Agri on portion 5 of the farm no. 320

**2014 - 2015** Herbertsdale SMEC

- Environmental Control Officer for the flood damage repairs to structures in the Eden region: Herbertsdale area

**2014 - 2015** George Department of Transport & Public Works

- Environmental Control Officer for the flood damage repair projects in the George and Knysna local municipal areas

**2015** George SMEC

- Environmental Control Officer for the improvements to the Pacaltsdorp interchange and new pedestrian bridge

**2014 - 2015** Still Bay De Villiers & Moore Consulting Engineers

- Environmental Control Officer for the Still Bay 66kV substation and overhead powerline

**2014** Beaufort West Worley Parsons Consulting Engineers

- Environmental Control Officer for the Nelspoort bulk water supply scheme northeast of Nelspoort

# Appendix A2: EAPASA REGISTRATION OF AUTHOR:

Environmental Assessment Practitioners Association of South Africa

**Registration No.** 2021/3163

## Herewith certifies that

MICHAEL BENNETT

**is registered as an**

Environmental Assessment Practitioner

**Registered in accordance with the prescribed criteria of Regulation 15. (1) of the Section 24H Registration Authority Regulations (Regulation No. 849, Gazette No. 40154 of 22 July 2016, of the National Environmental Management Act (NEMA), Act No. 107 of 1998, as amended).**

**Effective:** 01 March 2025

**Expires:** 31 March 2026

*Chairperson*

*Registrar*

SAQA
SOUTH AFRICAN QUALIFICATIONS AUTHORITY

# Appendix B: Plant Species Site Verification and Compliance Statement Report:

# SITE VERIFICATION AND COMPLIANCE STATEMENT REPORT FOR THE PROPOSED UPGRADE OF A SEWERAGE PIPELINE IN GREAT BRAK, WESTERN CAPE

## Plant species



| | |
|---|---|
| **Date:** | 17 August 2025 |
| **Version:** | Final |
| **Author:** | JA van der Walt (Pr. Sci.Nat: 116549) |
| **EAP:** | Sharples Environmental Services |
| **Applicant:** | Mossel Bay Municipality |

ADVANCED ENVIRONMENTAL CORPORATION

# EXECUTIVE SUMMARY

| | |
|---|---|
| **VEGETATION UNITS** | **Groot Brak Dune Strandveld**: The original vegetation has been almost fully transformed into roads, pavements, and lawns. The remaining natural vegetation is dominated by non-native species, with no intact plant communities remaining. |
| **VEGETATION SIZE** | Limited intact natural vegetation remains within the proposed development footprint, which is approximately 2,100 meters long and 5 meters wide. |
| **LANDUSE PLANNING** | Smaller sections of the proposed development footprint fall within a CBA Estuary and CBA Wetland, but these areas are transformed and mostly dominated by non-native plant species. |
| **CONNECTIVITY** | Portions of the proposed development footprint can be regarded as a buffer for the Groot Brak estuary. |
| **PLANT SPECIES OF CONSERVATION CONCERN** | No plant species of conservation concern were recorded in the proposed development footprint |
| **WATER COURSES AND WETLANDS** | The proposed pipeline crosses artificial drainage ditches created to direct stormwater into low-lying areas between the Groot Brak estuary and the urban development along Lang Street. |
| **MAIN CONCLUSIONS** | The site has been assessed as having **low** sensitivity from a plant species perspective, contrary to the medium rating assigned in the Environmental Screening Tool. This determination is supported by the absence of plant species of conservation concern within the proposed development footprint, the significant degree of transformation observed in the area, and the predominance of alien vegetation within the site. |

**DECLARATION OF INDEPENDENCE IN TERMS OF CHAPTER 5 OF THE NATIONAL ENVIRONMENTAL MANAGEMENT (NEMA), ACT 107 OF 1998:**

I, Johannes Adriaan van der Walt, ID: 6706225172085, declare that:

• I act as the independent environmental specialist in this report;

• I will perform the work relating to the report objectively, even if this results in views and findings that are not favourable to the applicant;

• I declare that there are no circumstances that may compromise my objectivity in performing such work;

• I have expertise in conducting environmental impact assessments and specialist reports, including knowledge of the Act, Regulations, and any guidelines that have relevance to the proposed activity;

• I will comply with the Act, Regulations, and all other applicable legislation;

• I do not have and will not have any vested interest (either business, financial, personal, or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations

**ENVIRONMENTAL SPECIALIST:**

Johannes Adriaan van der Walt

Tel: +27 (82) 305 8945

Email: admin@aecorp.co.za

**Signature** **Date:** 17 August 2025



# Abridged Curriculum Vitae – Johannes Adriaan van der Walt

**PROFESSIONAL REGISTRATION**

Professional Natural Scientist: South African Council for Natural Science Professionals (SACNASP) nr116549

**QUALIFICATIONS**

MTech Nature Conservation (cum laude) 2014, CPUT

BTech Nature Conservation (cum laude) 2012, CPUT

NDip Nature Conservation (cum laude) 1994, CPUT

**LANGUAGES**

English – fluent
Afrikaans – fluent

**EXPERIENCE**

37 years of biodiversity conservation and botanical experience in the Fynbos and Succulent Karoo Biomes

**EMPLOYMENT**

1988 – 2006 CapeNature

2007 – 2010 Botanical Insight cc

2010 - 2017 CapeNature

2017 – present: Director at Advanced Environmental Corporation (Pty) Ltd and Fynbos Fish Trust Trustee

**BOTANICAL, ANIMAL, AND BIODIVERSITY EXPERTISE WAS GAINED THROUGH:**

- Employment as a nature conservationist with CapeNature for 25 years;
- biodiversity assessments (including botanical, animal species, and biodiversity) since 1994;
- participating as a SANBI-CREW volunteer for botanical assessments for threatened plants;
- participating in the Protea Atlas project as a volunteer;
- contributing as a Red-list assessor for a selection of Fynbos species;
- conservation initiatives for threatened flora with CapeNature;
- compliance monitoring of wildflower shows (Clanwilliam, Leipoldtville, Porterville, Tulbagh, and Darling) between 1994 and 2006;
- compilation of species lists for protected areas;
- compilation of specialist botanical assessments for DEA&DP and private landowners since 2017;
- discovering five new plant species in the CFR since 2019;
- keeping up to date with new plant descriptions and taxonomic revisions in the CFR and
- keeping an extensive private collection of applicable literature, including field guides and other botanical reference books.

**PUBLICATIONS:**

- Author and co-author of 14 biodiversity conservation and botanical scientific papers

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# 1. INTRODUCTION

## 1.1 Background

The Mossel Bay Municipality is in the process of upgrading its sewage system in Groot Brakrivier, and one of these upgrades includes the installation of a new Ø300mm pipeline from Amy Searle Street/Greenhaven to the cricket field sewerage pump station near Lang Street. The Environmental Assessment Practitioner (EAP) appointed by the municipality is Sharples Environmental Services. The proposed activities trigger environmental regulations promulgated under the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("NEMA") and require environmental authorization.

## 1.2 Environmental Screening Tool Report

Regulation 16(1)(b)(v) of the Environmental Impact Assessment Regulations requires an applicant for an Environmental Authorisation to submit a report generated by the Environmental Screening Tool as part of their application. This tool, developed by the Department of Forestry, Fisheries, and the Environment (DFFE), became operational on July 5, 2019, as announced in the Government Gazette. The screening tool report will identify the environmental sensitivities that intersect with the proposed development footprint as defined by the applicant, as well as the relevant protocols that the applicant would need to follow. The screening tool is accessible at https://screening.environment.gov.za.

An environmental screening tool report for the proposed development was completed on the 25th of July 2025. A **"Medium"** environmental sensitivity rating was indicated for the Plant Species theme. As per the procedures for the assessment and minimum criteria for reporting on identified environmental themes (Terrestrial Plant Species) in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation (October 2020), "*An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of "**medium sensitivity**" for terrestrial plant species, must submit either a Terrestrial Plant Species Specialist Assessment Report or a Terrestrial Plant Species Compliance Statement, depending on the outcome of a site inspection/site sensitivity verification undertaken*".

The site sensitivity verification was conducted on 19 and 20 July 2025, and the outcome, as reported in **Section 7** of this report, indicated a **low sensitivity** towards terrestrial plant species and therefore a terrestrial plant species compliance statement was compiled and included in this report.

# 2. TERMS OF REFERENCE

## 2.1 Site verification

-The assessment must contextualize the study area to provide a baseline description of the ecological system; the terrestrial plant biodiversity and any significant terrestrial features must be provided.

-The assessment must identify the following:

- Terrestrial critical biodiversity areas (CBAs)
- Terrestrial ecological support areas (ESAs)
- Protected areas as defined by the National Environmental Management: Protected Areas Act, 2004
- Priority areas for protected area expansion
- Indigenous forests

-Undertake a site visit and ground-truth biodiversity information. Where required, undertake baseline surveys and/or studies to supplement the information base and inform the assessment.

-Estimate the trajectory of change in the context of the 'No-Go' Alternative due to existing impacts.

-Assessment criteria to be aligned with the promulgated Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes (October 2020).

Following the site verification visit, in which the Specialist confirms the presence, likely presence or confirmed absence of a SCC identified within the site identified as "medium" sensitivity by the screening tool, the Specialist is to confirm the need for a Compliance Statement or a Terrestrial Plant Species Assessment and undertake this report/statement following the Gazetted Protocol (October 2020).

## 2.2 Compliance statement

The compliance statement must:

- be applicable within the study area;
- confirm that the study area is of "low" sensitivity for terrestrial plant species; and
- indicate whether or not the proposed development will have any impact on SCC.

Minimum Requirements Include:

- contact details, relevant experience, and the SACNASP registration number of the specialist preparing the compliance statement, including a curriculum vitae.
- a signed statement of independence by the specialist;

- a statement on the duration, date, and season of the site inspection and the relevance of the season to the outcome of the assessment;
- a description of the methodology used to undertake the site survey and prepare the compliance statement, including equipment and modelling used where relevant;
- where required, proposed impact management actions and outcomes or any monitoring requirements for inclusion in the EMPr;
- a description of the assumptions made and any uncertainties or gaps in knowledge or data;
- the mean density of observations/ number of sample sites per unit area; and
- any conditions to which the compliance statement is subjected.

### 2.3. Legal requirements applicable to the specialists conducting assessments

The Environmental Impact Assessment Regulations that were published on 4 December 2014 and amended on 7 April 2017, state that:

(1) an EAP and a specialist, appointed in terms of regulation 12(1) or 12(2), must-

(a) be independent;

(b) have expertise in conducting environmental impact assessments or undertaking specialist work as required, including knowledge of the Act, these Regulations, and any guidelines that have relevance to the proposed activity;

(c) ensure compliance with these Regulations;

(d) perform the work relating to the application objectively, even if this results in views and findings that are not favourable to the application;

(e) take into account, to the extent possible, the matters referred to in regulation 18 when preparing the application and any report, plan, or document relating to the application; and

(f) disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in the possession of the EAP and, where applicable, the specialist, that reasonably has or may have the potential of influencing-

(i) any decision to be taken concerning the application by the competent authority in terms of these Regulations; or

(ii) the objectivity of any report, plan or document to be prepared by the EAP or specialist, in terms of these Regulations for submission to the competent authority; unless access to that information is protected by law, in which case it must be indicated that such protected information exists and is only provided to the competent authority.

(2) In the event where the EAP or specialist does not comply with sub-regulation (1)(a), the proponent or applicant must, before conducting public participation as contemplated in chapter 5 of these Regulations, appoint another EAP or specialist to externally review all work undertaken by the EAP or specialist, at the applicant's cost.

(3) An EAP or specialist appointed to externally review the work of an EAP or specialist as contemplated in sub-regulation (2) must comply with sub-regulation (1).

### 2.4 Report Content Requirements

The following legislation and guideline documents are applicable and were adhered to in compiling this report:

#### 2.4.1 Guidelines documents

a) Department of Environmental Affairs and Development Planning (DEA&DP) Guidelines for Involving Biodiversity Specialists in the EIA Process (Brownlie 2005).

b) Ecosystem Guidelines for Environmental Assessments in the Western Cape (Cadman 2016).

c) The Western Cape Biodiversity Spatial Plan Handbook (Pool-Stanvliet *et al*. 2017)

d) South African National Biodiversity Institute (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.

#### 2.4.2 Legal documents

a) Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("NEMA"), when applying for Environmental Authorisation" ("the Protocols") (GN No. 320 as published in Government Gazette No. 43110 on 20 March 2020) came into effect on 09 May 2020 the Protocol.

b) Appendix 6 of the 2014 EIA Regulations (National Environmental Management Act, 1998 (Act No. 107 of 1998)

## 3. LIMITATIONS AND ASSUMPTIONS

The field surveys for this report were conducted on July 19 and 20, 2025. These surveys took place during the optimal period for botanical assessments (June to September). The findings from this specialist assessment are based on a two-day site visit, which means some plant species might not have been recorded. However, the proposed development footprint was highly altered, reducing the likelihood that species were missed. Confidence in the findings is high. It is unlikely that a full botanical assessment would reveal additional findings that would significantly impact the outcome.

# 4. STUDY AREA

## 4.1 Location

Groot Brakrivier is situated on the southern coast of the Western Cape Province, South Africa, as illustrated in **Figure A.** The town is located on both sides of the Groot Brakrivier estuary.

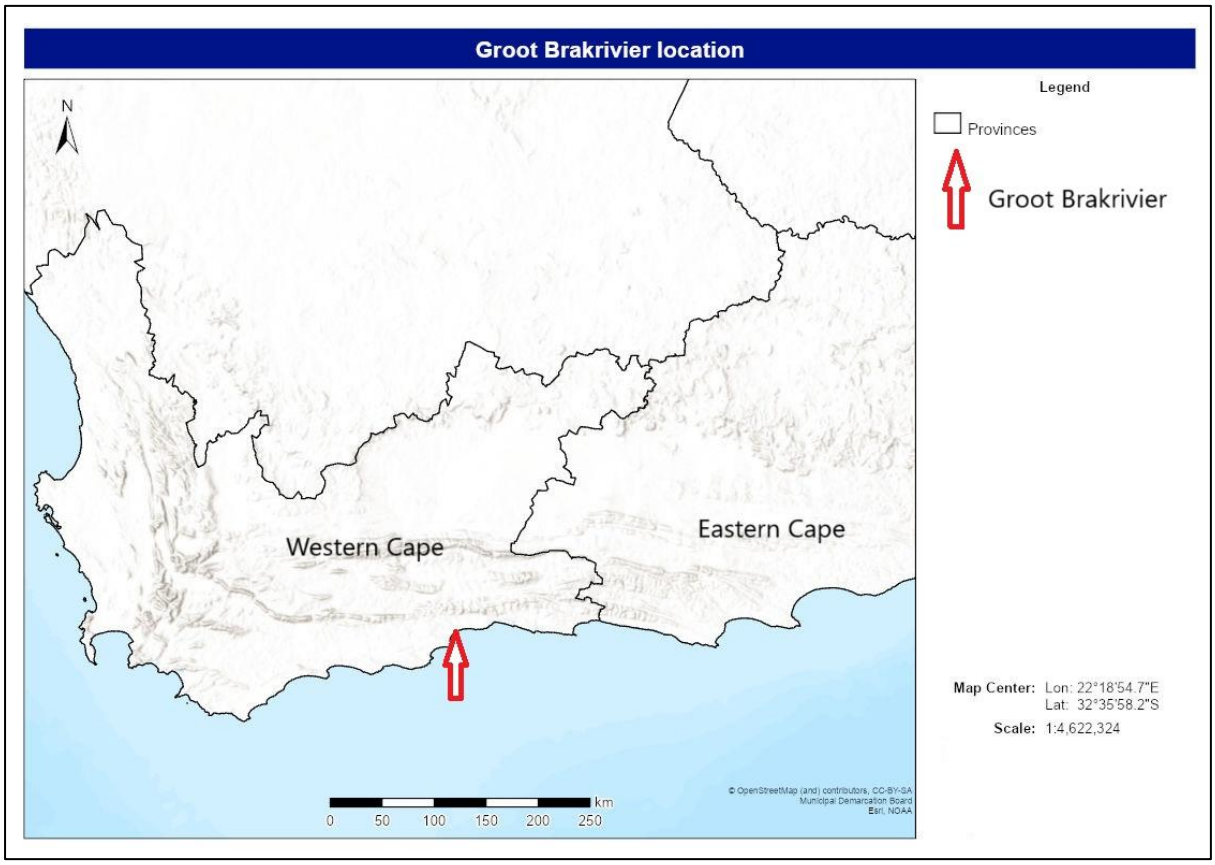



**Figure A.** Map showing the location of Groot Brakrivier

## 4.2 Proposed Development Footprint (PDI) and Project Area of Influence (PAOI)

The proposed development footprint is indicated as a purple polygon in **Figure B**. This purple polygon is the route of the old sewage pipeline that is due for an upgrade. The development footprint will The proposed sewage pipeline earmarked for this upgrade will be approximately 2,1 km in length, with a construction footprint of 5 m in width for installation during the construction phase. The anticipated impacts will mostly occur during the construction phase of the project when the municipality will dig a trench along the proposed development footprint for the replacement of the sewage pipeline. These impacts are not expected to extend beyond the demarcated footprint. The PAOI is therefore treated here as the development footprint within which direct impacts will occur.

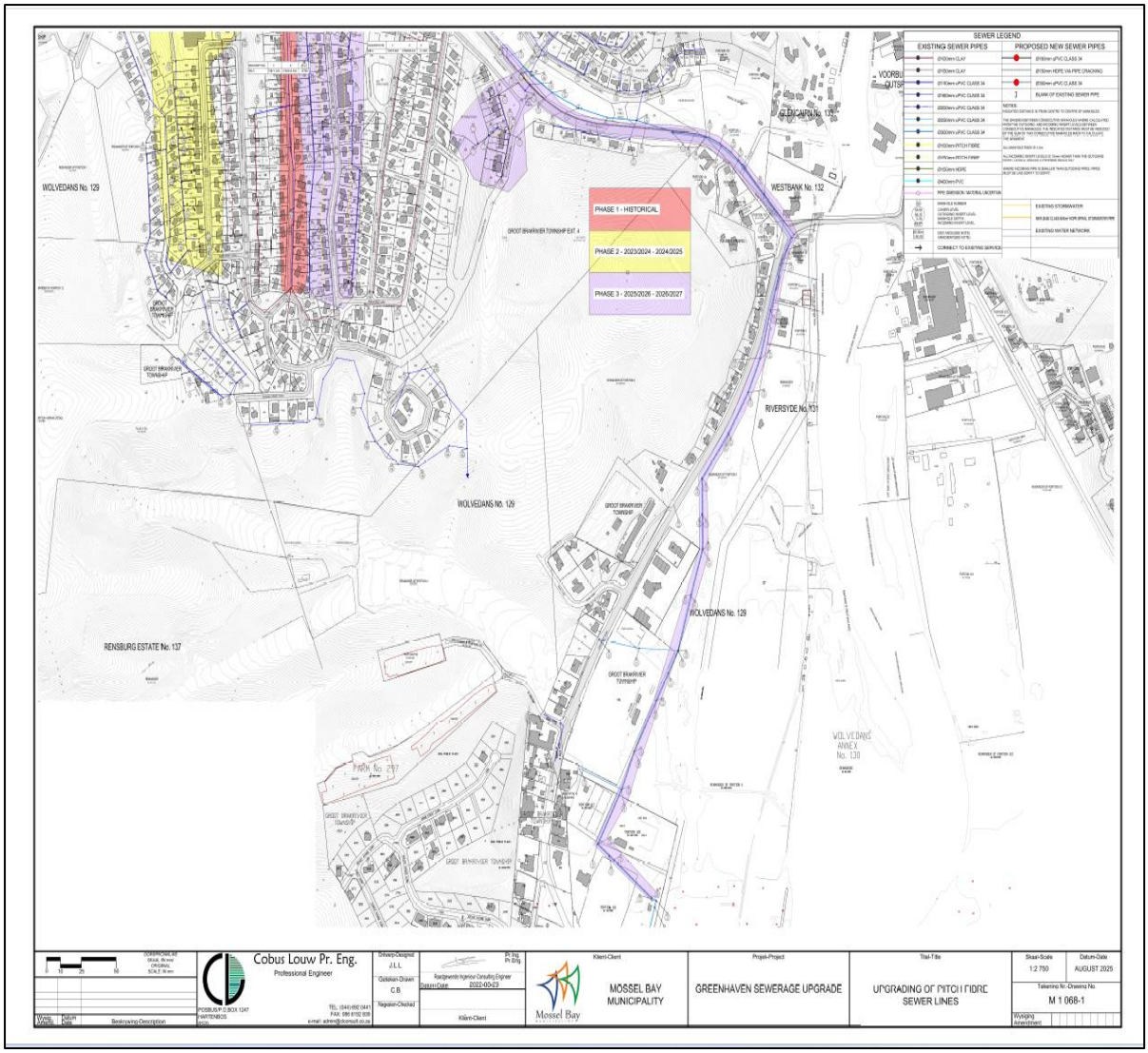



**Figure B:** The route of the proposed sewage pipeline upgrade is indicated with a purple polygon

# 5. METHODOLOGY

## 5.1 Desktop assessment

The specialist used various sources of information to assess the sensitivity of the vegetation and plant species within the proposed development footprint.

5.1.1 **The Environmental Screening Tool Report**: The environmental screening tool report indicates the sensitivity of the plant theme across the proposed development and lists threatened and sensitive plant species that could potentially occur within or near the proposed development footprint.

5.1.2 **CapeFarmMapper 3**: The following spatial data were obtained from CapeFarmMapper 3 (CFM 3). CMF 3 is GIS software provided by the Western Cape Department of Agriculture, available at https://gis.elsenburg.com/apps/cfm/.

- Vegetation units
- Vegetation unit threat status
- Spatial planning data: Critical Biodiversity Areas, Ecological Support Areas.

5.1.3 **iNaturalist**: iNaturalist is a crowdsourced species identification system and an organism occurrence recording tool. Sightings are graded, and only research-grade sighting is used in specialist assessments.

5.1.4 **Google Earth**: Google Earth is a web and computer program created by Google that renders a 3D representation of Earth based primarily on satellite imagery but also on street-level view. This imagery is useful when historical aerial imagery is needed of a proposed development footprint. It also gives a good perspective of the level of transformation before a field assessment is undertaken.

5.1.5 **Other sources of data**: Additional data were collected from a range of pertinent sources, including Mucina & Rutherford (2006), the National Vegetation Map (2018), and relevant biodiversity plans (Pool-Stanvliet 2017, SANBI 2021).

### 5.2 Field assessment

The field assessment was conducted over two days (19 and 20 July 2023). The specialist walked the proposed development footprint from west while collecting data. All plant and tree species were noted, photographed, and identified on-site if possible. Plants and trees that could not be identified during the field survey were later identified using available literature and taxonomic experts. The specialist also took drone imagery to give a better view of the proposed development footprint.

# 6. RESULTS: DESKTOP ASSESSMENT

## 6.1 Climate

The Mean Annual Precipitation (MAP) for Groot Brakrivier is approximately 459 mm, with approximately 40% of the rain falling in summer (October–March) and 60% in winter (April–September). Mean daily maximum and minimum temperatures are 26.8°C and 7.7°C for February and July, respectively (Mucina & Rutherford 2006).

## 6.2 Topography, geology, and soils

The proposed development footprint is located on a relatively flat area with a very slight gradient from west to east. The highest elevation on the proposed pipeline upgrade is at 10 metres above sea level (MASL), while the lowest point is at 1 MASL. The area is mostly underlain by the clastic sedimentary rocks of the Kirkwood Formation (Mesozoic Uitenhage Group). In the east, quartzite, schist, and phyllite of the Kaaimans Group (Namibian Erathem) and Cape Granite (edges of high coastal cliffs) are also present. In parts along the coast, these rocks are covered by the unconsolidated dune sand of the Strandveld. See **Figure C** for a map of the soil types present at the proposed development footprint (Mucina & Rutherford 2006).

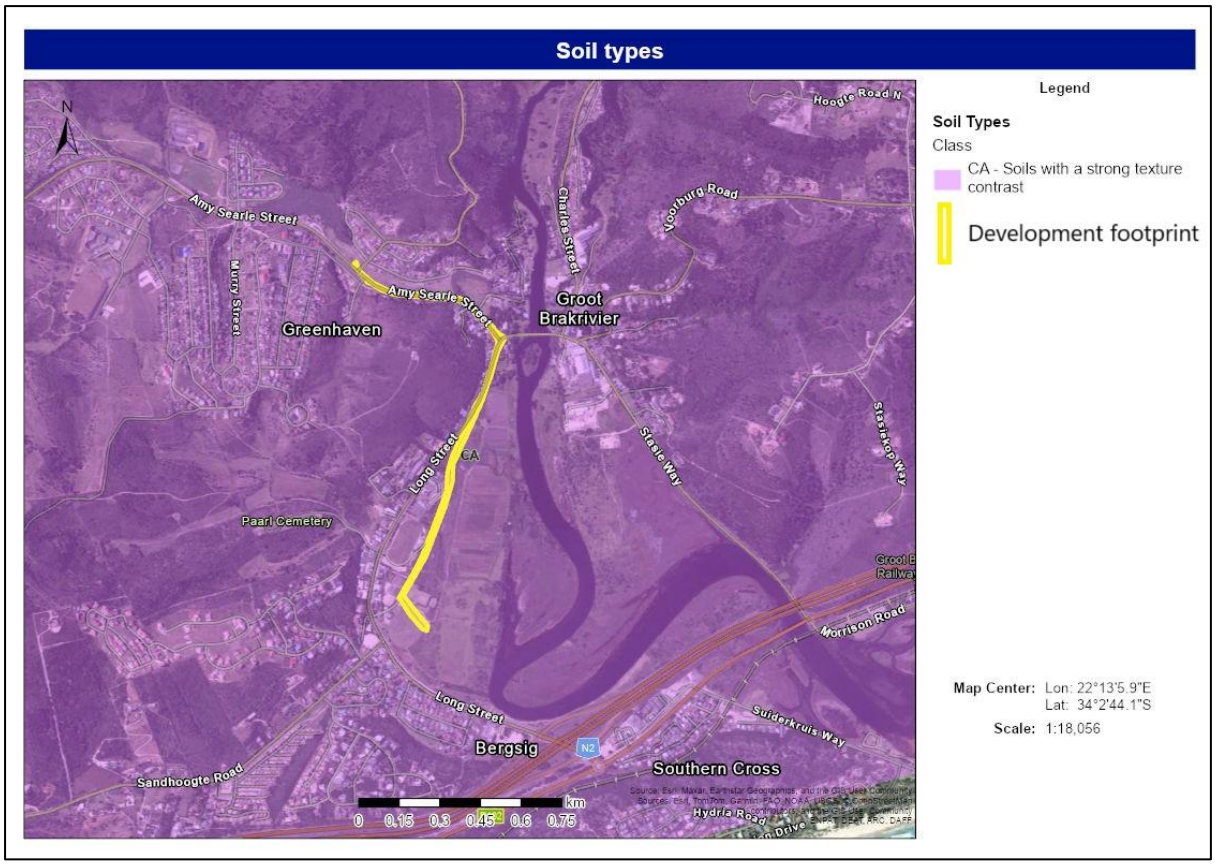



**Figure C:** Map indicating the different soil types on and near the proposed development footprint

## 6.3 VEGETATION

### 6.3.1 General Context

Groot Brakrivier town, where the proposed development is situated, is part of the Cape Floristic Region (CFR). The CFR is renowned for its botanical diversity, containing over 9,000 vascular plant species, 69% of which are endemic (Goldblatt & Manning 2000). The CFR encompasses most of the Cape Fold Mountains and coastal lowlands stretching from Niewoudtville to Gqeberha. The Fynbos Biome consists of three primary vegetation complexes: Fynbos, Renosterveld, and Western Strandveld. The Fynbos complex is the most extensive, covering 67% of the Fynbos Biome, while Western Strandveld covers the smallest area within the Fynbos Biome. The proposed development site is located within this Western Strandveld complex. The Western Strandveld complex is subdivided into nine different vegetation units, of which one, Groot Brak Dune Strandveld, is the mapped vegetation unit across the proposed development footprint.

### 6.3.2 Local vegetation context

Groot Brak Dune Strandveld (**Figure D**) is listed as Critically Endangered (CR), with a Target of 36%. None of it is protected in statutory conservation areas, and only about 1% is safeguarded in private reserves (George, Kanon, Blydskap, Kwelanga). Nearly half of the region has been transformed for agriculture, through road construction or coastal settlement development. Erosion levels vary, ranging from moderate to high, with some areas classified as low. In 1990, 53% of the original extent of this vegetation was still present, and in 2018, this had declined to 45%.

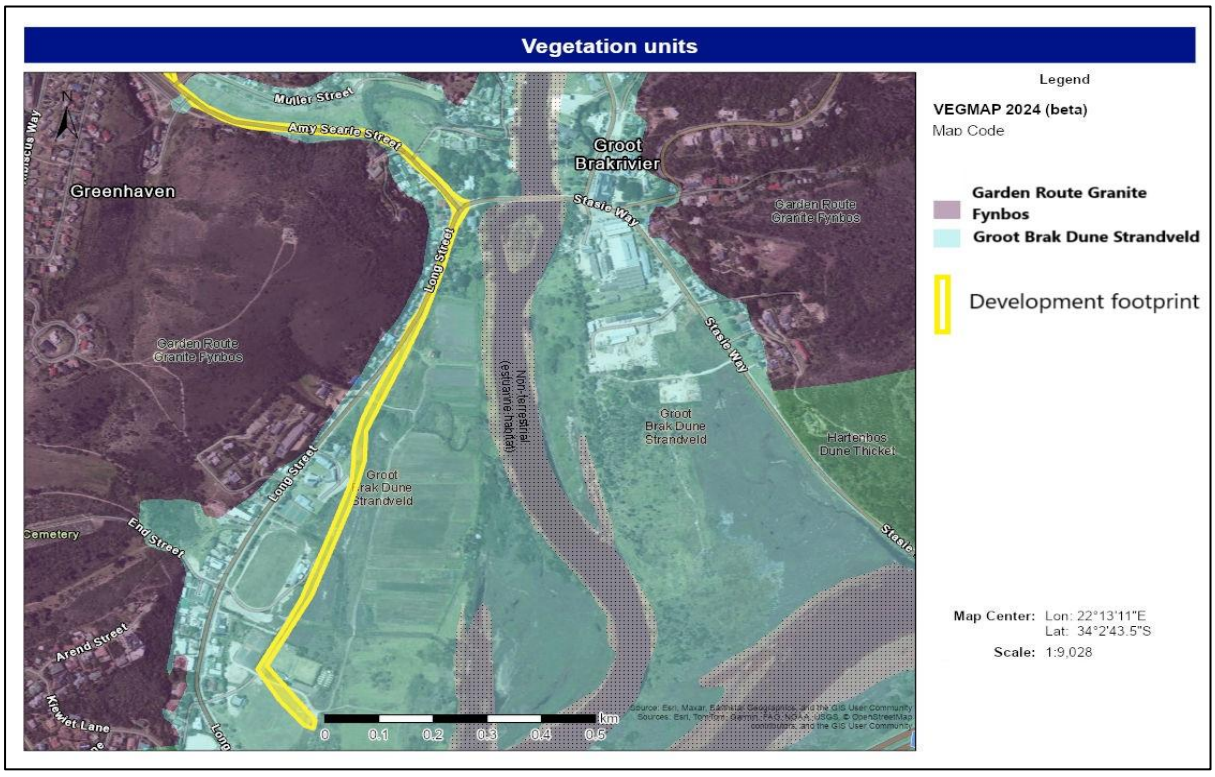



**Figure D:** Vegetation unit map for the proposed development footprint

### 6.3.3 Plant species

According to Mucina & Rutherford (2006), important taxa in Groot Brak Dune Strandveld include: **Important Taxa** Small Trees: *Chionanthus foveolatus*, *Clausena anisata*. Tall Shrubs: *Azima tetracantha*, *Cussonia thyrsiflora*, *Diospyros dichrophylla*, *Euclea racemosa* subsp. *racemosa*, *Grewia occidentalis*, *Gymnosporia buxifolia*, *Maytenus procumbens*, *Metalasia muricata*, *Morella cordifolia*, *Myrsine africana*, *Mystroxylon aethiopicum*, *Olea exasperata*, *Pterocelastrus tricuspidatus*, *Putterlickia pyracantha*, *Rhus crenata*, *R. glauca*, *R. longispina*, *R. lucida*, *Schotia afra* var. *afra*, *Sideroxylon inerme*, *Tarchonanthus littoralis*. Low Shrubs: *Asparagus suaveolens*, *Ballota africana*, *Carissa bispinosa* subsp. *bispinosa*, *Chironia baccifera*, *Clutia daphnoides*, *Eriocephalus africanus* var. *africanus*, *Helichrysum teretifolium*, *Lauridia tetragona*, *Phylica axillaris*, *Polygala myrtifolia*. Succulent Shrubs: *Aloe arborescens* (d), *Cotyledon orbiculata* var. *dactylopsis*, *Crassula perforata*, *C. pubescens* subsp. *pubescens*, *Euphorbia burmannii*, *E. mauritanica*, *Tetragonia fruticosa*, *Zygophyllum morgsana*. **Biogeographically Important Taxa** (both South Coast endemics) Herb: Indigofera tomentosa. Geophytic Herb: Freesia alba (Mucina & Rutherford 2006).

*Environmental Screening Tool results*

Regulation 16(1)(b)(v) of the Environmental Impact Assessment Regulations requires an applicant for an Environmental Authorisation to submit a report generated by the Environmental Screening Tool as part of their application. This tool became operational on 5 July 2019, as announced in the Government Gazette. The screening tool report will identify the environmental sensitivities that intersect with the proposed development footprint, as defined by the applicant, as well as the relevant protocols that the applicant must follow. The screening tool is accessible at https://screening.environment.gov.za. The Environmental Screening Tool Report rated the relative plant species theme as medium sensitivity for the proposed pipeline upgrade. The image from the Environmental Screening Tool Report is displayed in **Figure E.**

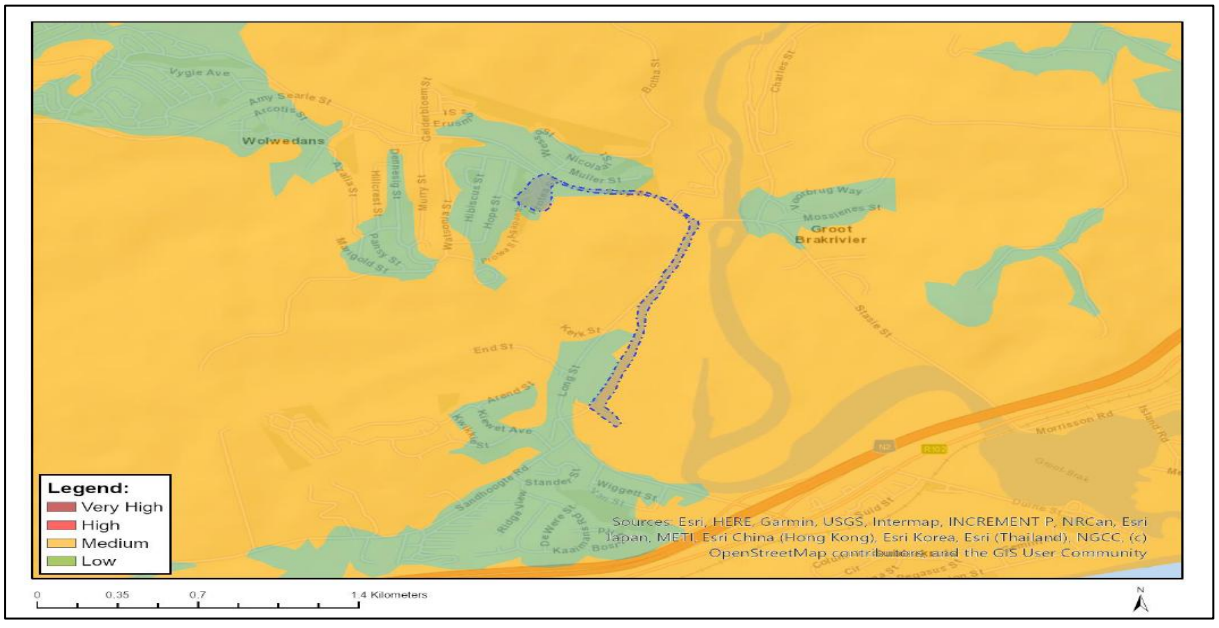



**Figure E:** Map indicating the relative plant theme sensitivity rating for the proposed development footprint and surrounding areas.

The Environmental Screening Tool report also lists threatened and sensitive species that could potentially occur at or near the proposed development footprint. These species are listed in **Table 1** below, and the table also indicates the SANBI Red List status of the species. The specialist also included a column that indicates the natural distribution of the species. The names of the sensitive species listed in the environmental screening tool report may not be displayed in this report, as this report will be available in the public domain. Sensitive species are targeted by collectors and/or illegal harvesting.

**Table 1:** Threatened and sensitive species listed for the proposed development footprint (CR Critically Endangered, EN Endangered, VU Vulnerable)

| Species | SANBI Red List status | Distribution |
|---|---|---|
| *Lampranthus pauciflorus* | EN | Cape Infanta to Plettenberg Bay |
| *Lebeckia gracilis* | EN | Agulhas to Gqeberha |
| *Erica unicolor subsp. mutica* | EN | Herbertsdale to George |
| *Erica glandulosa subsp. fourcadei* | VU | Mossel Bay to Cape St Francis. |
| *Hermannia lavandulifolia* | VU | Worcester to Plettenberg Bay |
| *Sensitive species 633* | CR | Groot Brak but not in Strandveld |
| *Sensitive species 268* | EN | Herbertsdale to Groot Brak (Renosterveld) |
| *Sensitive species 1024* | EN | Riversdale to Knysna (not in Strandveld) |
| *Cotula myriophylloides* | CR | Cape Peninsula, Bredasdorp, Plettenberg Bay |
| *Euchaetis albertiniana* | EN | Albertinia |
| *Sensitive species 516* | EN | Herbertsdale to Mossel Bay |
| *Sensitive species 800* | VU | Cape Peninsula to Knysna |
| *Sensitive species 500* | VU | Cape Flats to Gqeberha |
| *Diosma passerinoides* | VU | Caledon to Baviaanskloof |
| *Agathosma microcarpa* | VU | Potberg to Mossel Bay |

### *iNaturalist*

There were seven research-grade iNaturalist plant sightings within or very near to the proposed development footprint. The low number of iNaturalist sightings is an indication that the proposed development footprint has been transformed.

**Table 2:** Research grade observations from iNaturalist within or very near to the proposed development footprint.

| Family | Species | Common name | Red List status |
|---|---|---|---|
| ASTERACEAE | *Osteospermum moniliferum* | Bitou | LC |
| CONVOLVULACEAE | *Falkia repens* | Pink Ear | LC |
| ERICACEAE | *Erica afra* | heath | LC |
| IRADACEAE | *Gladiolus tristis* | Marsh Afrikaner | LC |

| | | | |
|---|---|---|---|
| OXALIDACEAE | *Oxalis pes-caprae* | Sorrel | LC |
| POACEAE | *Cenchrus clandestinus* | Kikuyu Grass | ALIEN |
| RUTACEAE | *Calodendrum capense* | Cape-Chestnut | LC |

## 6.4 Spatial Planning

### 6.4.1 Critical Biodiversity Areas and Ecological Support Areas

Critical Biodiversity Areas (CBAs) are areas that must be safeguarded in their natural or near-natural state because they are essential for conserving biodiversity and maintaining ecosystem functioning. The spatial planning map for Groot Brakrivier (**Figure F**) indicates that the proposed development footprint does not cross over any terrestrial CBA. The footprint does intersect with CBA Wetland and CBA Estuary near Lang Street. **Figure G** provides a zoomed-in version of **Figure F to** show more detail on the CBA Wetland demarcation. No Ecological Support Areas (ESAs) are mapped near the proposed development footprint. ESAs that are not essential for meeting biodiversity targets but play an important role in supporting the functioning of protected areas or critical biodiversity areas are often vital for delivering ecosystem services. The 2023 Western Cape Biodiversity Spatial Plan (WC BSP) was formally adopted into law on the 13th of December 2024 (Gazette Extraordinary 9017) in alignment with the Western Cape Biodiversity Act (No. 6 of 2021). This marks the replacement of the 2017 WC BSP with the 2023 WC BSP.

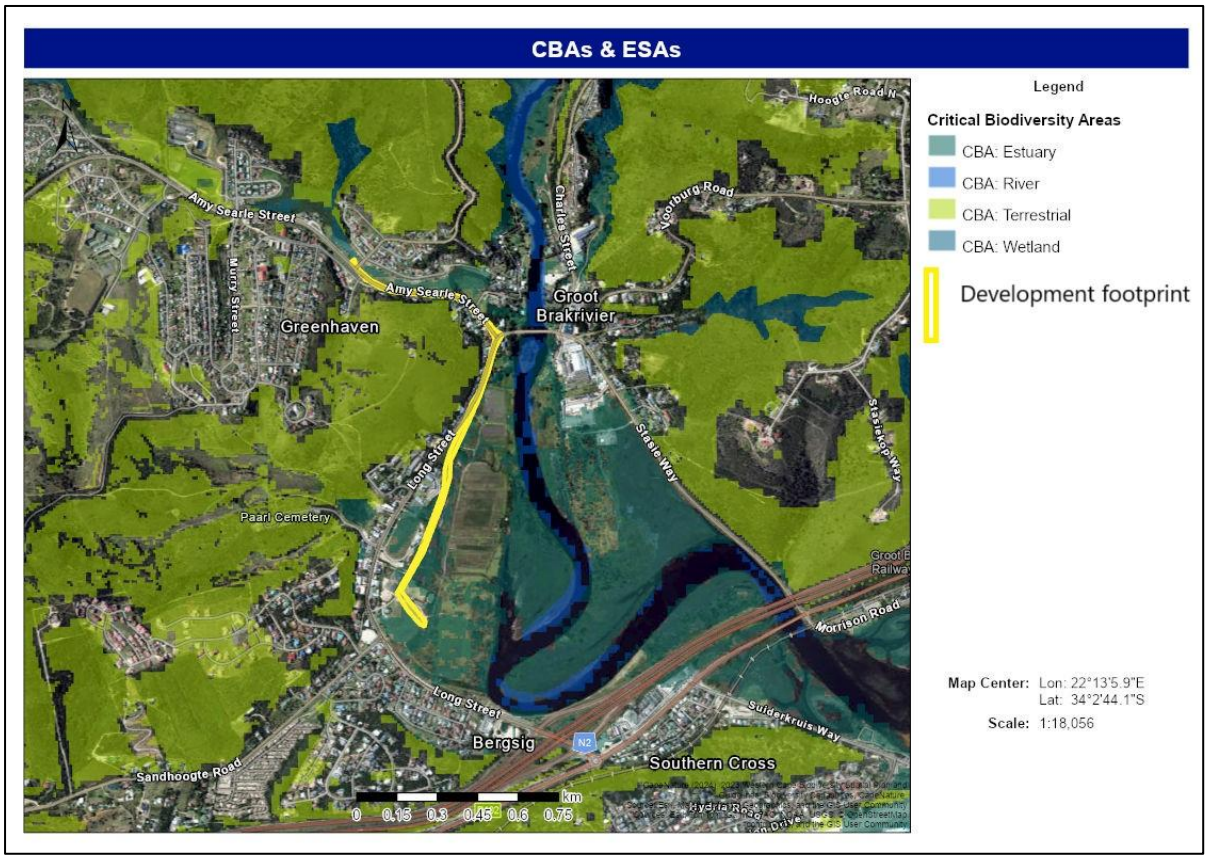


**Figure F:** Spatial planning map for Groot Brakrivier.

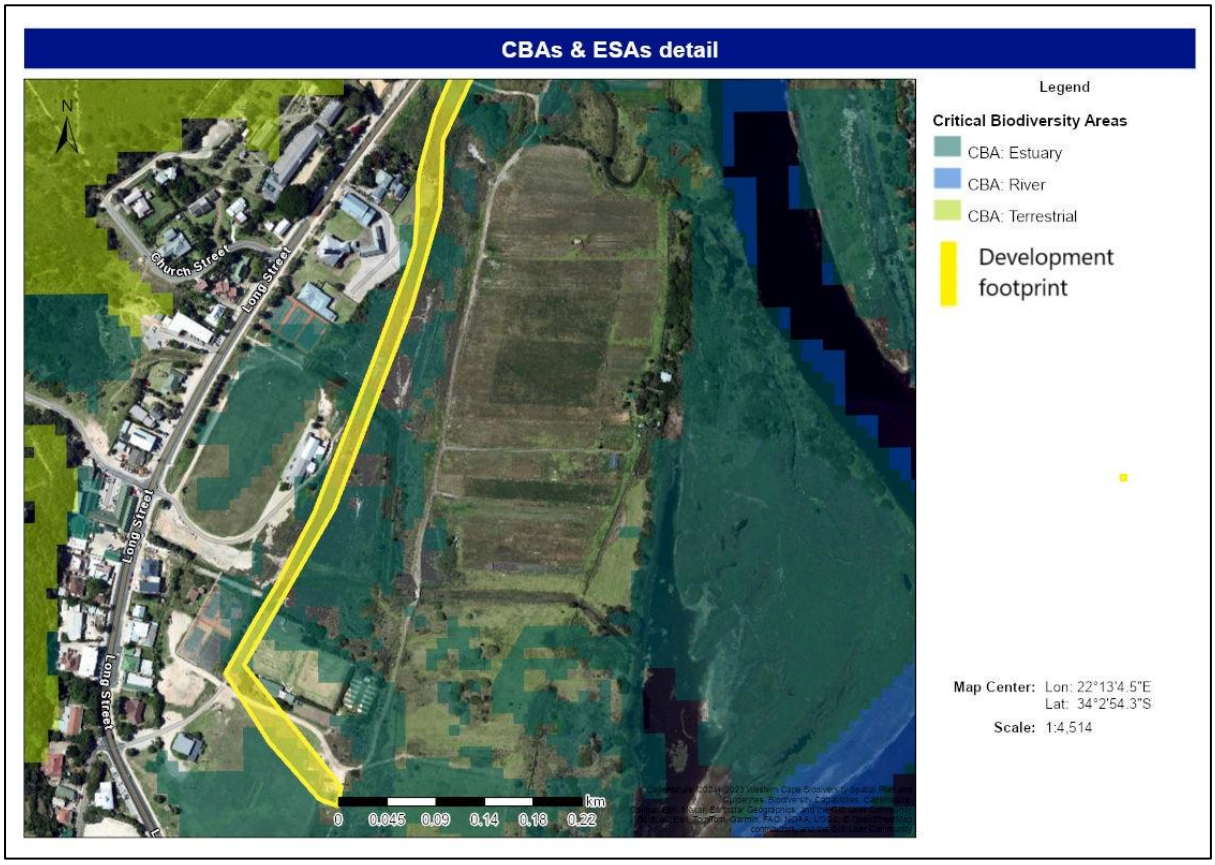



**Figure G:** Spatial planning map for the southern section of the proposed development footprint

### 6.4.2 Reasons for CBA status

The Biodiversity Spatial Plan (2017) for the Western Cape provides reasons for the inclusion of areas into CBAs. These reasons for the CBAs at the proposed development footprint are summarized in **Table 3**.

**Table 3:** Reasons for the inclusion of CBAs at the proposed development footprint

| | |
|---|---|
| Summary 1: | Climate adaptation corridor (14.28), Ecological processes (8.82), Estuary (14.29), River Type (3.21), SA Vegetation Type (2.32), Threatened SA Vegetation Type (8.13), Threatened Vertebrate (11.4), Water resource protection (7.69) |
| Feature 1: | Bontebok Extended Distribution Range |
| Feature 2: | Cape Coastal Lagoons (LT) |
| Feature 3: | Climate adaptation corridor |
| Feature 4: | FEPA River Corridor |
| Feature 5: | Groot Brak Dune Strandveld (EN) |
| Feature 6: | Groot Brak Estuary |
| Feature 7: | Southern Coastal Belt Permanent Lowland River |
| Feature 8: | Watercourse protection- Southern Coastal Belt |

### 6.4.3 Special Habitats, Indigenous Forest, Connectivity, and Corridors

The proposed southern section of the proposed development footprint is close to the Groot Brak estuary. The proposed development footprint is not within the estuary boundaries but part of a buffer zone between the estuary and urban development.

### 6.4.4 Protected Areas

There are no formally protected areas near the proposed development footprint. Groot Brakrivier does fall in the domain of the Gouritz Cluster Biosphere Reserve as indicated in **Figure H**.

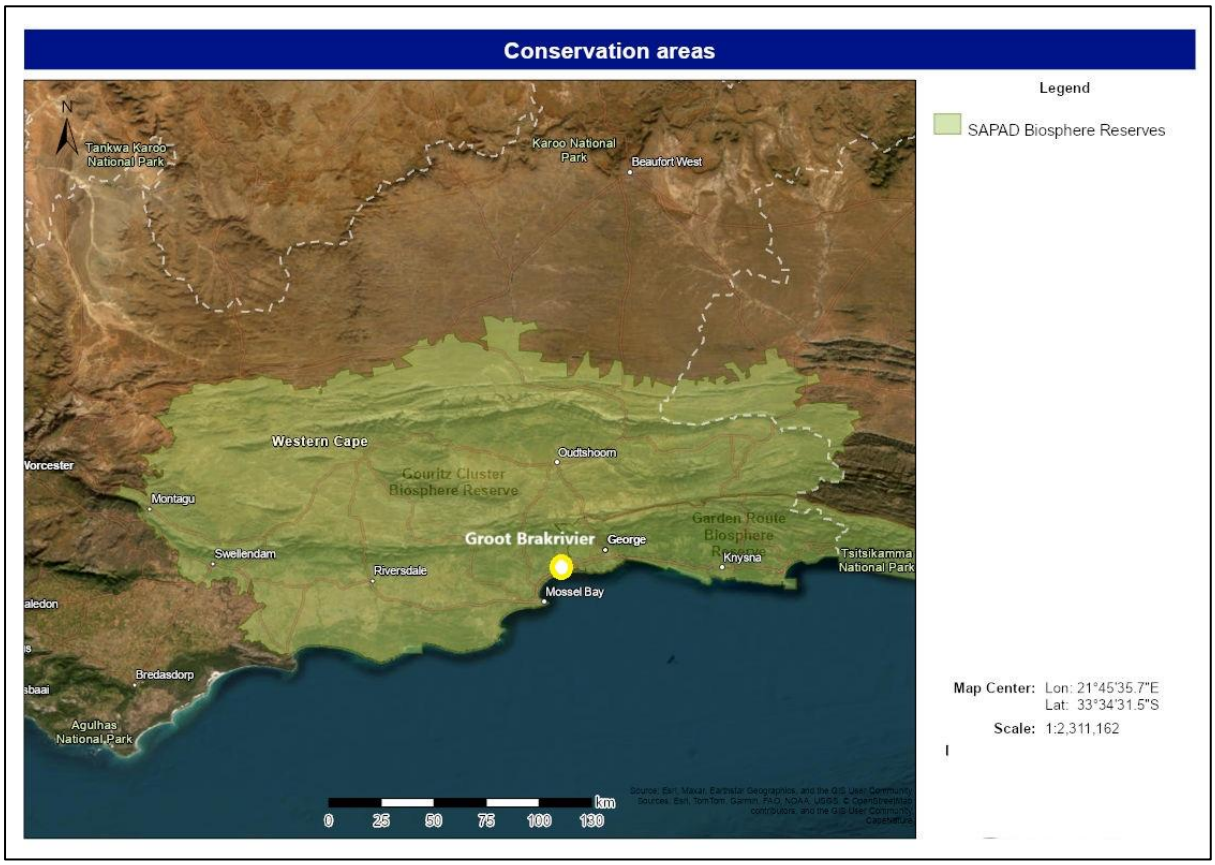



**Figure H:** Protected areas map for the area that includes Groot Brakrivier

The proposed development footprint is also not part of an area earmarked for protected area expansion, as it is located within an urban environment. The CBA status of sections of the footprint will protect further expansion of urban development.

# 7. RESULTS: FIELD ASSESSMENT

## 7.1 Vegetation

The natural vegetation (Groot Brak Dune Strandveld) has been historically transformed for urban development across most of the proposed development footprint. The range of photos and maps covers the proposed development footprint from north to south and is displayed in **Figures 1** to **17**. The yellow shaded area in the maps indicates the area visible in the adjoining photograph. There are small sections that retain elements of the original vegetation, but more than 75% of the area is fully transformed. Large sections are maintained as lawns and sidewalks that are either paved or tarred. No visible natural plant communities are still intact.











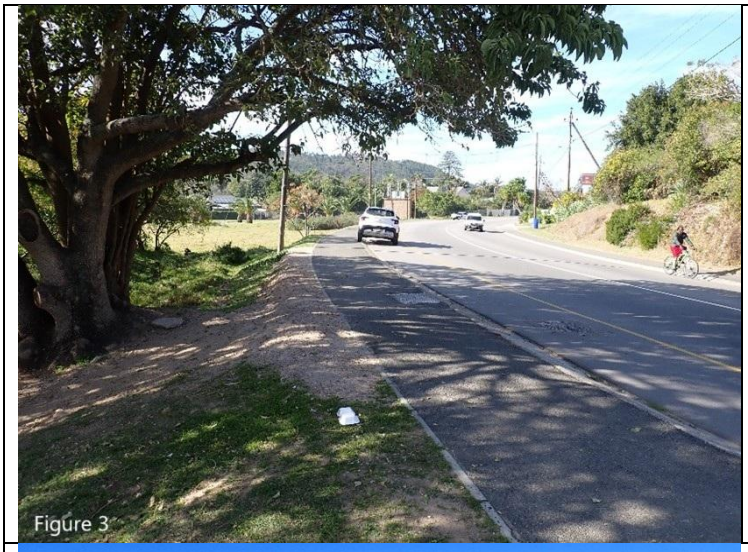


Figure 3





Figure 4






Figure 5



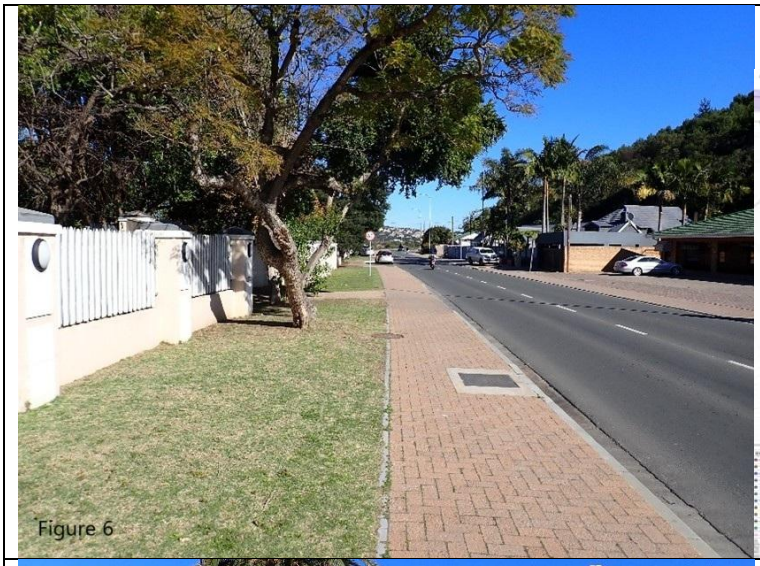


Figure 6






Figure 7

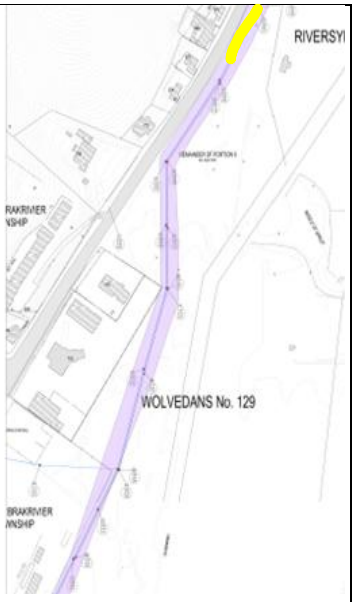


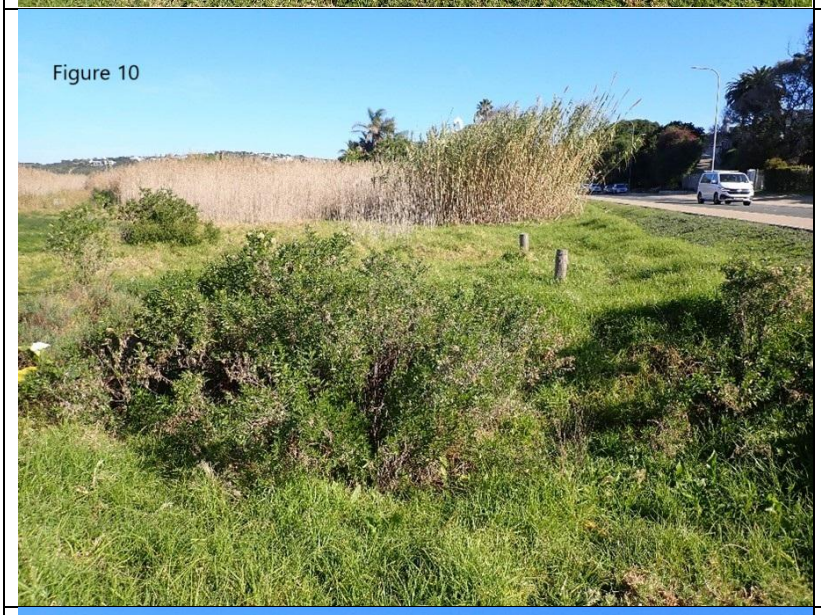



Figure 8




Figure 9


RIVERSYI
WOLVEDANS No. 129


Figure 10

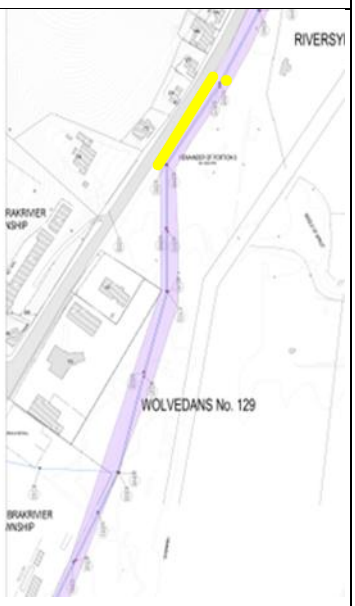

RIVERSYI
WOLVEDANS No. 129


Figure 11

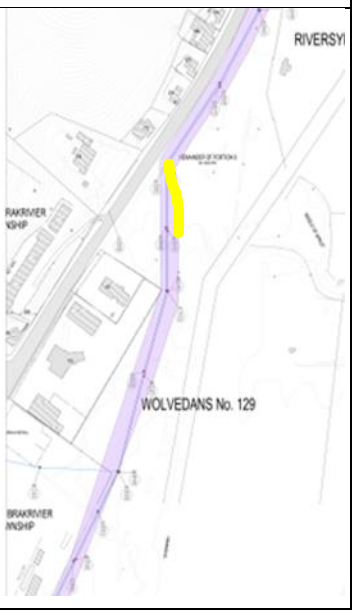

RIVERSYI
WOLVEDANS No. 129


Figure 12

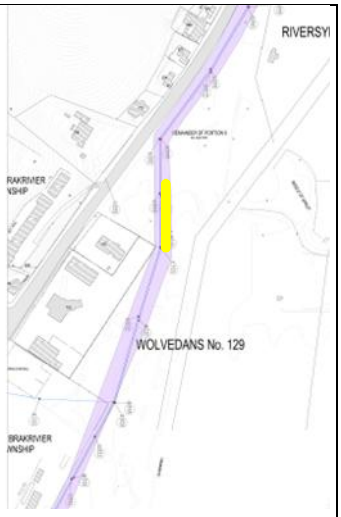

RIVERSYDE
WOLVEDANS No. 129


Figure 13

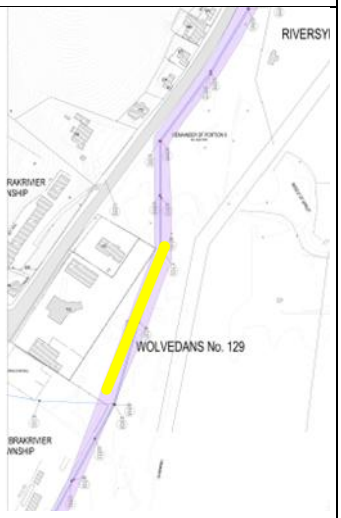

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Figure 14

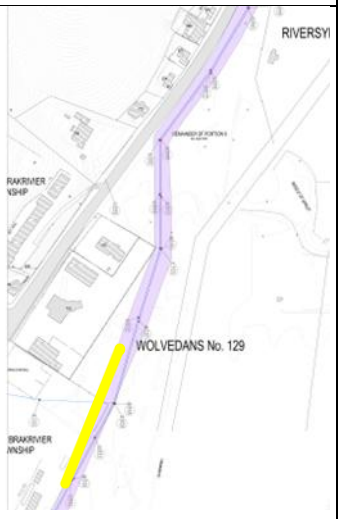

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Figure 15






Figure 16

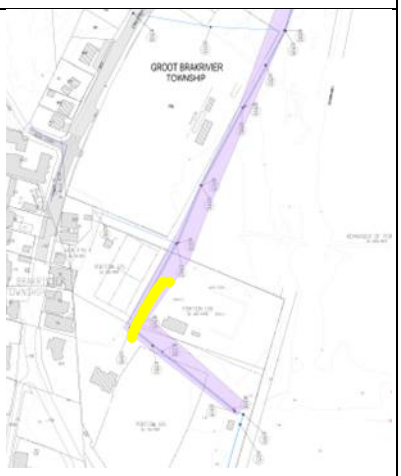





Figure 17



## 7.2 Plant species

The specialist identified 43 plant species from 27 families during a two-day survey of the proposed development site (**Table 4**). Due to prior transformation, overall species diversity was low as anticipated.

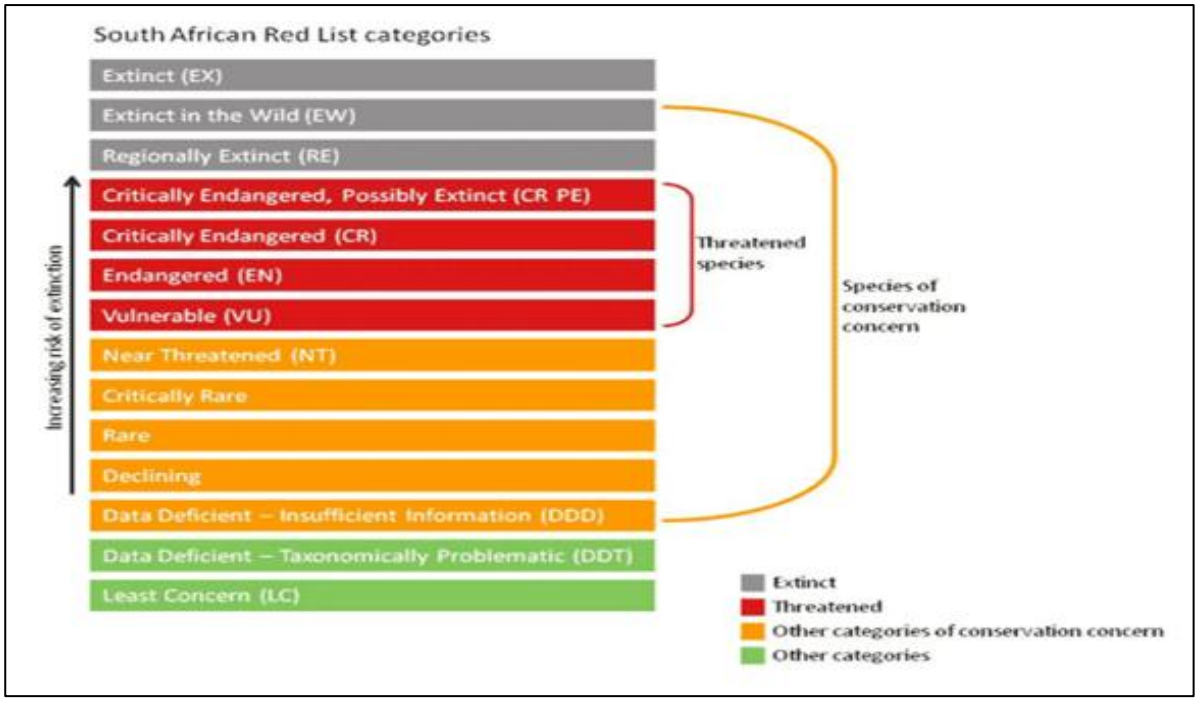
No threatened plant species were recorded within the proposed development footprint. None of the 15 threatened and sensitive plant species listed in the Environmental Screening Tool Report was recorded within the proposed development footprint. The conservation status of the plants is also presented in **Table 4**, and the various categories of conservation status are listed in **Table 5.**

**Table 4:** Plant species recorded during the field survey on 19 and 20 July 2025

| FAMILY | SPECIES | COMMON NAME | SANBI Red List status |
|---|---|---|---|
| AIZOACEAE | *Carpobrotus edulis* | Common Sourfig | LC |
| AIZOACEAE | *Carpobrotus deliciosus* | Delicious Sourfig | LC |
| AIZOACEAE | *Disphyma crassifolium* | Purple Dewplant | LC |
| AMARANTHACEAE | *Salicornia decumbens* | Dense Glasswort | LC |
| ANACARDIACEAE | *Searsia lucida* | Glossy Currantrhus | LC |
| ANACARDIACEAE | *Schinus terebinthifolia* | Brazilian pepper | alien |
| APOCYNACEAE | *Gomphocarpus physocarpus* | Balloonplant | LC |
| ARACEAE | *Zantedeschia aethiopica* | Arum Lily | LC |
| ASPARAGACEAE | *Agave attenuata* | Foxtail agave | LC |
| ASTERACEAE | *Arctotheca prostrata* | Prostrate Capeweed | LC |
| ASTERACEAE | *Helichrysum cymosum* | Fume Everlasting | LC |
| ASTERACEAE | *Helminthotheca echioides* | Bristly oxtongue | alien |
| ASTERACEAE | *Metalasia acuta* | Pointy Blombush | LC |
| ASTERACEAE | *Nidorella ivifolia* | Ovenbush | LC |
| ASTERACEAE | *Oedera pungens* | Perdekaroos | LC |
| ASTERACEAE | *Osteospermum moniliferum* | Bitou | LC |
| ASTERACEAE | *Senecio inaequidens* | Ragwort | LC |
| ASTERACEAE | *Taraxacum officinale* | Common dandelion | alien |
| BASELLACEAE | *Anredera cordifolia* | Mignonette vine | alien |
| BIGONIACEAE | *Tecomaria capensis* | Cape honeysuckle | LC |
| CASUARINACEAE | *Casuarina cunninghamiana* | Beefwood | alien |
| COMMELINACEAE | *Commelina africana* | Yellow Dayflower | LC |
| CONVOLVULACEAE | *Falkia repens* | Pink Ear | LC |
| CYPERACEAE | *Cyperus albostriatus* | Dwarf striped sedge | LC |
| CYPERACEAE | *Cyperus textilis* | Mat Sedge | LC |
| EBENACEAE | *Diospyros dichrophylla* | Poison Starapple | LC |
| FABACEAE | *Acacia mearnsii* | Black Wattle | alien |
| FABACEAE | *Acacia cyclops* | Rooikrans | alien |
| GERANIACEAE | *Pelargonium capitatum* | fleshy-stalk pelargonium | LC |
| GERANIACEAE | *Pelargonium zonale* | Zonal Storkbill | LC |

| | | | |
|---|---|---|---|
| HYPOXIDACEAE | *Hypoxis setosa* | Stargrasses | LC |
| IRADACEAE | *Bobartia robusta* | Giant Rushiris | LC |
| JUNCACEAE | *Juncus acutus* | Spiny rush | LC |
| JUNCACEAE | *Juncus effusus* | Common rush | LC |
| JUNCAGINACEAE | *Triglochin maritima* | Common arrow-grass | LC |
| MAVACEAE | *Hermannia flammea* | Flaming dollsrose | LC |
| OXALIDACEAE | *Oxalis pes-caprae* | klawersuring | LC |
| POACEAE | *Stenotaphrum secundatum* | Buffalo grass | LC |
| RUTACEAE | *Calodendrum capense* | Cape-Chestnut | LC |
| SCROPHULARIACEAE | *Myoporum laetum* | Myoporum | alien |
| TYPHACEAE | *Typha capensis* | Cape bulrush | LC |
| VERBENIACEAE | *Verbena bonariensis* | Purple top | alien |
| VISCACEAE | *Viscum capense* | Voëlent | LC |

**Table 5:** South African Red List categories as prescribed by the International Union for Conservation of Nature (IUCN**)**




### 7.3 Alien plant species present

Alien species were dominant in certain sections of the proposed development footprint. The alien species is listed in **Table 4** above.

## 8. CONCLUSIONS

The site sensitivity is verified to be Low from a plant species perspective and not Medium as rated in the Environmental Screening Tool. This finding is based on:

- No plant species of conservation concern is located within the proposed development footprint.
- The severe state of transformation of the proposed development footprint.
- The high percentage of alien vegetation located within the proposed development footprint.

The specialist therefore recommends that the development proceed as planned from a plant species perspective if the mitigation measures in **Section 9** are captured in the Environmental Management Program.

## 9. PROPOSED IMPACT MANAGEMENT OUTCOMES OR ANY MONITORING REQUIREMENTS FOR INCLUSION IN THE ENVIRONMENTAL MANAGEMENT PROGRAM.

- The proposed development footprint should be fully demarcated (stakes and danger tape) during the construction phase, and all construction activities must be done within this demarcated area.
- In the areas as displayed in Figures 11 to 14, the topsoil that is removed during construction must be kept separate from the lower soil and replaced accordingly.
- Alien invasive trees (*Acacia* spp.) within the proposed development footprint in the section, as displayed in Figures 11 to 14, should be removed.

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# Appendix C: DFFE Pesticide Policy:

forestry, fisheries & the environment

Department:
Forestry, Fisheries and the Environment
**REPUBLIC OF SOUTH AFRICA**

# *ENVIRONMENTAL PROGRAMMES PESTICIDE POLICY FOR THE CONTROL OF ALIEN INVASIVE SPECIES*

| **Originated By:** | | **Reviewed By:** | **Recommended By:** | **Approved By:** |
|---|---|---|---|---|
| **Name/Section:** | Directorate: National Southern & Western Programmes | Dr Christo Marais | Ms Nonhlanhla Mkhize | Ms Nomfundo Tshabalala |
| **Designation** | D: N, S&WP | CD: NRM | DDG: EP | DG |
| **Signature:** | | | | |
| **Date:** | | | | |

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12.4 Adjuvants should be added to the tank as per the label instruction prior to the addition of the pesticide when buffering and afterwards for adjuvants and dyes. ..... 29

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DOCUMENT CONTROL PAGE

| Document Control Page | |
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**APPROVAL**

**_____**

**Name:**

**Designation: Director-General**

**Date: _____**

TERMINOLOGY

**Abbreviations**

| Acronym | Meaning |
|---|---|
| AIS | Alien Invasive Species |
| CD: NRM | Chief Directorate: Natural Resource Management |
| COIDA | Compensation for Occupational Injuries and Diseases Act (COIDA) (Act 130 o9f 1993) |
| DDG | Deputy Director General |
| DFFE | Department of Forestry, Fisheries and the Environment |
| DG | Director General |
| D: N, S & WP | Director: National, Southern & Western Programmes |
| EDC | Endocrine disrupting chemical |
| EP | Environmental Programmes |
| EPWP | Expanded Public Works Programmes |
| ESRA | Environmental Social Risk Assessment |
| FAO | Food and Agriculture Organization |
| GHS | UN Global Harmonization System of Classification and Labelling of Chemicals, known as the Purple book |
| HA | Hectare |
| HHP | Highly hazardous pesticide |
| IPM | Integrated Pest Management |
| MANCO | Management Committee |
| NEM:BA | National Environmental Management: Biodiversity Act |
| NRM | Natural Resource Management |
| OHS | Occupational Health and Safety |
| PIC | Prior informed consent |
| POE-T | Polyethoxylated tallow amine |
| PPE | Personal Protective Equipment |
| SCM | Supply Chain Management |
| SDS | Safety Data Sheet |
| SP | Service Provider |
| SPCA | Society for the Prevention of Cruelty to Animals |
| WFW | Working for Water |
| WHO | World Health Organization |

**Terminology**

| Terminology | Definition |
|---|---|
| Absorption route | Includes ingestion, inhalation or absorption through the skin or mucous membranes of the pesticide |
| Acute toxicity | Acute toxicity refers to those adverse effects occurring following oral or dermal administration of a single dose of a substance, or multiple doses given within 24 hours, or an inhalation exposure of 4 hours. |
| Bioaccumulation | Bioaccumulation is the process by which toxins enter the food web by building up in individual organisms |
| Biological exposure index | Value for assessing biomonitoring results, intended as a reference guideline for use in the likelihood of adverse health effects. It generally represents the level of metabolites that are most likely to be observed in the specimens collected from employees exposed to pesticides with |

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| | inhalation exposure at the occupational exposure limit or body burden threshold |
| Biomagnification | Biomagnification is the process by which toxins are passed from one trophic level to the next (and thereby increase in concentration) within a food web. |
| Biomonitoring | Biomonitoring is a tool of health-related environmental monitoring with which populations are examined for their exposure to pollutants from the environment using bioassays. A component of medical surveillance. |
| Biopesticide | Biopesticides are certain types of pesticides derived from such natural materials as animals, plants, bacteria, and certain minerals. |
| Carcinogenicity | Is any pesticide or mixtures of pesticides that induces cancer or increase the incidence of cancer as classified by GHS as either category 1 (known carcinogen) or category 2 (suspected carcinogen) and falls in hazard group 2 |
| CAS number | Chemical identity number or name given to each pesticide which is its unique identifying number in accordance with the nomenclature systems of the International Union of Pure and Applied Chemistry |
| Container Management Programme | The Container Management Programme should provide for the safe, effective and responsible management of all of the empty pesticide containers from the collection to the disposal. |
| Developmental and reproductive toxicity | **Developmental toxicity** pertains to adverse toxic effects to the developing embryo or foetus. Chemicals cause developmental toxicity by two ways. They can act directly on cells of the embryo or foetus causing cell death or cell damage, leading to abnormal organ development. A chemical might also induce a mutation in a parent's germ cell which is transmitted to the fertilized ovum. Some mutated fertilized ova develop into abnormal embryos. **Reproductive toxicity** is defined as adverse effects of a chemical substance on sexual function and fertility in adult males and females, as well as developmental toxicity in the offspring |
| Ecotoxicity | Ecotoxicology is the study of toxic effects caused by natural or man-made substances on biota. |
| Engineering control measures | Control measures that remove or reduce exposure of persons to pesticides by means of engineering methods, a step in the Hierarchy of Control |
| Environmental fate | The environmental fate of pesticides depends on the physical and chemical properties of the pesticide as well as the environmental conditions. ... Once a pesticide has been released into the environment, it can be broken down by exposure to sunlight (photolysis) exposure to water (hydrolysis) |
| Exposed | Exposed to a highly hazardous pesticide or Hazardous chemical agent |
| GHS concentration limit | Minimum concentration of a pesticide, expressed as a percentage to trigger the classification that a pesticide can be classified as highly hazardous |
| Hazard class | The nature of a physical, health or environmental hazard under the GHS |
| Hazard classification | GHS hazard classes and hazard categories assigned to various pesticides |
| Hazard category | A division of the hazard criteria within the hazard class in the GHS where these hazard categories compare hazard severity within the hazard class, this is not a comparison of hazard categories |
| Hazard pictogram | Graphical composition, including a symbol plus graphical elements such as border, background pattern or colour that is intended to convey specific |

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| | information, that is assigned in the GHS to a hazard class or hazard category |
| Hazard statement | A statement assigned in GHS to a hazard class or hazard category describing the nature of the hazards of the pesticides, including degree of hazard if appropriate |
| Hazardous chemical waste | Hazardous chemical waste is defined as a chemicals/pesticides that pose a hazard to human health or the environment when improperly managed. |
| Hierarchy of Control | The hierarchy of control is a system for controlling risks that pesticides pose. The hierarchy of control is a step-by-step approach to eliminating or reducing risks and it ranks risk controls from the highest level of protection and reliability through to the lowest and least reliable protection. |
| Highly hazardous Pesticide | HHP's are pesticides that are acknowledged to present particularly high levels of acute or chronic hazards to health or environment according to internationally accepted classification systems such as WHO or Global Harmonized System (GHS) |
| Integrated Pest Management | IPM is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and nontarget organisms, and the environment |
| Medical surveillance | A planned programme or periodic examination, which may include clinical examinations, biological monitoring or medical tests of employees by an occupational health practitioner or in prescribed cases, by an occupational medicine practitioner. |
| monitoring | Planning, carrying out and recording results of a measurement programme |
| OEL | Occupational exposure limit is the limit value set by the Minister, which represents the airborne concentration of a pesticide, where the exposure standard can be, a) an eight-hour time-weighted average, b) a ceiling limit, c) a short-term exposure limit |
| Obsolete pesticide | Obsolete pesticides are defined by the FAO as stockpiled pesticides that can no longer be used for their original purpose or any other purpose and therefore require proper disposal. |
| Persistent Organic Pollutants | Persistent organic pollutants (POPs) are toxic chemicals that adversely affect human health and the environment around the world. |
| Pesticide Lifecyle Management | Pesticide lifecycle management encompasses a range of elements from legislation, regulation, manufacturing, application, risk reduction, monitoring, and enforcement to disposal of pesticide waste. |
| Precautionary principle | Essentially the precautionary principle directs that action be taken to reduce risk from pesticides in the face of uncertain but suggestive evidence of harm |
| Precautionary statement | A phrase prescribed by GHS that describes recommended measures that should be taken to minimise or prevent adverse effects resulting from exposure to pesticides or improper handing or storage or pesticides |
| Prior informed consent procedure | The Prior Informed Consent (PIC) procedure is a means of sharing information globally regarding certain chemicals and pesticides that have |

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| | been considered hazardous to human health and/or the environment by the Conference of the Parties. |
| Risk assessment | A programme to determine any risk from exposure to a pesticide and the steps taken to remove, reduce control or mitigate suck risks posed by sais pesticide |
| Safety data sheet | SDS, a document that is aligned to the GHS providing information on hazard classification, properties of pesticides, procedures for handling and working with pesticides in a safe manner and the ecotoxicity information on pesticides and emergency information and numbers for accidental spillages |
| sensitizer | A pesticide that causes people to develop allergic skin reactions in normal tissue after repeated exposure, includes dermal and respiratory sensitizers |
| signal word | The word 'danger' or 'warning' used on GHS labels to indicate to the reader the potential hazard as well as the potential severity |
| Toxicity rating | The quality of being poisonous, especially the degree of virulence of a toxic microbe or of a poison. |
| Waste management Programme (WMP) | A WMP prescribes measures for the collection, temporary storage and safe disposal of the waste streams associated with the project and includes provisions for the recovery, re-use and recycling of waste |

## LIST OF RELEVANT LEGISLATION

National Water Act, 1998 (Act 36 of 1998)

National Forest Act, 1998 (Act 84 of 1998)

National Environmental Management Act, 1998 (Act 107 of 1998)

National Environmental Management Act, 1998 (Act 107 of 1998): *Regulations to domesticate the requirements of the Rotterdam Convention on the prior informed consent procedure to certain hazardous chemicals and pesticides in International Trade, 2021, published as Government Notice No. 413 of 12 May 2021*

National Environmental: Waste Act, 2014 (Act 26 of 2014)

Occupationall Health and Safety Act, 1993 (Act 85 of 1993)

Occupational Health and Safety Act, 1993 (Act 85 of 1993): *Hazardous Chemical Agent Regulations, 2021, published as Government Notice No. R280 of 29 March 2021*

Farm Feeds, Fertilizers, Agricultural Remedies and Stock remedies Act, 1947 (Act 36 of 1947)

National Aviation Act. 1962 (Act 74 of 1962)

SABS 072: (The Code of Practise for the Safe Handling of Pesticides)

SANS 10228:2010 (The Code of Practise for the Identification and Classification of Dangerous Goods for transport)

SANS 10118:2011 Edition 3.01: The Aerial Application of Pesticides.

SANS 10206:2010 The handling, storage and disposal of Pesticides.

OHSAS 45001:2016: Health and Safety Management Component (Clause 8.1)

## PURPOSE:

To provide guidelines and practical advice to departmental staff and service providers on current pesticides available, international obligations and biomonitoring requirements with regards to using some pesticides that have health impacts and mitigation measures for these.

## APPLICATION:

The EP Pesticide Policy will apply to all persons who use pesticides to carry out work for the Department as part of their work as an employee or Service Provider either directly or as a contractor or subcontractor.

## INTRODUCTION:

The EP Pesticide Policy complies with all international conventions on pesticide management such as the Stockholm convention[1], Rotterdam convention[2], Basel convention[3] and Bamako[4] convention.

The Stockholm convention deals with persistent organic pollutants such as the dirty dozen that have been banned internationally due to their impacts on human health and these have all been removed from the EP pesticide policy as the EP pesticide policy follows the precautionary principle of the Hierarchy of Control in the Code of Conduct of Pesticide Management[5] which eliminates and substitutes all highly hazardous pesticides (HHP's) as the first stage of mitigation for protection of human health and the environment.

The Rotterdam convention deals with Prior Informed Consent (PIC) pesticides through Annexure III where all pesticides listed under Annexure III have been banned thus their import into the receiving country has to be approved by the receiving country and be reported to the Rotterdam secretariat and all conditions regarding their import needs to be met. Paraquat has currently been listed under Annexure III and thus removed from the EP policy due to the Precautionary Principle adopted.

The Basel Convention deals with trans boundary movement of hazardous chemical wastes, disposal of empty pesticide containers, obsolete pesticide disposal and pesticide container management.

The Bamako Convention is specific to Africa and is related to the Basel Convention regarding all the categories listed above and includes the banning of pesticides being imported into Africa that are close to their expiry date making Africa a dumping ground for near expired pesticides. Both of these conventions are critical for implementation in the EP Pesticides Policy for implementation of the container management programme for empty pesticide containers.

The EP Pesticide Policy aims to implement pesticide lifecycle management by implementing all the stages the pesticide might pass through from when the pesticide is procured to its degradation in the environment after use, or its destruction as an unused or obsolete product. For the purposes or this

policy, the life cycle includes procurement, distribution, storage, transport, use and final disposal or the pesticide product and/or its container[5].

**The Service Provider is responsible for the procuring pesticides and may make use of the RT12 (Transversal Contract by national Treasury) to procure pesticides as the same price as government, providing that National Treasury approval is in place and that the pesticides are only used for this Project. The Service Provider is required to Comply to the Departments EP Pesticide Policy. The Department shall, whenever requested by the Service Provider, facilitate the process of obtaining approval from National Treasury for the Service Provider to use RT12 (Transversal Contract by National Treasury) to procure pesticides at the same price as government. The Service Provider will not only be responsible for procuring pesticides but also to implement, manage, store, handle, transport and dispose of the empty pesticide containers and obsolete pesticides in line with the EP Pesticide Policy implementing responsible container management programmes and adopting responsible pesticide lifecycle management.**

## OBJECTIVES FOR THE USE OF PESTICIDES FOR INVASIVE ALIEN SPECIES CONTROL

1. To implement a long-term strategy for the initial and long-term control of invasive alien species.
2. To ensure the safety of operators involved in the control operations and public in the operational area in compliance with the EP biomonitoring protocols[6]for pesticides in hazard groups 1-6 and 9 & 10 (Annexure 1), Regulations for Hazardous Chemicals Agents[7] and Guidelines for Personal Protection when handling and Applying Pesticides[8].
3. To ensure that there is minimal environmental impact in the short-term and that there are no long-term adverse effects on the environment resulting from the application of pesticides, to humans and the environment, environmental risk assessments are required for pesticides in hazard groups 7 and 8[6] (Annexure 1).
4. To ensure that the application takes place in the most cost effective way within objectives 2 and 3, taking the recommendations into account as listed in the **WFW Species and Pesticide list** spreadsheet that accompanies this policy.
5. To attain these objectives DFFE EP management shall be responsible for:
   5.1 Determining areas and species to be controlled and setting priorities.
   5.2 Deciding upon appropriate methods of pesticide and biopesticide control.
   5.3 Drawing up short and long-term control programmes.
   5.4 Selection of suitable pesticides and biopesticides.
6. Establishing training requirements for EP personnel and contractors and ensuring that the training takes place
7. Costing control programmes.
8. Sourcing suitable pesticide and biopesticide equipment suppliers and obtaining product and equipment at the best prices. Ensuring compliance to government transversal contracts, such as RT 12.
9. Ensuring that pesticide applications take place within all relevant legislation, including international legislation and conventions.
10. Ensuring proper medicals, biomonitoring and medical surveillance is done on all pesticide operators and staff exposed to pesticides in compliance to legislative requirements[6,7,9].

## METHODS OF CONTROL

### A. Invasive Alien Plants

1. Selection of appropriate methods of control shall be based on the following criteria:
    - Species to be controlled
    - Size of target plants
    - Density of stand
    - Accessibility of terrain
    - Environmental safety
    - Disposal of dead vegetation

1.1 Species to be controlled.

1.1.1 Pesticides selected for control shall be registered for use on that species under the conditions specified under Act 36, the label and minor use registrations.

1.1.2 Selection should be based on the WfW species and pesticide spreadsheet, Croplife suggestions, minor use registrations, labels and information brochures issued by suppliers.

1.2 Size of plants.

The following methods of control are appropriate for age or size target plants:

1.2.1 Seedlings.

1.2.1.1 *Hand pulling or hoeing*. Hand pulling should be carried out in sparse stands under conditions where seedlings are easily removed from the soil. Operators should be supplied with suitable gloves or other hand protection[6]. Hoeing is also most suited to sparse stands. Seedlings should be severed below the soil surface or removed from the soil. Soil disturbance should be minimized to reduce re-germination.

1.2.1.2 *Foliar applications of pesticides/ biopesticides* can be carried out in dense stands or open stands. For dense stands suitable fan nozzles for overall application should be fitted. Sprayers should be fitted with pressure or flow regulators. In stands where individual plants are treated solid cone nozzles should be fitted. This is the same for biopesticide applications, except the carrier is a medium grade mineral oil such as canola oil.

1.2.2 Saplings.

1.2.2.1 *Hand pulling, hoeing or brashing*. Where appropriate hand pulling or hoeing should be carried out as recommended for seedlings. Brashing is recommended for Eucalyptus species seedlings. Brashing is done using a hand saw or hatchet. The programme does not currently use this method.

1.2.2.2 *Foliar sprays*. Overall application or individual plant spraying can be carried out, depending on the density of the stand. Fan nozzles should be fitted for overall spraying and solid cone nozzles for individual plant treatment. Pressure or flow regulators should be fitted to sprayers for overall application Spraying should be restricted to plants waist height or lower, but ensure there is sufficient foliage to carry the applied pesticide to the root system. Foliar applications should not be done with volatizing pesticides due to human health inhalation risk being too high to mitigate[9], alternative methods should be implemented here.

1.2.2.3 *Basal stem treatments*. Applications using pesticides registered for this method that DO NOT use diesel as a carrier are allowed (such as Turbador). No diesel applications allowed due to environmental risks. Stems with a diameter up to 50 mm should be treated to a height of 250 mm and stems above 50mm diameters to a height of 500 mm. This method is only suitable for stems up to 100 mm in diameter with smooth live bark. Application is by means of a low pressure coarse droplet spray from a narrow angle, solid cone nozzle.

1.2.2.4 *Cut stump treatments*. Stems should be cut as low as practical as stipulated on the label and in the EP best practices guidelines. Pesticides are applied in water as recommended for the pesticide. No diesel applications are allowed. The gel applications need to be painted on the whole cut surface and should be 10mm in thickness. Biopesticides can be applied using the same method as for pesticides, but in canola oil as the carrier.

1.2.2.5 *Mature trees*. These should be regarded as trees above shoulder height or robust bushes 12-18 months or older.

1.2.2.6.1 *Strip barking*. Bark must be removed from approximately waist height to the bottom of the stem. All bark must be removed to below ground level for good results. Where clean de-barking is not possible due to crevices in the stem or where exposed roots are present, a combination of bark removal and basal stem treatments should be carried out. Handsaws (such as silky zubats) or hatchets (silky nata hatchets) should be used for de-barking.

1.2.2.6.2 *Ring barking*. A band of bark is removed around the stem, 10cm wide and situated as close to the ground as possible. Ensure all bark, phloem and cambium tissue is removed within the band.

1.2.2.6.3 *Frilling or partial frilling*. Cuts should be made through the bark into the sapwood by means of a bush knife or light axe and a suitable pesticide applied into the cuts. In a full frill the cuts join or overlap along the circumference of the stem. This is the standard method for most species to be frilled. A partial frill has cuts spaced along the stem circumference and is only used where a pesticide is very effective on a particular species.

1.2.2.6.4 *Stem injection*. Pesticide solutions are applied directly into pre-mad

holes in the stem and cladodes of certain cactus species using a sheep dose applicator. This application method is only used on rare occasions when biocontrol is not available for the species as biocontrol is the preferred method.

1.2.2.11 *Soil application*. Pesticide granules are applied directly to the soil under the trees in the dosage rates stipulated on the label. This method is mostly used for bush encroachers. Care must be taken when applying and the application must be timed with the rainfall. Risk assessments must be done for all soil applications as all the soil application pesticides fall within hazard criterion 7 and 8 (Annexure 1).

1.3 Density of stands.

1.3.1 Overall applications can be made to dense stands of seedlings or saplings. Where other desirable vegetation is present (e.g. grass cover), selective pesticides that will not damage the grass or other desirable vegetation cover should be applied. Fan nozzles and pressure regulators should be fitted to sprayers. The non-target species kill rate and acceptable non target criteria must be agreed to prior to application. Aerial applications with biopesticides can also be used. Risk assessments must be done to determine the acceptable non target criteria.

1.3.2 Where dense stands of big trees, resulting in a large bio-mass, treatment of standing trees may be appropriate to obviate the problem of disposing of felled trees. Where there is a danger of dead trees falling into water courses they should be cut down and removed and the stumps treated with a suitable pesticide. Risk assessments must be done if there is a risk to riparian areas and a rehabilitation plan be put into place to mitigate these risks.

1.4 Accessibility of terrain.

1.4.1 In inaccessible areas such as mountainous areas or where no access roads exist, methods of control where a minimum amount of transportation of equipment and pesticide is involved should be given preference. Appropriate gel applied pesticides should be considered or nomix products.

1.5 Environmental considerations.

1.5.1 Protection of the environment is of prime importance. Riparian areas, where most alien vegetation infestations occur, require a particularly careful approach. Only pesticides that are approved for use in riparian areas should be used. Only aquatic safe products that are polyethoxylated tallow amine free can be used in riparian and aquatic systems. Consult the technical manager for these products. Washing of equipment or disposal of waste spray mixture or washings is prohibited in or near water courses where contamination of water can occur, including aquifer or ground water contamination[5-9].

1.6 Desirable vegetation.

1.6.1 Where desirable vegetation is present, e.g. grass cover in pastures or the margins of forests, methods of control must be selected that will cause minimum damage to the desirable vegetation. Alternative methods to foliar spraying should be adopted where there is a danger of damage to adjacent desirable plants occurring. The non-target species kill rate must also be determined prior to the control after a risk assessment (ESRA) is done.

1.7 Disposal of vegetation.

1.7.1 Where possible utilizable wood should be removed after felling from properly stacked and piled wood sources. Brush piles in certain environmental conditions is not ideal, and in these situations, the brush/cut biomass should be removed or spread out over the entire area to minimise the risks.

1.7.2 Brushwood is often burned on purpose or accidentally. If burning is planned, brushwood should be spread out rather than stacked to limit soil damage as intense fires result in stacked brushwood destroying soil structure and preventing grass establishment for many years.

1.7.3 If there is a danger of damaging fires, unusable trees should be left standing as this will result in a less intense fire. This can only be done for wood in landscape areas.

1.7.4 Felled trees or trees in danger of falling in water courses should be removed so that they do not cause blockages with resulting problems of flooding and damage to infrastructure such as roads and fences. The felled trees should not be stacked within 20m of the riverbank/shore to comply with the National Water Act.

## B. Non Plant Invasives

1. Selection of appropriate methods of control shall be based on the following criteria:
   - Priority species
   - Availability of best practise
   - Availability of registered pesticides
   - Integrated Pest Management Practices

1.1 Priority species

1.1.1 Priority species will be guided by the National Environmental Management: Biodiversity Act, 10 of 2004, Alien and Invasive Species Lists, 2016.

1.1.2 Priority species will be divided into categories as listed in the AIS lists as follows;

1.1.2.1 List 1: National list of Invasive Terrestrial and Freshwater Plant Species

1.1.2.2 List 2: National list of Invasive Marine Plant Species

1.1.2.3 List 3: National list of Invasive Mammal Species
1.1.2.4 List 4: National list of Invasive Bird Species
1.1.2.5 List 5: national list of Invasive Reptile Species
1.1.2.6 List 6: National list of Invasive Amphibian Species
1.1.2.7 List 7: National list of Invasive Freshwater Fish species
1.1.2.8 List 8: National list of Invasive Terrestrial Invertebrate Species
1.1.2.9 List 9: National list of Invasive Freshwater Invertebrate Species
1.1.2.10 List 10: National list of Invasive Marine Invertebrate Species
1.1.2.11 List 11: National list of Invasive Microbial Species

1.1.3 At least one species should be selected for control from each list based on their priority within their list and their risk to human health and the environment

1.1.4 Pesticides selected for control of priority species must be registered for use on the selected species under Act 36 of 1947.

1.1.5 Selection should be based on the WfW species and pesticide spreadsheet, Croplife suggestions, minor use registrations, labels and information brochures issued by suppliers.

1.2 Availability of best practise

1.2.1 Best practice methods contains integrated methods with a portion of pesticides in some form, whether by spraying, baiting or treatment of waterbodies with piscicides. Strict guidelines need to be adhered to when implementing these.

1.3 Availability of registered pesticides

1.3.1 Registered pesticides for non-plant programmes are not readily available in South Africa.

1.3.2 There are a variety of rodenticides registered for mice control with varying effectiveness but huge impacts on non-target organisms such as birds as brodifacoum, coumatetralyl and difenacoum are secondary poisoners and anti-coagulants but cholecalciferol is not and should be the preferable product (see WFW species and pesticide spreadsheet).

1.3.3 Avicides are generally used in the form of baiting and there is currently only one avicide registered as a restricted use pesticides for the use on house crows and is held by the City of Cape Town. The health impacts of this avicide is concerning and relates to the operators and the utmost care needs to be taken when applying the bait, thus the EP biomonitoring protocols need to be strictly adhered to[6], as well and the PPE guidelines[14].

1.3.4 Piscicides are generally applied as solutions to waterbodies to control invasive alien fish and once the invasive alien fish have been removed from the system, a solution of potassium permanganate is released into the system to render the piscicide inert. There is currently only one piscicide registered under an emergency registration in South Africa as a restricted use pesticide for the control of invasive alien fish.

1.4 Integrated Pest Management (IPM) Practises

1.4.1 (IPM) in relation to non-plant invasives relates to a combination of control methods utilised to combat these species to reduce the amount of pesticides needed for their management and/or control

1.4.2 Mammals are generally controlled using a combination of trapping and shooting as pesticides are considered inhumane by organizations such as the SPCA

1.4.3 Birds are generally controlled with a combination of trapping using a Judas bird, baiting with pesticide laced bait, and nest destruction and egg removal from nests.

1.4.4 Invertebrates such as invasive wasps are controlled by fumigating their nests

1.4.5 Amphibians are caught and humanely exterminated.

## LONG TERM CONTROL PROGRAMMES

2.1 In areas where after initial control of alien vegetation has taken place and regrowth of the species and/or other undesirable vegetation will occur, the programme should be so structured that a minimum of regrowth will occur and a follow-up programme will be actioned. The following must be taken into consideration:

2.1.1 *Species coppicing*. Many species coppice from cut stumps and/or roots. Cut stumps must be thoroughly treated within 15 minutes of cutting according to label recommendations to minimise regrowth. Root coppice from species such as grey poplar (*Populus canescens)* and silver wattle (*Acacia dealbata)* occurs rapidly and control measures must be undertaken before plants become too large to be controlled with foliar sprays. Coppicing stumps should be treated before coppice reaches head height. Biopesticides should also be considered where practical and available.

2.1.2 *Seedling control*. Germination of Acacia species takes place rapidly after a fire and control measures must be put in place as soon as possible to minimise the quantity of pesticide used and the cost of application. Selective pesticides should be used where there is a danger of damage to grass present. Biopesticides should also be considered.

2.1.3 *Burning*. Burning should be considered part of the control programme to get rid of unwanted brushwood or to stimulate even growth of seedlings so that follow-up control measures are easier.

2.1.4 *Rehabilitation*. Where the danger of erosion exists or where the re-establishment of pastures is desired after clearing, rehabilitation of the area with grasses or other suitable plants should be carried out. The advice of pasture / rehabilitation / ecology experts should be sought in planning this operation. Other erosion control measures such as the building of weirs should be undertaken where necessary.

2.1.5 *Monitoring*. Monitoring of control and/or eradication programmes should be done to ensure extirpation of the invasive alien species from the area/catchment

and reported to DFFE Biosecurity unit for compliance with the NEM:BA AIS regulations promulgated in 2014.

2.1.6 *Data reporting*. All data should be reported to DFFE National Office and kept on file to comply with reporting requirements.

## SELECTION OF PESTICIDES

3.1 Pesticides are selected in accordance with the "WfW species and pesticide spreadsheet" by the Technical unit. The selection of pesticides should be based on the following criteria and any deviation from this point must be approved by the management committee (MANCO). Consult the NRM Technical Advisor.

3.1.1 *State Tender*. Most of the pesticides are found on The State Tender Contract – RT 12. These pesticides must be purchased in accordance with the correct procurement procedures as laid down by the department and National Treasury. The status of the State Tender Contract changes from time to time and it is therefore imperative that the latest version is used. For the latest version please contact your Regional DFFE:NRM Office.

3.1.2 *Efficacy*. Where alternative products are available for the same purpose, advice should be sought on the efficacy of these products under the prevailing application conditions. Biopesticides should be the priority as the environmental impacts are limited after biocontrol.

3.1.3 *Cost*. Where different methods of application exist the cost of application and retreatment, in addition to the cost of the product shall be taken into consideration in deciding on which pesticide to apply. The non-target effects and toxicity to human health and the environment should also be taken into account when deciding on a product. The ecotoxicity and environmental fate for all the pesticides is available in the species and pesticide spreadsheet. Biopesticides should be considered, but biocontrol is the priority if available for the species under investigation.

3.2 Operator safety.

3.2.1 All measures must be taken to ensure the safety of the operators[6,8] and where choices exist preference should be given to the safest product. Check the label colour band.

3.2.2 The following table gives the toxicity rating according to the label colour band according to the WHO Recommended Classification of Pesticides by Hazard[10]:

| | |
|---|---|
| **BLUE** | **SLIGHTLY HAZARDOUS - CAUTION** |
| **YELLOW** | **MODERATELY HAZARDOUS - HARMFUL** |
| **RED** | **TOXIC TO VERY TOXIC** |

The new GHS labelling guidelines indicate that the labels will not have colour bands anymore but will have 6 compulsory label elements as follows[9]:

1. *Signal word*
   Indicates relative level of hazard. ''Danger'' is used for most severe instances while ''Warning'' is less severe.
2. *Symbols* (hazard pictograms)
   Convey health, physical and environmental hazard information with red diamond pictograms. May use a combination of one to five symbols.
3. *Product name or identifiers*
   Identifies the chemical or substance. Should match the product name or identifier used on the SDS.
4. *Hazard statements*
   Phrases that describe the nature of the hazardous products and often the degree of the hazard.
5. *Precautionary statements*
   Phrases associated with each hazard statement that describe general preventative, response, storage or disposal precautions.
6. *Manufacturer Information*
   Company name, address & telephone number




An example of a new GHS pesticide label with the 6 compulsory label elements.

3.2.3 Label recommendations regarding safety must be strictly observed in line with legislation[6-10].

3.3 Environmental safety.

3.3.1 Pesticides that have the least impact on the environment shall be used where no effective biopesticides or biocontrol is available.

3.3.2 Every precaution shall be taken to ensure that these products are safely stored, handled and applied.

3.4 Availability.

3.4.1 Products should be readily available from suppliers in the areas of use to limit quantities stored in line with legislative requirements[3,4].

## TRAINING

All contractors (or one of their employees) who apply pesticide for gain in the EP Programme must attend and pass the approved WfW Limited Pest Control Certified Pesticide Course or its equivalent.
All Project Managers, in order to effectively manage the pesticide operations in their projects, must attend and pass the approved Pest Control Operators Course or its equivalent.
Operating teams shall be trained in the following aspects of pesticide use. Teams must receive training before commencing operations. Training shall be appropriate for the situations where teams will operate and specialized training or teams operating under specialized conditions, e.g. indigenous forests or soil applied pesticides, may be necessary.

4.1 Supervisors. Team supervisors shall receive training in the following:

4.1.1 Pesticide awareness. Basic training on the mode of action of pesticides, safety and human health impacts.

4.1.2 Operator safety. Handling of concentrates and spray mixtures, personal hygiene and protective clothing.

4.1.3 Safe storage of product at depots and operational sites and spray mixtures at operational sites in line with the international conventions and Waste Management Programme[11].

4.1.4 Mixing. Handling of concentrates and mixing techniques and safety procedures.

4.1.5 Safety procedures to be observed during transportation of product, spray mixtures, equipment and personnel in line with legislative requirements[3,4].

4.1.6 Care and maintenance of application equipment, saws etc.

4.1.7 Record keeping in respect of quantities of product/spray mixtures used, area treated, person hours per area/operation, stock control.

4.1.8 Planning. Advanced planning for follow-up operations, transportation, equipment and spares requirements, product procurement and availability. Team management.

4.1.9 First aid. Actions to be taken in case of accidental contamination, suspected and actual poisoning, chronic poisoning, eye contamination and other physical injuries.

4.1.10 Health of operators. Persons unsuitable for use as application operators, e.g. chronically ill, persons with disabilities, pregnant women .Allergic reactions. Wearing of protective apparel. Hygiene[5-9].

4.1.11 Disposal of general waste.

4.1.12 Disposal of pesticide waste, triple rinsing procedures and management of pesticide spillage according to best management practise and Waste Management Programme[3,4,11].

4.1.12 Managing major and minor spills, accident sites.

4.1.13 Calibrating application equipment.

4.1.14 Environmental safety.

4.1.15 Application techniques. Correct application to obtain most cost effective results.

4.1.16 Suitable and unsuitable application conditions.

4.2 Operators. Operators should receive training in the following:

4.2.1 Pesticide awareness - the purpose and functioning of pesticides and the need for correct application.

4.2.2 Pesticide applicator – ensure knowledge of pesticides and human health impacts and environmental impacts.

4.2.3 Safe handling of concentrates and spray mixtures, toxicity of pesticides, protective clothing, safe application, personal hygiene and disposal of waste in line with legislative requirements[6-10].

4.2.4 Application techniques. Correct, thorough application. Preventing waste.

4.2.5 Care of equipment. Cleaning and disposal of washings.

4.4.6 Cleaning of empty containers. Triple rinse procedure and proper disposal of empty containers[3,4,11].

## COSTING OPERATIONS OR PROGRAMMES

5.1 Prior to the commencement of any control operations or programmes an assessment shall be made on the cost, based on the following:

5.1.1 Cost of pesticides and co-formulants.

5.1.2 Quantity, to be based on:

5.1.1.1 Method of application

5.1.1.2 Size and density of target plants.

5.1.1.3 Size and density of the non-plant infestation

5.1.1.3 Dilution rates

5.1.3 Adjuvant/surfactants required.

5.1.4 Personnel costs. Number of person hours per area/operation.

5.1.5 Cost of equipment, spares and maintenance.

5.1.6 Cost of transportation, storage and other incidental costs.

5.2 Follow-up treatments such as seedling and/or coppice control must be similarly costed and built into the total cost of the control operation.

5.3 The cost of the biomonitoring and medical surveillance of spray operators and workers should be built into the overall cost of the control operation.

## PROVISION OF EQUIPMENT

6.1 Application equipment shall be standardised and obtained from approved suppliers.

6.2 Use of the following brand of knapsacks has been approved. CP 3, CP 15, Matabi, Solo, AgrimexA18, Osatu. (On placing an order for knapsacks, ensure the quote includes the approved nozzles and pressure regulator or constant flow valves, and a replacement set.)

6.2.1 Where appropriate sprayers must be fitted with pressure regulators or flow regulators.

6.2.2 Spares must be readily available and spares such as nozzles, plumbers tape, nuts, screws, hose and washers must be carried with teams. Suppliers must be consulted on spares requirements.

6.2.3 The following nozzles or their equivalents shall be used as standard: TG-1, FL-5VS and TF-VS2 or their equivalents.

6.3 The teams should have the necessary tools, e.g. spanners, screwdrivers, pliers, to carry out necessary maintenance and repairs in the field.

6.4 Malfunctioning nozzles should be replaced in the field and no attempt should be made to clean them. Cleaning should be done at the workshop/store using preferably compressed air and water.

6.5 Small hand held sprayers should be standardised on to Polispray or equivalent and Hack-pack applicators.

6.6 Suitable plastic measuring cylinders, beakers and mixing containers must be available and only used for pesticide mixing.

6.7 Containers must always be provided for clean water for personal use.

## STORAGE, HANDLING AND TRANSPORTATION

7.1 Storage.

All storage facilities shall comply with the requirements of Croplife South Africa[11], Regulations for Hazardous Chemical Agents 2021[7], Occupational Health and Safety Act 85 of 1993, FAO Pesticide Storage and Stock Control Manual[12] and the FAO Guidelines for retail distribution of Pesticides with particular Reference to Storage and Handling at the Point of Supply to Users in Developing Countries[13]. These can be summarised as follows:

7.2 Isolation.

Where possible, a store should preferably be a separate building and should not be sited near a dwelling house, hospitals, schools, shops, food markets, livestock buildings or where fodder, fuel or other flammable materials are stored[12]. A minimum of five meters between the store and the other buildings is recommended. If part of a complex, the store must be totally sealed off from the rest of the complex, i.e. no free movement of air between the storage area and the rest of the complex. **The store should be far away from watercourses, wells and other supplies of water for domestic and stock animal use that could be contaminated by spillages or leaks from the store[12,13]. The site should not be in an area with high groundwater levels which may be subject to seasonal flooding nor adjacent to areas subject to seasonal flooding.**

7.3 Accessibility.

When planning a store bear in mind the ease of access for delivery or dispatch. Also consider the possibility of a fire and the need to be able to approach the building from all sides. There should be easy access for pesticide delivery vehicles. There should be access on at least three sides of the building for fire-fighting vehicles and equipment in an event of an emergency.

7.4 Construction.

7.4.1 Floor.

Earth, timber, bitumen, PVC or linoleum, coarse unscreened or disintegrating concrete is not acceptable. The floor should be made of impervious material or of slats over a concrete-lined sump into which chemical spills can drain to be neutralised. The floor area should be slightly raised at the edges to prevent spills from leaking out of the building and flood water from getting in[12]. Another option is smooth screeded concrete, however sealed, steel container floors are also acceptable. The doorway should be bunded to a minimum height of 200 mm and this, as well as all wall to floor joints, should be made watertight. The purpose of the bund is to contain spills or fire water which could cause damage to the environment and prevent water (e.g. flood run-off) entering the store.

7.4.2 Walls.

Walls should preferably be brick or concrete block with airbricks or vents 200 mm from the floor and near or at roof level. Containers are acceptable if there is adequate ventilation 200 mm from floor level and near roof level. The container should where possible be placed in a shaded area. If this is not possible ensure good permanent ventilation. The store walls should have outside sills that drain spilled chemicals into a sump. Internal walls should be smooth and free from cracks and ledges to allow for easy cleaning[12]. There should be walls between sections to act as fire breaks.

7.4.3 Roof.

The roof should be constructed of a light material, possibly glass fibre or asbestos substitute which collapses in an event of a fore to allow smoke and fumes to get out and avoid explosions. The material should be firm however so that it is not blown away during severe wind or storms. The roof should be leak-free and have some form of insulation to maintain temperatures at a reasonable level. Vent in the roof will allow for the escape of hot air during the summer months.

7.4.4 Doors.

Steel doors with an effective locking system are preferred. A wooden door should have a security gate to reduce the risk of forced entry. Containers with fitted security gates can be left open to cool the contents during the heat of the day .Only authorized personnel should have access to keys and be allowed in the store. There should be an emergency exit in addition to the entry and exit doors, preferably at the other end of the store.

7.4.5 Windows.

It is important to note that windows should not be built into a store it there are alternative means of ventilation and lighting; otherwise they should be shaded (or

prevent sunlight from heating the pesticides causing them to degrade and/or volatise) and barred or burglar bars installed to prevent unauthorised entry[12].

7.4.6 Lighting.

There should be sufficient lighting (200 lux) to allow for reading of product labels. If electric lighting is required it must be secure in order to reduce fire risk. Electric fittings should be mineral insulated or armoured cable should be used with flame/dust-proof fittings[12]. The mains control should be outside the store itself.

7.4.7 Sanitation.

Staff should have immediate access to washing facilities with running water, soap and towels. They should be encouraged to use it frequently. An eye wash bottle or similar object must be available at all times for the flushing of contamination from the eyes should it occur. A shower facility is recommended.

7.4.8 *Ventilation*

Ventilation if one of the most important requirements within the store as it prevents the build-up of vapours. Toxic vapours may affect the health of the store workers and flammable vapours are a fire risk. Ventilation also keeps the store as cool as possible. This is important as pesticides deteriorate more slowly and therefore last longer in a cooler environment. Many pesticides are destabilised by high temperatures, which in exceptional cases may even case explosions. The ventilation area should be equivalent to 1/150 of the floor area, or outside doors should be open for at least six hours per week. Exhaust fans should be fitted to large stores, preferably on a time-delay switch. Roof- and floor-level ventilation is required to extract light fumes, hot air and heavy vapours[12].

7.5 Equipment.

7.5.1 Equip the room with a table of suitable strength and height to facilitate reading of labels, decanting and measuring out of Pesticides.

7.5.2 Measuring jugs, funnels, pumps and buckets must be kept on hand and kept specifically for the purpose of measuring out Pesticides. Do not use household items for this purpose.

7.5.3 For the sake of good housekeeping, have on hand a broom, spade and a supply of dry fine soil as absorbent material to contain and absorb spills (spill kit). This is available in “kit form” from a number of suppliers.

7.6 Handling.

7.6.1 The handling of pesticides concentrates requires strict precautions and personnel handling product concentrates must be fully aware of precautions to be observed.

7.6.2 Suitable protective clothing must be available and use thereof is compulsory.

7.6.2.1 Chemical resistant plastic aprons, butile rubber gloves or chemical resistant nitrile gloves and eye protection and half-face respirator must be worn when handling concentrates[6,8,14].

7.6.3 Adequate hygiene aids such as plentiful water, soap, towels and eye wash must be readily available.

7.6.4 Suitable absorbent material such as fine dry soil and cleaning equipment must be available to handle accidental spillage, including hazardous materials spill kits[12,13].

7.6.5 In the case of spillage, the spill must be contained immediately and cleaned up with absorbent material such as fine dry soil and the relevant spill kit. The contaminated material should then be disposed of according to the guidelines[7,12,13].

7.6.6 Concentrates should if possible be decanted in a safe, suitable place and not in the field. Such a handling and mixing area should have a hard impermeable floor, be bunded and have an adequate sump to accommodate run-off from washing, flooding or fire containment. A $1m^3$sump /$10m^2$floor space is recommended.

7.6.7 Concentrates and mixtures should never be decanted into or be mixed in drinking bottles or other food containers.

7.6.8 Suitable equipment must be available to prepare spray mixtures. These include plastic measuring cylinders and beakers, mixing containers (buckets) and funnels.

7.7 In the field the following must be observed:

7.7.1 If concentrates must be handled in the field, observe the precautions listed under 7.6.1, 7.6.2, 7.6.3, 7.6.4, 7.6.5, 7.6.6, 7.6.7 and 7.6.8

7.7.2 Spray mixtures must be kept in leak-proof, non-spill containers. The containers should be kept away from personal belongings, foodstuff, drinking water and eating and living areas.

7.7.3 Containers should stand on suitable absorbent material, for example, a large piece of thick hessian sack, which will absorb minor drips, out of direct sunlight in a cool place.

7.7.4 Containers must be kept at least 20m away from water bodies to prevent possible contamination.

7.7.5 Filling sites should be selected to prevent damage to desirable vegetation and to enable spillage to be cleaned up and disposed of.

7.7.6 Spray mixture containers must be clearly labelled and only reused for the specific pesticide.

7.7.7 Application equipment and containers should not be cleaned on site but at a suitable designated area at the store.

7.7.8 Suitable protective clothing, overalls, rubber boots, gloves and eye protection must be worn by operators when handling and applying Pesticides[6,8,14].

7.8 Transportation[5,7].

7.8.1 Pesticides and application equipment must be carried on a separate vehicle or in a part of the vehicle isolated from people, food and clothing.

7.8.2 Vehicles should carry absorbent material to absorb any spillage.

7.8.3 Pesticides and equipment must be secured to prevent spillage and damage.

7.8.4 Pesticides, spray mixtures and equipment must not be left unattended where there is a danger of theft or abuse.

7.8.5 Pesticides should not be left uncovered in the sun but in shaded areas and covered.

7.9 Disposal[11,12,13,15].

7.9.1 A designated officer should be responsible to ensure that pesticide containers are correctly and safely disposed of, according to Croplife guidelines.

7.9.2 Empty containers must be triple rinsed and disposed of after use and not be used for any other purpose. Under no circumstances may containers be taken home for personal use.

7.9.3 Empty containers should be returned to the store for safe keeping and disposal under the Waste Management Programme.

7.9.4 Where arrangements have been made containers should be returned to the supplier.

7.9.5 Containers that have to be destroyed should be triple rinsed, punctured and flattened. See attached pamphlets for details of triple rinsing and details of accredited suppliers in the Waste Management Programme for collection of empty containers.

7.9.5 Only sufficient spray mixture that can be used in a day should be prepared. Left- over material should be returned to the depot for safe storage and re-use in the spray mixture the following day.

7.9.6 Certain spray mixtures should not be left standing overnight and should be safely disposed of. Consult the product label. If mixtures can be left overnight with no adverse effects, they should be kept to reduce costs and pollution from pesticide and wash water.

## PUBLIC SAFETY

8.1 Due regard must be paid at all times to the health and safety of the public.

8.2 Public should be kept out of operational areas where any hazards exist. Warning notices should be displayed to this effect where necessary.

8.3 Pesticides must only be applied strictly according to label recommendations.

8.4 Product and spray mixtures should be stored so that they are inaccessible to the public.

8.5 Treatment of areas within 50 m of habitations, schools, hospitals and public areas (e.g. parks) should be avoided or only carried out in consultation with the parties effected.

8.6 Public should be informed of control operations in their area by means of verbal communication, notices, pamphlets, the press etc prior to the commencement of spray operations.

## ENVIRONMENTAL SAFETY

Most alien vegetation control operations are carried out in riparian situations which are regarded as environmentally sensitive. Non-plant control operations need to follow the same instructions in order to minimize the impact of the operation on the natural environment the following must be observed.

9.1 Area contamination must be minimised by careful accurate application with a minimum amount of pesticide to achieve good control.

9.2 All care must be taken to prevent contamination of any water bodies. This includes due care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures.

9.3 Equipment should be washed where there is no danger of contaminating water sources and washings used in the next spray mix.

9.4 To avoid damage to indigenous or other desirable vegetation product should be selected that will have the least effect on non-target vegetation.

9.4.1 Coarse droplet nozzles should be fitted to avoid drift onto neighbouring vegetation, e.g. TG-1 or equivalent.

9.5 Only polyethoxylated tallow amine free, or aquatic safe herbicide formulations should be used in the riparian and aquatic environments so as to limit the impact on aquatic invertebrates.

## APPLICATION

10.1 Equipment.

Only application equipment and accessories specified (see PROVISION OF EQUIPMENT) shall be used by operating teams.

10.1.1 Equipment shall be inspected regularly between and during applications and necessary repairs carried out[12].

10.1.2 Leaking sprayers or sprayers not applying correctly should be withdrawn until repairs have been carried out. Spare applicators and parts should always be available so as not to impede operations[12,13].

10.1.3 Ensure that correct nozzles are fitted and pressure settings are checked regularly.

10.1.4 Where possible use low water volumes to keep turn around (refilling) time down to a minimum. Caution must be observed to limit drift when using minimum output nozzles[12].

10.1.5 Always ensure that knapsacks are filled to 70% capacity. In aquatic programmes, never fill the knapsacks more than 50% to increase buoyancy of the sprayer in aquatic environments.

10.1.6 Equipment must be emptied and cleaned thoroughly after spraying ceases. Spray mixture must not be left in the apparatus overnight.

10.1.7 Apparatus should be stored under lock and key when not in use.

10.2 Rates of Application.

10.2.1 Products shall be mixed and applied at rates recommended on the label. This shall not be deviated from without consultation with Working for Water Technical Advisor and suppliers.

10.2.2 Applications should be checked regularly to ensure that they comply with recommendations.

10.3 Precautions.

10.3.1 Appropriate protective clothing must be changed and washed regularly and should be removed immediately if contaminated[6-9].

10.3.2 Spillage must be attended to immediately and appropriately disposed of[3,4,7,1,12,13].

10.3.3 Application teams must be trained to avoid damage to non-target species.

10.3.4 Contamination of all water bodies must be strictly avoided.

10.3.5 Hygiene aids - clean water, soap, towels and eye wash must always be available to spray operators.

10.4 Adjuvants.

10.4.1 Where recommended adjuvants (wetting and spreading agents) should be added to spray mixtures. Adjuvants should always be mixed in accordance with label recommendations. Recommended adjuvant must be used as stipulated on the pesticide label.

10.4.2 Dye must be added to all applications where the product has no built in dye to ensure that no target species are missed and plants are correctly treated.

10.4.3 In areas where alkaline water is used for spraying the use of a buffering agent may be necessary. Consult the product label. Buffers should always be added to the water before the herbicide.

10.4.4 In sensitive areas where drift must be controlled, the use of drift control agents may be necessary. Seek expert advice on the use of these agents.

10.5 Water Sources.

10.5.1 Only clean water may be used for spray mixtures.

10.5.2 Where particulate matter occurs in water, e.g. water drawn from rivers, the water must be filtered to avoid nozzle blockages.

10.5.3 Funnels with filters should be used for filling or filters should be fitted in the application equipment.

10.5.4 Where large volumes of water are transported, tankers or tanks should be fitted with buffer plates particularly where operating in rough terrain.

10.5.5 The product label should be consulted regarding the quality of water suitable for the specific pesticide.

## WEATHER CONDITIONS

11.1 Applications should not be carried out under unfavourable weather conditions that could affect the control obtained or endanger nearby desirable vegetation, water bodies or personnel.

11.2 Label recommendations regarding suitable application conditions must be followed.

11.3 The following conditions must be taken into consideration, depending on the method of application.

11.3.1 Application to wet or dew covered plants.

11.3.2 Imminent rain, moist or humid conditions.

11.3.3 Wind conditions <15km/h

11.3.4 Hot, dry conditions and volatility of active ingredients under high temperatures

11.4 Conditions of target plants.

11.4.1 Poor results may result if target plants are not in a suitable condition for treatment. The following conditions may result in poor control.

11.4.1.1 Water stressed plants.

11.4.1.2 Water logged plants.

11.4.1.3 Dormant plants.

11.5 Seasonal variability. Some non-plant invasive species do not feed on bait in some seasons due to high availability of food.

## MIXING PESTICIDES

12.1 Mixing must take place according to label instructions.

12.2 Suitable protective clothing must be worn when handling pesticide concentrates[8,14].

12.3 Liquid pesticide concentrates should be added to the half full tank of water which is then topped up with water.

12.4 Adjuvants should be added to the tank as per the label instruction prior to the addition of the pesticide when buffering and afterwards for adjuvants and dyes.

12.5 Do not mix pesticide concentrates together before adding them to the tank. Consult product labels.

12.6 Proper mixing in knapsacks and hand held applicators is difficult and spray mixtures should be mixed in bulk containers or if necessary (e.g. wettable powders) buckets before pouring into the knapsacks or hand held applicators.

12.7 Spray mixtures should be agitated continuously as recommended. This is essential after they have been standing for a while.

## CALIBRATION

13.1 Application equipment must be correctly calibrated to obtain optimum results and prevent wastage through over-application.

13.2 Calibration should be carried out in the area to be treated.

13.3 Calibration should be checked frequently during application. The following should be checked:

13.3.1 Correct spray pressure.

13.3.2 Correct nozzle size and spray pattern.

13.3.3 Correct nozzle output.

13.3.4 Volume of application over a specific area.

## ESTIMATED VOLUMES OF PRODUCT PER HECTARE

THIS IS FOR PLANNING PURPOSES AND TO BE USED, AS A GUIDE TO CALCULATE THE REQUIRED HERBICIDE NEEDED TO TREAT THE INTENDED AREA. (THIS IS NOT FOR CALIBRATION PURPOSES.)
AS THERE IS NO OR LITTLE DIFFERENCE IN HERBICIDE USE FOR A CLOSED OR DENSE STAND, THE VOLUMES PER HECTARE ARE GIVEN FOR A DENSE / CLOSED STAND OF THE SPECIFIC SPECIES. FOR LOWER INFESTATIONS, VOLUMES SHOULD BE REDUCED ACCORDINGLY.
THE % FIGURE OF THE DENSE/CLOSED APPLICATION RATE FOR THE LOWER INFESTATION GROUPS IS CALCULATED AT THE MID POINT OF THE DESITY RANGE. IE MEDIUM, 25% TO 50% THE MID POINT IS 37.5%
THEREFORE IF THE RECOMMENDED RATE IS 6 LITRES OF A SPECIFIC PRODUCT PER HECTARE, THE RATE FOR A MEDIUM DENSITY WILL BE 37.5% OF THE 6 LITRES. THIS WILL BE EQUAL TO 2.25 LITRES PER HECTARE.

| | | |
|---|---|---|
| DENSE | = | 75 % OF CLOSED |
| MEDIUM | = | 40 % OF CLOSED |
| SCATTERED | = | 15 % OF CLOSED |
| VERY SCATTERED | = | 3 % OF CLOSED |
| OCCASIONAL | = | 1 % OF CLOSED |
| RARE | = | 1 % OF CLOSED |

- **FOR WATER BASED APPLICATIONS, A SUITABLE ADJUVANT (WETTER) SHOULD BE ADDED WHERE RECOMMENDED ON THE LABEL. THE WETTER QUANTITIES CAN BE CALCULATED AS A RATIO (%) OF THE HERBICIDE QUANTITY, AS THE LABEL PRESCRIBES. E.G. IF HERBICIDE IS 1% MIX AND WETTER IS 0.1%, HALF THE HERBICIDE QUANTITY IS THE WETTER QUANTITY. OR IT CAN BE CALCULATED AS % WETTER REQUIRED X TOTAL MIXTURE TO BE APPLIED / HA = Lt (0.1% X 300Lt =1.5Lt)**

  **RATE PER HECTARE FOR DENSE / CLOSED STAND – 1.75 l / ha**

## HERBICIDE DOSAGE AND LITRES PER HECTARE SUMMARY

The list of PESTICIDES, BIOCONTROL and BIOPESTICIDES are available in the WfW species and herbicide spreadsheet obtainable from the Technical Manager. Please ensure that you have the latest version. The following page contains a table of active ingredients and a list of some brand names that can be used. For more examples please consult the “Master species and herbicides spreadsheet” issued by the Technical Unit. This guide is updated from time to time, as new pesticides are being developed and registered as an ongoing process.

However before choosing other products please consult the National Office Technical Advisor. *The * indicates the Biopesticides available*.

**Table 1: Herbicide Table**

| **Active ingredients** | **Trade names** | **Restrictions** | **Comments** | **Hazard criteria** |
|---|---|---|---|---|
| *Cylindrobasidium leave** | Stumpout | None | Only registered for *A. Cyclops, A. mearnsii, A. dealbata, A. decurrans. A. melanoxylon, A. pycnantha* | None |
| *Colletrotrichum acutatum** | Hakea gummosis | Grahamstown hakea resistant to pathogen | Only used on *Hakea sericea*, *H. drupacea* and *H. sericifolia*<br>Effective on all growth stages | None |
| *Puccinia eupatori** | Leaf pathogen | | Only for *C. macrocephalum* | None |
| *Uromycladium tepperianum** | Rust fungus | | Only for *A. saligna* | None |
| *Cercospora rodmannii** | | | Only for *E. crassipes* | None |
| *Mycovellociella lantanae** | Leaf pathogen | | Only for *L. camara* | None |
| *Pasalora agaritinae** | Leaf pathogen | | Only for *A. adenophera* | None |
| *Entyloma ageratinae** | Leaf pathogen | | Only for *A. riparia* | None |
| *Puccinia abrupt** | Leaf pathogen | | Only for *P. hysterophorus* | None |
| *Puccinia xanthii** | Leaf pathogen | | Only for *P. hysterophorus* | None |

| **Active ingredients** | **Trade names** | **Restrictions** | **Comments** | **Hazard criteria** |
|---|---|---|---|---|
| *Prospodium transformans** | Leaf pathogen | | Only for *T. sans* | None |
| Triclopyr 270 g/L + Clopyralid 90g/L | Confront<br>Astra | Eye irritant, skin irritant<br>Don't use in aquatic environments | | 2- acute toxicity to mammals and birds<br>GHS 07 WARNING<br>  <br>5 – Developmental and reproductive toxicity<br>GHS08 DANGER<br>  <br>8 – Persistence in soil/water and soil absorption potential& biomagnification & bioaccumulation<br>GHS09 WARNING<br>  |
| Fluroxypyr 200g/L | Starane<br>Tomahawk<br>Voloxypyr | Exclusion period | Limited species on Starane and Voloxypyr<br>Flammable | 8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation<br>GHS09 WARNING<br>  |
| Picloram 80g/L + Fluroxypyr 80g/L | Plenum | Don't use in aquatic environments<br>Eye and skin irritant | Toxic to aquatic invertebrates | 2- acute toxicity to mammals and birds<br>GHS 07 WARNING<br>  |

| Active ingredients | Trade names | Restrictions | Comments | Hazard criteria |
|---|---|---|---|---|
| | | | | 3 - Carcinogenicity<br>GHS07 WARNING<br>  <br>6 – Endocrine Disrupting Chemicals (EDC)<br>GHS08 DANGER<br>  <br>7 – Acute toxicity to aquatic organisms<br>GHS09 WARNING<br>  <br>8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation<br>GHS09 WARNING<br>  |
| Picloram (as potassium salt) 54g/L + Triclopyr ( as triethylamine salt) 46g/L | Kaput gel | Limited species registered currently | No mixing necessary | 2- acute toxicity to mammals and birds<br>GHS 07 WARNING<br>  <br>3 - Carcinogenicity<br>GHS07 WARNING<br>  |

| **Active ingredients** | **Trade names** | **Restrictions** | **Comments** | **Hazard criteria** |
|---|---|---|---|---|
| | | | | 5 – Developmental and reproductive toxicity<br>GHS08 DANGER<br>  <br>6 – Endocrine Disrupting Chemicals (EDC)<br>GHS08 DANGER<br>  <br>7 – Acute toxicity to aquatic organisms<br>GHS09 WARNING<br>  <br>8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation<br>GHS09 WARNING<br>  |
| 2-4D (as dimethyl amine salt) 480g/L | 2,4D<br>2,4D Amine | Limited registrations, herbaceous species | Weedy species such as *D. ferox* | 2- acute toxicity to mammals and birds<br>GHS 07 WARNING<br>  <br>3 - Carcinogenicity<br>GHS07 WARNING |

| Active ingredients | Trade names | Restrictions | Comments | Hazard criteria |
|---|---|---|---|---|
| | | | |  <br>5 – Developmental and reproductive toxicity<br>GHS08 DANGER<br>  <br>8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation<br>GHS09 WARNING<br>  |
| Glyphosate (as isoproplyamine salt) 360g/L | Enviro-glyphosate | Not to be used in riparian or aquatic environments, unless tallow amine free adjuvants incorporated | Ensure polyethoxylated tallow amine free as some of the products are toxic to aquatic environments | 2- acute toxicity to mammals and birds<br>GHS 07 WARNING<br>  |
| Glyphosate (as isopropylamine salt) 480g/L | Seismic | Only seismic tallow amine free and recommended for aquatic weed control | Polyethoxylated tallow amine free only | 2- acute toxicity to mammals and birds<br>GHS 07 WARNING<br>  |
| Glyphosate (as sodium salt) 500g/L | Kilo | Kilo registered for aquatic weeds, polyethoxylated tallow amine free. 3km exclusion zone for aerial applications | Poisonous if swallowed, eye irritant | 2- acute toxicity to mammals and birds<br>GHS 07 WARNING<br>  |

| **Active ingredients** | **Trade names** | **Restrictions** | **Comments** | **Hazard criteria** |
|---|---|---|---|---|
| Glyphosate (as sodium salt) 700g/L | Kilo max | Registered for aquatic weeds<br>Polyethoxylated tallow amine free<br>Aerial spray exclusion zones | Eye irritant | 2- acute toxicity to mammals and birds<br>GHS 07 WARNING<br>  |
| Imazapyr 100 g/L | Chopper<br>Hatchet | Hatchet, limited registrations | Poisonous if swallowed | 2- acute toxicity to mammals and birds<br>GHS 07 WARNING<br>  <br>8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation<br>GHS09 WARNING<br>  |
| Imazapyr 250g/L | Format | Consult the technical unit for minor use registrations | | 2- acute toxicity to mammals and birds<br>GHS 07 WARNING<br>  <br>8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation<br>GHS09 WARNING<br>  |

| **Active ingredients** | **Trade names** | **Restrictions** | **Comments** | **Hazard criteria** |
|---|---|---|---|---|
| Chlorimuron ethyl 500g/L | Extreme<br>Nicanor | Bush encroachment only | Consult technical unit for assistance | 2- acute toxicity to mammals and birds<br>GHS 07 WARNING<br>  <br>7 – Acute toxicity to aquatic organisms<br>GHS09 WARNING<br>  |
| Metsulfurion methyl 600g/L | Brushoff<br>Climax | 28 days withholding period | Eyes, nose skin irritant | 2- acute toxicity to mammals and birds<br>GHS 07 WARNING<br>  <br>7 – Acute toxicity to aquatic organisms<br>GHS09 WARNING<br>  |
| Picloram (as potassium salt) 240g/L | Access<br>Browser | Not to be used as foliar applications | | 2- acute toxicity to mammals and birds<br>GHS 07 WARNING<br>  <br>3 - Carcinogenicity<br>GHS07 WARNING<br>  <br>6 – Endocrine Disrupting Chemicals (EDC) |

| **Active ingredients** | **Trade names** | **Restrictions** | **Comments** | **Hazard criteria** |
|---|---|---|---|---|
| | | | | GHS08 DANGER<br>  <br>7 – Acute toxicity to aquatic organisms<br>GHS09 WARNING<br>  <br>8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation<br>GHS09 WARNING<br>  |
| Tebuthiuron 200g/kg | Molopo | Bush encroachment only<br>Consult the technical unit PRIOR to application | Extremely residual in soil, acutely toxic | 2- acute toxicity to mammals and birds<br>GHS 07 WARNING<br>  <br>7 – Acute toxicity to aquatic organisms<br>GHS09 WARNING<br>  <br>8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation<br>GHS09 WARNING |

| **Active ingredients** | **Trade names** | **Restrictions** | **Comments** | **Hazard criteria** |
|---|---|---|---|---|
| | | | |  |
| Tebuthiuron 500g/L | Molopo | Bush encroachment only<br><br>Consult the technical unit PRIOR to application | Extremely residual in soil, acutely toxic | 2- acute toxicity to mammals and birds<br><br>GHS 07 WARNING<br><br>  <br><br>7 – Acute toxicity to aquatic organisms<br><br>GHS09 WARNING<br><br>  <br><br>8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation<br><br>GHS09 WARNING<br><br>  |
| Tebuthiuron 800g/kg | Molopo<br><br>Limpopo | Bush encroachment only<br><br>Consult the technical unit PRIOR to application | Extremely residual in soil, acutely toxic | 2- acute toxicity to mammals and birds<br><br>GHS 07 WARNING<br><br>  <br><br>7 – Acute toxicity to aquatic organisms<br><br>GHS09 WARNING<br><br>  <br><br>8 – Persistence in soil/water and soil absorption |

| Active ingredients | Trade names | Restrictions | Comments | Hazard criteria |
|---|---|---|---|---|
| | | | | potential& bio magnification & bioaccumulation<br>GHS09 WARNING<br>  |
| Triclopyr (as butoxy ethyl ester) 240g/L | Ranger | Eye irritant<br>Volatile over 25 degrees | Toxic to fish and animals<br>Skin and eye irritant | 2- acute toxicity to mammals and birds<br>GHS 07 WARNING<br>  <br>5 – Developmental and reproductive toxicity<br>GHS08 DANGER<br>  <br>8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation<br>GHS09 WARNING<br>  |
| Triclopyr (as butoxy ethyl ester) 480g/L | Garlon<br>Triclon<br>Viroaxe | Volatile over 25 degrees<br>Do not use in riparian and aquatic environments<br>Diesel mix not allowed | Toxic to fish and animals<br>Skin and eye irritant<br>Poisonous if swallowed | 2- acute toxicity to mammals and birds<br>GHS 07 WARNING<br>  <br>5 – Developmental and reproductive toxicity<br>GHS08 DANGER |

| **Active ingredients** | **Trade names** | **Restrictions** | **Comments** | **Hazard criteria** |
|---|---|---|---|---|
| | | | |  <br>8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation<br>GHS09 WARNING<br>  |
| Triclopyr (as pyridyloxy compound) 360 g/L | Lumberjack<br>Timbrel | Adjuvant as indicated on the label | Skin, eye irritant, burns<br>Flammable<br>Possible weed resistant | 2- acute toxicity to mammals and birds<br>GHS 07 WARNING<br>  <br>8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation<br>GHS09 WARNING<br>  |
| Triclopyr (as butoxy ethyl ester) 240g/L + Aminopyralid 30g/L | Garlon max | Volatile over 25 degrees<br>Do not use in riparian and aquatic environments<br>Diesel mix not allowed | Toxic to fish and animals<br>Skin and eye irritant<br>Poisonous if swallowed | 2- acute toxicity to mammals and birds<br>GHS 07 WARNING<br>  <br>5 – Developmental and reproductive toxicity<br>GHS08 DANGER<br>  |

| Active ingredients | Trade names | Restrictions | Comments | Hazard criteria |
|---|---|---|---|---|
| | | | | 7 – Acute toxicity to aquatic organisms<br>GHS09 WARNING<br>  <br>8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation<br>GHS09 WARNING<br>  |
| Triclopyr (as thiethyl ammonium) 120g/L + Aminopyralid (as triisopropanol) 12g/L | Confront super | Eye irritant, skin irritant<br>Don't use in aquatic environments | Limited registrations | 2- acute toxicity to mammals and birds<br>GHS 07 WARNING<br>  <br>5 – Developmental and reproductive toxicity<br>GHS08 DANGER<br>  <br>7 – Acute toxicity to aquatic organisms<br>GHS09 WARNING<br>  <br>8 – Persistence in soil/water and soil absorption potential& bio |

| Active ingredients | Trade names | Restrictions | Comments | Hazard criteria |
|---|---|---|---|---|
| | | | | magnification & bioaccumulation<br>GHS09 WARNING<br>  |
| Bromacil 250g/L + Tebuthioron 250g/L | Bundu | Bush encroachers only | | 2- acute toxicity to mammals and birds<br>GHS 07 WARNING<br>  <br>7 – Acute toxicity to aquatic organisms<br>GHS09 WARNING<br>  <br>8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation<br>GHS09 WARNING<br>  |
| Wetter/Adjuvant | H&R crop oil<br>BP crop oil<br>Actipron super | Ensure the adjuvant used is the approved adjuvant as per the relevant herbicide label | Please see the master species and herbicide list for which formulations require adjuvants | |
| Blue/red/white dye | Ecoblue<br>Ecowhite | Only marker dyes or pigments to be used, not food colouring | | |

| Active ingredients | Trade names | Restrictions | Comments | Hazard criteria |
|---|---|---|---|---|
| **Blue Dye =Approximately 0.5% per litre water** | **Medium = 37.5% of Closed/Dense** | | | |
| **Medium = 37.5% of Closed/Dense** | **Medium = 37.5% of Closed/Dense** | **Medium = 37.5% of Closed/Dense** | | |
| **Red Dye (diesel) = Approximately 0.5% per litre diesel.** | Very Scattered = 3% of Closed/Dense | | | |
| | **Occasional = 0.5% of Closed/Dense** | | | |
| | **Rare = 0.5% of Closed/Dense** | | | |

**Table 2: Pesticide table**

| Active ingredients | Trade names | Restrictions | Comments | Hazard criteria |
|---|---|---|---|---|
| Brodifacoum 0.025g/kg | Pest off bait | Control of mice on off-shore Islands | Secondary poisoner<br><br>Anti-coagulant | 2- acute toxicity to mammals and birds<br>GHS 07 WARNING<br>  <br>7 – Acute toxicity to aquatic organisms<br>GHS09 WARNING<br>  <br>8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation<br>GHS09 WARNING<br>  |

| Active ingredients | Trade names | Restrictions | Comments | Hazard criteria |
|---|---|---|---|---|
| 2,2,2-trichloroethyylidene | Alphachloralose | To not use near water bodies. Toxic if swallowed.<br><br>Inhalation risk<br><br>CNS depressant | Used as a sedative in invasive bird control such as Mallard control programmes | 2- acute toxicity to mammals and birds<br><br>GHS06 – DANGER<br><br>  <br><br>GHS 07 WARNING<br><br>  <br><br>7 – Acute toxicity to aquatic organisms<br>GHS09 WARNING<br>  <br><br>8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation<br>GHS09 WARNING<br><br>  |
| 3-chloro-p-toluidine hydrochloride | DRC-1336/Starlicide | Toxic if swallowed<br><br>Toxic in contact with skin<br><br>Skin irritation, eye irritation<br><br>Inhalation risk<br><br>Toxic to aquatic environments 4 | Avicide powder to mix into bait to control corvids | 2- acute toxicity to mammals and birds<br><br>GHS06 – DANGER<br><br>  <br><br>GHS 07 WARNING<br><br>  <br><br>7 – Acute toxicity to aquatic organisms<br>GHS09 WARNING<br>  <br><br>8 – Persistence in soil/water and soil |

| Active ingredients | Trade names | Restrictions | Comments | Hazard criteria |
|---|---|---|---|---|
| | | | | absorption potential& bio magnification & bioaccumulation<br>GHS09 WARNING<br>  |
| 1,2,12,12a-tetrahydrochromeno[3,4-b]furo[2,3-h]chromen-6(6aH)-one | Rotenone | Toxic if swallowed<br><br>Causes skin and eye irritation<br><br>Toxic to aquatic environments | Used to control invasive fish, monitoring programmes necessary to ensure recovery after potassium permangate recovery process implemented | 2- acute toxicity to mammals and birds<br><br>GHS06 – DANGER<br>  <br><br>GHS 07 WARNING<br>  <br>7 – Acute toxicity to aquatic organisms<br>GHS09 WARNING<br>  <br>8 – Persistence in soil/water and soil absorption potential& bio magnification & bioaccumulation<br>GHS09 WARNING<br>  |

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## ANNEXURE 1: CHEMICAL GROUPS AND HAZARD GROUPS OF PESTICIDES

**This must be read in conjunction with the International Chemical Groups and Hazard groups and listed in *UN, 2011. Globally Harmonised System of Classification and Labelling of Chemicals (GHS). 4th Revised Edition. United Nations, New York and Geneva, 2011.***

**HERBICIDES FOR ALIEN PLANT CONTROL**

| | | | | | | PPE | | | Medical Biomonitoring | | Frequency and Duration | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Chemical group** | **MOA** | **Examples** | **Hazard Group** | **Hazard Criterion** | **Type** | **Pictogram** | **Classification** | **Blood** | **Urine** | **Blood** | **Urine** | **Environmental monitoring** |
| 1 | Imidazolinones | Group 2: ALS: AHAS inhibitors | Imazapyr ( Chopper, Hatchet, Arsenal) | 2 | **<u>Acute toxicity to mammals and birds</u>**<br>**GHS07**<br>**WARNING**<br>  <br>H319 (causes serious eye irritation)<br>H335 ( Respiratory irritant)<br>H315 (causes skin irritation) | 1.Chemically resistant nitrile gloves<br>2.Type 3 and Type 4 protective clothing<br>  <br>3.Safety boots<br>4.Face & Eye protection<br>5.Half-face respirators<br>6.Particulate air filters for respirators<br>7.Apron/ Knapjack<br>8. Long-sleeved shirts |  <br>  <br>  <br>  <br>  <br>  | EN 374:2016<br>EN 14605:2005<br>EN 345: 1993<br>EN ISO 20345<br>EN 166:2001 EN 140, EN149, EN 143:200<br>R95, R99, R100 | N/A | 5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test | N/A | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years.<br>3. All workers need to be tested once they leave they programme | |

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| | | | | 8 | **<u>Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation</u>**<br>**GHS09**<br>**WARNING**<br>  <br>H412 (harmful to aquatic life with long lasting effects) | | | | | | | | Hazard criterion 7 and 8 are linked to environmental risks |
| 2 | Sulfonylureas | Group 2: ALS: AHAS inhibitors | Metsulfuron-methyl ( Brush-off, Climax, Forester, Extreme, Nikanor) | 7 | Acute toxicity to aquatic organisms<br>GHS09<br>WARNING<br>  <br>H400 (Very toxic to aquatic life) | | | | | | | | |
| | | | | 2 | Acute toxicity to mammals and birds<br>GHS07<br>WARNING<br>  <br>H315 ( causes skin irritation)<br>H335 (Respiratory tract irritant)<br>H319 (Causes serious eye irritation) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing<br>  <br>  |  <br>  <br>  | EN 374:2016<br><br>EN 14605:2005<br><br>EN 345: 1993 | N/A | 5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test | N/A | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years.<br>3. All workers need to be | |

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| | | | | | | 3.Safety boots<br><br>4.Face & Eye protection<br><br>5.Half-face respirators<br><br>6.Particulate air filters for respirators<br><br>7.Apron/ Knapjack<br><br>8. Long-sleeved shirts |  <br>  <br>  | EN ISO 20345<br><br>EN 166:2001 EN 140, EN149, EN 143:200<br><br>R95, R99, R100 | | | | tested once they leave they programme | |
| | Carboxylic acids | Group 4: Synthetic auxins | Picloram (Access, Browser, Scrubber) | 2 | Acute toxicity to mammals and birds GHS07 WARNING<br>  <br>H302 (harmful if swallowed)<br>H312 (harmful in contact with skin)<br>H319 (Causes serious eye irritation)<br>H332 (harmful if inhaled) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing<br>  <br><br>3.Safety boots<br><br>4.Face & Eye protection |  <br>  <br>  <br>  | EN 374:2016<br><br>EN 14605:2005<br><br>EN 345: 1993<br><br>EN ISO 20345 | | 5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every year.<br>3. All workers need to be tested once they leave they programme | |

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| | | | | | | 5.Half-face respirators<br><br>6.Particulate air filters for respirators<br><br>7.Apron/ Knapjack<br><br>8. Long-sleeved shirts |  <br>  | EN 166:2001 EN 140, EN149, EN 143:200<br><br>R95, R99, R100 | | | | | |
| | | | | 3 | Carcinogenicity GHS07 WARNING<br>  <br>H335 (May cause respiratory irritation) | Same as above | Same as above | Same as above | 20cc fresh blood sample. AChE tests done with Test-Mate model 400 device | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..<br>3. All workers need to be tested once they leave the programme | | |

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| | | | | | | | | | | | | | |
| | | | | 6 | Endocrine Disrupting Chemicals (EDC)<br>GHS08 DANGER<br>  <br>H370 (causes damage to organs – lungs) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing<br>  <br>Type 5 protective clothing<br>  <br><br>3.Safety boots<br><br>4.Face & Eye protection<br><br>5.Half-face respirators<br><br>6.Particulate air filters for respirators<br><br>7.Apron/ Knapjack<br><br>8. Long-sleeved shirts |  <br>  <br>  <br>  <br>  <br>  | EN ISO 20345<br><br>EN 166:2001<br><br>EN140<br>EN 149<br><br>EN 143:2000<br><br>R95, R99, R100 | 20cc fresh blood sample. AChE tests done with Test-Mate model 400 device | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..<br>3. All workers need to be tested once they leave the programme | | |

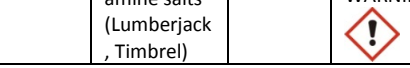
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| | | | | | | | | | | | | | |
| | | | | 7 | Acute toxicity to aquatic organisms<br>GHS09<br>WARNING<br>  <br>H400 (Very toxic to aquatic life) | | | | | | | | |
| | | | | 8 | Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation<br>GHS09<br>WARNING<br>  <br>H410 (Very toxic to aquatic life with long lasting effects)<br>H412 (harmful to aquatic life with long lasting effects) | | | | | | | | |
| | Phenoxy acids | Group 4: Synthetic auxins | Alkylchloro phenoxy (2,4D) | 2 | Acute toxicity to mammals and birds<br>GHS07<br>WARNING<br>  <br>H302 (Harmful if swallowed)<br>H317 ( May cause an allergic reaction) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing<br>  |  <br>  | EN 374:2016<br><br>EN 14605:2005<br><br>EN 345: 1993 | | 5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every year. | |

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| | | | | | H318 (causes serious eye damage) | 3.Safety boots<br><br>4.Face & Eye protection<br><br>5.Half-face respirators<br><br>6.Particulate air filters for respirators<br><br>7.Apron/ Knapjack |  | EN ISO 20345<br><br>EN 166:2001 EN 140, EN149, EN 143:200<br><br>R95, R99, R100 | | | | 3. All workers need to be tested once they leave they programme | |
| | | | | 3 | Carcinogenicity GHS07 WARNING<br>  <br>H335 (May cause respiratory irritation) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing<br>  <br><br>3.Safety boots<br><br>4.Face & Eye protection<br><br>5.Half-face respirators |  | EN 374:2016<br><br>EN 14605:2005<br><br>EN 345: 1993<br><br>EN ISO 20345<br><br>EN 166:2001 | 20cc fresh blood sample. AChE tests done with Test-Mate model 400 device | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..<br>3. All workers need to be tested | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 6.Particulate air filters for respirators<br><br>7.Apron/ Knapjack |  <br>  | EN 140, EN149, EN 143:200<br><br>R95, R99, R100 | | | once they leave the programme | |
| | | | | 5 | Developmental & Reproductive toxicity<br>GHS08 DANGER<br>  <br>H361 (Suspected of damaging fertility or the unborn child) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing<br>  <br>Type 5 protective clothing<br>  <br><br>3.Safety boots<br><br>4.Face & Eye protection<br><br>5.Half-face respirators<br><br>6.Particulate air |  <br>  <br>  <br>  <br>  <br>  | EN ISO 20345<br><br>EN 166:2001<br><br>EN140<br>EN 149<br><br>EN 143:2000<br><br>R95, R99, R100 | 20cc fresh blood sample. AChE tests done with Test-Mate model 400 device | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..<br>3. All workers need to be tested once they leave the programme | | |

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| | | | | | | filters for respirators<br><br>7.Apron/ Knapjack<br><br>8. Long-sleeved shirts | | | | | | | |
| | | | | 8 | Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation<br>GHS09 WARNING<br>  <br>H412 (Harmful to aquatic life with long lasting effects) | | | | | | | | |
| | | | Pyridine compounds as butoxy ethyl esters (Garlon 4, Garlon max, Nuvogon, Triclon, Viroaxe, Triclomax, Turbador) | 2 | Acute toxicity to mammals and birds<br>GHS07 WARNING<br>  <br>H302 (Harmful if swallowed)<br>H317 ( May cause an allergic reaction) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing<br>  |  <br>  <br>  | EN 374:2016<br><br>EN 14605:2005<br><br>EN 345: 1993 | | 5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years.<br>3. All workers need to be | |

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| | | | | | H319 (causes serious eye irritation)<br>H373 (May cause damage to organs – heart, liver, kidneys) | 3.Safety boots<br><br>4.Face & Eye protection<br><br>5.Half-face respirators<br><br>6.Particulate air filters for respirators<br><br>7.Apron/ Knapjack |  <br>  <br>  | EN ISO 20345<br><br>EN 166:2001 EN 140, EN149, EN 143:200<br><br>R95, R99, R100 | | | | tested once they leave they programme | |
| | | | | 5 | Developmental and Reproductive toxicity<br>GHS08 DANGER<br>  <br>H360 (May damage fertility or the unborn child) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing<br>  <br>Type 5 protective clothing<br>  <br><br>3.Safety boots |  <br>  <br>  <br>  | EN ISO 20345<br><br>EN 166:2001<br><br>EN140 EN 149<br><br>EN 143:2000<br><br>R95, R99, R100 | 20cc fresh blood sample. AChE tests done with Test-Mate model 400 device | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 5 years..<br>3. All workers need to be tested once they | | |

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| | | | | | | 4.Face & Eye protection<br><br>5.Half-face respirators<br><br>6.Particulate air filters for respirators<br><br>7.Apron/ Knapjack<br><br>8. Long-sleeved shirts |  <br>  | | | | leave the programme | | |
| | | | | 8 | Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation<br>GHS09<br>WARNING<br>  <br>H411 (Toxic to aquatic life with long lasting effects) | | | | | | | | |
| | Quinoline carboxylic acid | Group 4: Synthetic auxins | Pyridine compounds such As Triclopyr as amine salts (Lumberjack, Timbrel) | 2 | Acute toxicity to mammals and birds<br>GHS07<br>WARNING<br>  | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 |  | EN 374:2016<br><br>EN 14605:2005 | | 5cc fresh urine sample refrigerated. Tested using | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays | |

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| | | | | | H302 (Harmful if swallowed)<br>H317 ( May cause an allergic reaction)<br>H318 (Causes serious eye damage)<br>H315 (Causes skin irritation)<br>H335 (may cause respiratory irritation)<br>H336 (may cause drowsiness or dizziness)<br>H360 (may damage fertility or the unborn child) | protective clothing<br>  <br>3.Safety boots<br>4.Face & Eye protection<br>5.Half-face respirators<br>6.Particulate air filters for respirators<br>7.Apron/ Knapjack |  | EN 345: 1993<br>EN ISO 20345<br>EN 166:2001<br>EN 140, EN149, EN 143:200<br>R95, R99, R100 | | ELIZA dipstick test | | 8 hours per day for 5 days per week, an additional test is needed every 2 years.<br>3. All workers need to be tested once they leave they programme | |
| | | | | 8 | Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation<br>GHS09 WARNING<br>  <br>H411 (Toxic to aquatic life with | | | | | | | | |

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| | | | | | long lasting effects) | | | | | | | | |
| | Quinoline carboxylic acid | Group 4: Synthetic auxins | Pyridine compounds such as fluroxypyr (Tomahawk, Starane, Voloxypyr) | 8 | Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation<br>GHS09 WARNING<br>  <br>H411 (Toxic to aquatic life with long lasting effects) | | | | | | | | |
| | Quinoline carboxylic acid | Group 4: Synthetic auxins | Pyridine compounds such as Aminopyralids ( Sendero) | 2 | Acute toxicity to mammals and birds<br>GHS07 WARNING<br>  <br>H315 (Causes skin irritation<br>H318 (causes serious eye damage)<br>H319 (Causes serious eye irritation)<br>H335 (may cause respiratory irritation) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing<br>  <br><br>3.Safety boots<br><br>4.Face & Eye protection<br><br>5.Half-face respirators<br><br>6.Particulate air |  <br>  <br>  <br>  <br>  | EN 374:2016<br><br>EN 14605:2005<br><br>EN 345: 1993<br><br>EN ISO 20345<br><br>EN 166:2001 EN 140, EN149, EN 143:200 | | 5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years.<br>3. All workers need to be tested once they leave they programme | |

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| | | | | | | filters for respirators<br><br>7.Apron/ Knapjack |  | R95, R99, R100 | | | | | |
| | | | | 7 | Acute toxicity to aquatic organisms<br>GHS09<br>WARNING<br>  <br>H400 (Very toxic to aquatic life) | | | | | | | | |
| | | | | 8 | Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation<br>GHS09<br>WARNING<br>  <br>H411 (Toxic to aquatic life with long lasting effects) | | | | | | | | |
| | Combinations | Group 4: Synthetic auxins | Quinoline carboxylic acid such as Picloram + Pyridine compound such as Fluroxypyr ( | 2 | Acute toxicity to mammals and birds<br>GHS07<br>WARNING<br>  <br>H302 (harmful if swallowed) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing |  <br>  | EN 374:2016<br><br>EN 14605:2005 | | 5cc fresh urine sample refrigerated. Tested using ELIZA | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days | |

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| | | | Plenum, Gladiator) | | H312 (harmful in contact with skin)<br>H319 (Causes serious eye irritation)<br>H332 (harmful if inhaled) |  <br>3.Safety boots<br>4.Face & Eye protection<br>5.Half-face respirators<br>6.Particulate air filters for respirators<br>7.Apron/ Knapjack |  | EN 345: 1993<br>EN ISO 20345<br>EN 166:2001 EN 140, EN149, EN 143:200<br>R95, R99, R100 | | dipstick test | | per week, an additional test is needed every 2 years.<br>3. All workers need to be tested once they leave they programme | |
| | | | | 3 | Carcinogenicity GHS07 WARNING<br>  <br>H335 (May cause respiratory irritation) | 1.Chemically resistant nitrile gloves<br>2.Type 3 and Type 4 protective clothing<br>  <br>3.Safety boots |  | EN 374:2016<br>EN 14605:2005<br>EN 345: 1993<br>EN ISO 20345 | 20cc fresh blood sample. AChE tests done with Test-Mate model 400 device | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done | | |

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| | | | | | | 4.Face & Eye protection<br><br>5.Half-face respirators<br><br>6.Particulate air filters for respirators<br><br>7.Apron/ Knapjack |  <br>  <br>  | EN 166:2001<br>EN 140, EN149, EN 143:200<br><br>R95, R99, R100 | | | every 2 years..<br>3. All workers need to be tested once they leave the programme | | |
| | | | | 6 | Endocrine Disrupting Chemicals (EDC)<br>GHS08 DANGER<br>  <br>H370 (causes damage to organs – lungs) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing<br>  <br>Type 5 protective clothing<br>  <br><br>3.Safety boots<br><br>4.Face & Eye protection |  <br>  <br>  <br>  | EN ISO 20345<br><br>EN 166:2001<br><br>EN140<br>EN 149<br><br>EN 143:2000<br><br>R95, R99, R100 | 20cc fresh blood sample. AChE tests done with Test-Mate model 400 device | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..<br>3. All workers need to be tested once they leave the | | |

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| | | | | | | 5.Half-face respirators<br><br>6.Particulate air filters for respirators<br><br>7.Apron/ Knapjack<br><br>8. Long-sleeved shirts |  <br>  | | | | programme | | |
| | | | | 7 | Acute toxicity to aquatic organisms<br>GHS09<br>WARNING<br>  <br>H400 (Very toxic to aquatic life) | | | | | | | | |
| | | | | 8 | Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation<br>GHS09<br>WARNING<br>  <br>H410 (Very toxic to aquatic life with long lasting effects) | | | | | | | | |

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| | | | | | H412 (harmful to aquatic life with long lasting effects) | | | | | | | | |
| | Combinations | Group 4: Synthetic auxins | Pyridine compounds such as Fluroxypyr + Pyridine compounds such as Triclopyr as Pyridyloxy compound ( Impala) | 2 | Acute toxicity to mammals and birds<br>GHS07<br>WARNING<br>  <br>H302 (Harmful if swallowed)<br>H317 ( May cause an allergic reaction)<br>H319 (causes serious eye irritation)<br>H373 (May cause damage to organs – heart, liver, kidneys) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing<br>  <br><br>3.Safety boots<br><br>4.Face & Eye protection<br><br>5.Half-face respirators<br><br>6.Particulate air filters for respirators<br><br>7.Apron/ Knapjack<br><br>8. Long-sleeved shirt |  <br>  <br>  <br>  <br>  <br>  | EN 374:2016<br><br>EN 14605:2005<br><br>EN 345: 1993<br><br>EN ISO 20345<br><br>EN 166:2001<br>EN 140, EN149, EN 143:200<br><br>R95, R99, R100 | | 5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years.<br>3. All workers need to be tested once they leave they programme | |

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| | | | | 5 | Developmental and Reproductive toxicity GHS08 DANGER  H360 (May damage fertility or the unborn child) | 1.Chemically resistant nitrile gloves<br>2.Type 3 and Type 4 protective clothing  <br>Type 5 protective clothing  <br>3.Safety boots<br>4.Face & Eye protection<br>5.Half-face respirators<br>6.Particulate air filters for respirators<br>7.Apron/ Knapjack<br>8. Long-sleeved shirts |  <br>  <br>  <br>  <br>  <br>  | EN ISO 20345<br>EN 166:2001<br>EN140 EN 149<br>EN 143:2000<br>R95, R99, R100 | 20cc fresh blood sample. AChE tests done with Test-Mate model 400 device | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 5 years..<br>3. All workers need to be tested once they leave the programme | | |

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| | | | | 8 | Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation<br>GHS09<br>WARNING<br>  <br>H411 (Toxic to aquatic life with long lasting effects) | | | | | | | | |
| | Combinations | Group 4: Synthetic auxins | Quinoline carboxylic acid such as Picloram + Pyridine compound such Triclopyr as trimethylamine salt (Kaput gel) | 2 | Acute toxicity to mammals and birds<br>GHS07<br>WARNING<br>  <br>H302 (harmful if swallowed)<br>H312 (harmful in contact with skin)<br>H315 (causes skin irritation)<br>H317(May cause allergic skin reaction)<br>H319 (Causes serious eye irritation)<br>H332 (harmful if inhaled)<br>H335 (May cause respiratory irritation) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing<br>  <br><br>3.Safety boots<br><br>4.Face & Eye protection<br><br>5.Half-face respirators<br><br>6.Particulate air |  <br>  <br>  <br>  <br>  | EN 374:2016<br><br>EN 14605:2005<br><br>EN 345: 1993<br><br>EN ISO 20345<br><br>EN 166:2001<br>EN 140, EN149, EN 143:200 | | | | | |

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| | | | | | H336 (may cause drowsiness or dizziness) | filters for respirators<br><br>7.Apron/ Knapjack |  | R95, R99, R100 | | | | | |
| | | | | 3 | Carcinogenicity GHS07 WARNING  H335 (May cause respiratory irritation) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing  <br><br>3.Safety boots<br><br>4.Face & Eye protection<br><br>5.Half-face respirators<br><br>6.Particulate air filters for respirators<br><br>7.Apron/ Knapjack |       | EN 374:2016<br><br>EN 14605:2005<br><br>EN 345: 1993<br><br>EN ISO 20345<br><br>EN 166:2001 EN 140, EN149, EN 143:200<br><br>R95, R99, R100 | 20cc fresh blood sample. AChE tests done with Test-Mate model 400 device | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..<br>3. All workers need to be tested once they leave the programme | | |

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| | | | | 5 | Developmental and Reproductive toxicity<br>GHS08 DANGER<br>  <br>H360 (May damage fertility or the unborn child) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing<br>  <br>  <br>Type 5 protective clothing<br>  <br><br>3.Safety boots<br><br>4.Face & Eye protection<br><br>5.Half-face respirators<br><br>6.Particulate air filters for respirators<br><br>7.Apron/ Knapjack<br><br>8. Long-sleeved shirts |  <br>  <br>  <br>  <br>  <br>  | EN ISO 20345<br><br>EN 166:2001<br><br>EN140<br>EN 149<br><br>EN 143:2000<br><br>R95, R99, R100 | 20cc fresh blood sample. AChE tests done with Test-Mate model 400 device | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 5 years..<br>3. All workers need to be tested once they leave the programme | | |

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| | | | | 6 | Endocrine Disrupting Chemicals (EDC) GHS08 DANGER  H370 (causes damage to organs – lungs) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing  <br>Type 5 protective clothing  <br><br>3.Safety boots<br><br>4.Face & Eye protection<br><br>5.Half-face respirators<br><br>6.Particulate air filters for respirators<br><br>7.Apron/ Knapjack<br><br>8. Long-sleeved shirts |  <br>  <br>  <br>  <br>  <br>  | EN ISO 20345<br><br>EN 166:2001<br><br>EN140<br>EN 149<br><br>EN 143:2000<br><br>R95, R99, R100 | 20cc fresh blood sample. AChE tests done with Test-Mate model 400 device | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..<br>3. All workers need to be tested once they leave the programme | | |

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| | | | | 7 | Acute toxicity to aquatic organisms<br>GHS09<br>WARNING<br>  <br>H400 (Very toxic to aquatic life) | | | | | | | | |
| | | | | 8 | Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation<br>GHS09<br>WARNING<br>  <br>H410 (Very toxic to aquatic life with long lasting effects)<br>H411 (Toxic to aquatic life with long lasting effects)<br>H412 (harmful to aquatic life with long lasting effects) | | | | | | | | |
| | Combinations | Group 4: Synthetic auxins | Pyridine compounds such Triclopyr as amine salt + Pyridine compounds such as | 2 | Acute toxicity to mammals and birds<br>GHS07<br>WARNING<br>  | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 |  | EN 374:2016<br><br>EN 14605:2005 | | 5cc fresh urine sample refrigerated. Tested using ELIZA | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per | |

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| | | | Clopyralid (Confront, Astra) | | H302 (Harmful if swallowed)<br>H315 (Causes skin irritation)<br>H317 ( May cause an allergic reaction)<br>H318 (causes serious eye damage)<br>H319 (causes serious eye irritation)<br>H335 (May cause respiratory irritation)<br>H373 (May cause damage to organs – heart, liver, kidneys) | protective clothing<br>  <br>3.Safety boots<br>4.Face & Eye protection<br>5.Half-face respirators<br>6.Particulate air filters for respirators<br>7.Apron/ Knapjack |  | EN 345: 1993<br>EN ISO 20345<br>EN 166:2001 EN 140, EN149, EN 143:200<br>R95, R99, R100 | | dipstick test | | day for 5 days per week, an additional test is needed every 2 years.<br>3. All workers need to be tested once they leave they programme | |
| | | | | 5 | Developmental and Reproductive toxicity GHS08 DANGER<br>  <br>H360 (May damage fertility or the unborn child) | 1.Chemically resistant nitrile gloves<br>2.Type 3 and Type 4 protective clothing<br>  <br>Type 5 protective clothing |  | EN ISO 20345<br>EN 166:2001<br>EN140 EN 149 | 20cc fresh blood sample. AChE tests done with Test-Mate model 400 device | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs | | |

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| | | | | | |  3.Safety boots 4.Face & Eye protection 5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack 8. Long-sleeved shirts |     | EN 143:2000 R95, R99, R100 | | | to be done every 5 years.. 3. All workers need to be tested once they leave the programme | | |
| | | | | 8 | Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  H411 (Toxic to aquatic life with | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | long lasting effects) | | | | | | | | |
| | Combinations | Group 4: Synthetic auxins | Pyridine compounds such as Triclopyr as triethyl ammonium + Aminopyralid (Confront super) | 2 | Acute toxicity to mammals and birds<br>GHS07 WARNING<br>  <br>H317 (May cause an allergic skin reaction)<br>H318 (Causes serious eye damage)<br>H319 (Causes serious eye irritation)<br>H315 (Causes skin irritation)<br>H335 (may cause respiratory irritation)<br>H336 ( may cause drowsiness or dizziness) | 1.Chemically resistant nitrile gloves<br>  <br>2.Type 3 and Type 4 protective clothing<br>3.Safety boots<br>4.Face & Eye protection<br>5.Half-face respirators<br>6.Particulate air filters for respirators<br>7.Apron/ Knapjack |  <br>  <br>  <br>  <br>  <br>  | EN 374:2016<br>EN 14605:2005<br>EN 345: 1993<br>EN ISO 20345<br>EN 166:2001<br>EN 140, EN149, EN 143:200<br>R95, R99, R100 | | 5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years.<br>3. All workers need to be tested once they leave they programme | |
| | | | | 5 | Developmental and Reproductive toxicity<br>GHS08 DANGER | 1.Chemically resistant nitrile gloves |  | EN ISO 20345 | 20cc fresh blood sample. AChE tests | | 1.All workers need to be tested before | | |

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| | | | | |  H360 (may damage fertility or the unborn child) | 2.Type 3 and Type 4 protective clothing  Type 5 protective clothing  3.Safety boots 4.Face & Eye protection 5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack 8. Long-sleeved shirts |      | EN 166:2001 EN140 EN 149 EN 143:2000 R95, R99, R100 | done with Test-Mate model 400 device | | they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 5 years.. 3. All workers need to be tested once they leave the programme | | |
| | | | | 7 | Acute toxicity to aquatic organisms GHS09 WARNING | | | | | | | | |

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| | | | | |  H400 (Very toxic to aquatic life) | | | | | | | |
| | | | | 8 | Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  H410 (Very toxic to aquatic life with long lasting effects) H11 (Toxic to aquatic life with long lasting effects) | | | | | | | |
| | Combinations | Group 4: Synthetic auxins | Pyridine compounds such as Triclopyr as Butoxy ethyl ester + Aminopyralid (Garlon Max) | 2 | Acute toxicity to mammals and birds GHS07 WARNING  H302 (Harmful if swallowed) H315 (causes skin irritation) H317 ( May cause an allergic reaction) H318 (causes serious eye damage) | 1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing  3.Safety boots 4.Face & Eye protection |  | EN 374:2016 EN 14605:2005 EN 345: 1993 EN ISO 20345 | | 5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test | | 1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years. 3. All workers need to be tested once they leave they programme | |

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| | | | | | H319 (causes serious eye irritation)<br>H335 (may cause respiratory irritation)<br>H336 (may cause drowsiness or dizziness)<br>H373 (May cause damage to organs – heart, liver, kidneys) | 5.Half-face respirators<br><br>6.Particulate air filters for respirators<br><br>7.Apron/ Knapjack |  <br>  | EN 166:2001 EN 140, EN149, EN 143:200<br><br>R95, R99, R100 | | | | | |
| | | | | 5 | Developmental and Reproductive toxicity GHS08 DANGER<br>  <br>H360 (May damage fertility or the unborn child) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing<br>  <br>Type 5 protective clothing<br>  <br><br>3.Safety boots<br><br>4.Face & Eye protection |  <br>  <br>  <br>  <br>  | EN ISO 20345<br><br>EN 166:2001<br><br>EN140 EN 149<br><br>EN 143:2000<br><br>R95, R99, R100 | 20cc fresh blood sample. AChE tests done with Test-Mate model 400 device | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 5 years..<br>3. All workers need to be tested once they leave the programme | | |

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| | | | | | | 5.Half-face respirators<br><br>6.Particulate air filters for respirators<br><br>7.Apron/ Knapjack<br><br>8. Long-sleeved shirts |  | | | | | | |
| | | | | 8 | Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation<br>GHS09<br>WARNING<br>  <br>H410 (Very toxic to aquatic life with long lasting effects) | | | | | | | | |
| | Uracils | Group 5: Photosynthetic inhibitors at Photosystem II, Site A. | Bromacil (Bushwacker) | 2 | Acute toxicity to mammals and birds<br>GHS07<br>WARNING<br>  <br>H302 (Harmful if swallowed) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing |  <br>  | EN 374:2016<br><br>EN 14605:2005 | | 5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an | |

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| | | | | | H315 (Causes skin irritation)<br>H319 (Causes serious eye irritation)<br>H335 (may cause respiratory irritation) |  <br>3.Safety boots<br>4.Face & Eye protection<br>5.Half-face respirators<br>6.Particulate air filters for respirators<br>7.Apron/ Knapjack |  | EN 345: 1993<br>EN ISO 20345<br>EN 166:2001 EN 140, EN149, EN 143:200<br>R95, R99, R100 | | | | additional test is needed every 2 years.<br>3. All workers need to be tested once they leave they programme | |
| | | | | 7 | Acute toxicity to aquatic organisms<br>GHS09<br>WARNING<br>  <br>H400 (Very toxic to aquatic life) | | | | | | | | |
| | | | | 8 | Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation<br>GHS09<br>WARNING | | | | | | | | |

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| | | | | |  H410 (Very toxic to aquatic life with long lasting effects) | | | | | | | | |
| | Ureas | Group 7: Photosynthetic inhibitors at Photosystem II, Site B. | Tebuthiuron (Limpopo, Molopo) | 2 | Acute toxicity to mammals and birds GHS07 WARNING  H302 (Harmful if swallowed) | 1.Chemically resistant nitrile gloves<br>2.Type 3 and Type 4 protective clothing  <br>3.Safety boots<br>4.Face & Eye protection<br>5.Half-face respirators<br>6.Particulate air filters for respirators<br>7.Apron/ Knapjack |       | EN 374:2016<br>EN 14605:2005<br>EN 345: 1993<br>EN ISO 20345<br>EN 166:2001 EN 140, EN149, EN 143:200<br>R95, R99, R100 | | 5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years.<br>3. All workers need to be tested once they leave they programme | |

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| | | | | 7 | Acute toxicity to aquatic organisms<br>GHS09<br>WARNING<br>  <br>H400 (Very toxic to aquatic life) | | | | | | | | |
| | | | | 8 | Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation<br>GHS09<br>WARNING<br>  <br>H410 (Very toxic to aquatic life with long lasting effects) | | | | | | | | |
| | Combinations | Group 5 (Uracil) + Group 7 (urea) | Bromacil + Tebuthiuron (Bundu) | 2 | Acute toxicity to mammals and birds<br>GHS07<br>WARNING<br>  <br>H302 (Harmful if swallowed)<br>H315 (Causes skin irritation)<br>H319 (Causes serious eye irritation)<br>H335 (may cause respiratory irritation) | 1.Chemically resistant nitrile gloves<br>  <br>2.Type 3 and Type 4 protective clothing<br><br>3.Safety boots<br>  <br>4.Face & Eye protection<br>  |  <br>  | EN 374:2016<br>EN 14605:2005<br>EN 345: 1993<br>EN ISO 20345 | | 5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years.<br>3. All workers need to be tested once they leave they programme | |

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| | | | | | | 5.Half-face respirators<br><br>6.Particulate air filters for respirators<br><br>7.Apron/ Knapjack |  <br>  | EN 166:2001 EN 140, EN149, EN 143:200<br><br>R95, R99, R100 | | | | | |
| | | | | 7 | Acute toxicity to aquatic organisms GHS09 WARNING<br>  <br>H400 (Very toxic to aquatic life) | | | | | | | | |
| | | | | 8 | Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING<br>  <br>H410 (Very toxic to aquatic life with long lasting effects) | | | | | | | | |

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| | Glycines | Group 9: Inhibitors of EPSP synthesis. | Phosphono glycines such as Glyphosate isopropylam ine salts (Seismic, tumplewee d) POE-T free | 2 | Acute toxicity to mammals and birds GHS07 WARNING  H318 (Causes serious eye damage) | 1.Chemical ly resistant nitrile gloves<br>2.Type 3 and Type 4 protective clothing  <br>3.Safety boots<br>4.Face & Eye protection<br>5.Half-face respirators<br>6.Particula te air filters for respirators<br>7.Apron/ Knapjack |       | EN 374:2016<br>EN 14605:2005<br>EN 345: 1993<br>EN ISO 20345<br>EN 166:2001 EN 140, EN149, EN 143:200<br>R95, R99, R100 | | 5cc fresh urine sample refrigerat ed. Tested using ELIZA dipstick test | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years.<br>3. All workers need to be tested once they leave they programme | |
| | Glycines | Group 9: Inhibitors of EPSP synthesis. | Phosphonog lycines such as Glyphosate sodium salts (Kilo max) | 2 | Acute toxicity to mammals and birds GHS07 WARNING  | 1.Chemical ly resistant nitrile gloves<br>2.Type 3 and Type 4 protective clothing |   | EN 374:2016<br>EN 14605:2005 | | 5cc fresh urine sample refrigerat ed. Tested using ELIZA dipstick test | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an | |

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| | | | | | H318 (Causes serious eye damage) |  3.Safety boots 4.Face & Eye protection 5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack |  | EN 345: 1993 EN ISO 20345 EN 166:2001 EN 140, EN149, EN 143:200 R95, R99, R100 | | | | additional test is needed every 2 years. 3. All workers need to be tested once they leave they programme | |
| | Glycines | Group 9: Inhibitors of EPSP synthesis. | Phosphonoglycines such as glyphosate ( all GBH's containing POE-T such as Roundup etc) | 2 | Acute toxicity to mammals and birds GHS07 WARNING  H318 (Causes serious eye damage) | 1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing  3.Safety boots |  | EN 374:2016 EN 14605:2005 EN 345: 1993 EN ISO 20345 | | 5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test | | 1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years. 3. All workers need to be tested once they leave | |

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| | | | | | | 4.Face & Eye protection<br><br>5.Half-face respirators<br><br>6.Particulate air filters for respirators<br><br>7.Apron/ Knapjack |  <br>  <br>  | EN 166:2001<br>EN 140, EN149, EN 143:200<br><br>R95, R99, R100 | | | | they programme | |
| | | | | 3 | Carcinogenicity GHS07<br>WARNING<br>  <br>H335 (May cause respiratory irritation)<br>H336 (may cause drowsiness or dizziness)<br>H315 (Causes skin irritation)<br>H319 (causes serious eye irritation) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing<br>  <br><br>3.Safety boots<br><br>4.Face & Eye protection<br><br>5.Half-face respirators<br><br>6.Particulate air |  <br>  <br>  <br>  <br>  | EN 374:2016<br><br>EN 14605:2005<br><br>EN 345: 1993<br><br>EN ISO 20345<br><br>EN 166:2001<br>EN 140, EN149, EN 143:200 | 20cc fresh blood sample. AChE tests done with Test-Mate model 400 device | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..<br>3. All workers need to be tested once they leave the | | |

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| | | | | | | filters for respirators<br><br>7.Apron/ Knapjack |  | R95, R99, R100 | | | programme | | |
| | | | | 8 | Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation<br>GHS09 WARNING<br>  <br>H411 (Toxic to aquatic life with long lasting effects) | | | | | | | | |
| | Organoarsenicals | Group 17: Unknown | Monosodium methylarsonate (MSMA) | 2 | Acute toxicity to mammals and birds<br>GHS07 WARNING<br>  <br>H302 (Harmful if swallowed)<br>H315 (causes skin irritation)<br>H319 (Causes serious eye irritation)<br>H332 (Harmful if inhaled) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing<br>  <br><br>3.Safety boots |  <br>  <br>  | EN 374:2016<br><br>EN 14605:2005<br><br>EN 345: 1993<br><br>EN ISO 20345 | | 5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years.<br>3. All workers need to be tested once they leave | |

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| | | | | | | 4.Face & Eye protection<br><br>5.Half-face respirators<br><br>6.Particulate air filters for respirators<br><br>7.Apron/ Knapjack |  <br>  <br>  | EN 166:2001<br>EN 140, EN149, EN 143:200<br><br>R95, R99, R100 | | | | they programme | |
| | | | | 3 | Carcinogenicity<br>GHS07<br>WARNING<br>  <br>H335 (May cause respiratory irritation)<br>H336 (May cause drowsiness or dizziness) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing<br>  <br>  <br><br>3.Safety boots<br><br>4.Face & Eye protection<br><br>5.Half-face respirators<br><br>6.Particulate air |  <br>  <br>  <br>  <br>  | EN 374:2016<br><br>EN 14605:2005<br><br>EN 345: 1993<br><br>EN ISO 20345<br><br>EN 166:2001<br>EN 140, EN149, EN 143:200 | 20cc fresh blood sample. AChE tests done with Test-Mate model 400 device | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..<br>3. All workers need to be tested once they leave the programme | | |

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| | | | | | | filters for respirators<br><br>7.Apron/ Knapjack |  | R95, R99, R100 | | | | | |
| | | | | 6 | Endocrine Disrupting Chemicals (EDC)<br>GHS08 DANGER<br>  <br>H371 (may cause damage to organs (kidneys and liver)<br>H372 (causes damage to organs through prolonged effect (liver and kidneys) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing<br>  <br>Type 5 protective clothing<br>  <br><br>3.Safety boots<br><br>4.Face & Eye protection<br><br>5.Half-face respirators<br><br>6.Particulate air filters for respirators |  <br>  <br>  <br>  <br>  <br>  | EN ISO 20345<br><br>EN 166:2001<br><br>EN140<br>EN 149<br><br>EN 143:2000<br><br>R95, R99, R100 | 20cc fresh blood sample. AChE tests done with Test-Mate model 400 device | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..<br>3. All workers need to be tested once they leave the programme | | |

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| | | | | | | 7.Apron/ Knapjack<br><br>8. Long-sleeved shirts | | | | | | | |
| | Bipyridyliums | Group 22: Cell membrane disruptors | Diquat dibromide (Scuba, Midstream) & Paraquat (Gramoxone ) | 2 | Acute toxicity to mammals and birds<br>GHS06 DANGER<br>  <br>H301( Toxic if swallowed)<br>H311(Toxic in contact with skin)<br>H330(Fatal if inhaled)<br><br>GHS07<br>WARNING<br>  <br>H315(Causes skin irritation)<br>H319(causes serious eye irritation)<br>H335(May cause respiratory irritation)<br>H372(Causes damage to organs) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing<br>  <br><br>3.Safety boots<br><br>4.Face & Eye protection<br><br>5.Half-face respirators<br><br>6.Particulate air filters for respirators<br><br>7.Apron/ Knapjack |  | EN 374:2016<br><br>EN 14605:2005<br><br>EN 345: 1993<br><br>EN ISO 20345<br><br>EN 166:2001<br>EN 140, EN149, EN 143:200<br><br>R95, R99, R100 | | 5cc fresh urine sample refrigerated. Tested using ELIZA dipstick test | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test is needed every 2 years.<br>3. All workers need to be tested once they leave they programme | |

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| | | | | 7 | Acute toxicity to aquatic organisms  H400 (Very toxic to aquatic life) | | | | | | | | |
| | | | | 8 | Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  H411 (Toxic to aquatic life with long lasting effects) | | | | | | | | |

**PESTICIDES FOR NON-PLANT INVASIVES CONTROL**

| | | | | | | **PPE** | | | **Medical Biomonitoring** | | **Frequency and Duration** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Chemical group** | **MOA** | **Examples** | **Hazard Group** | **Hazard Criterion** | **Type** | **Pictogram** | **Classification** | **Blood** | **Urine** | **Blood** | **Urine** | **Environmental monitoring** |
| 1 | Rodenticides | Inhibits vitamin K, anti-coagulant | Difenacoum, Brodifacoum Coumatetralyl | 2 | Acute Toxicity to mammals and birds GHS06 DANGER  | 1.Chemically resistant nitrile gloves |  | EN ISO 20345 EN 166:2001 | 20cc fresh blood sample. AChE tests | | 1.All workers need to be tested before they | | |

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| | | | | | H300 (Fatal if swallowed)<br>H310 (Fatal in contact with skin)<br>GHS07 WARNING<br>  <br>H373 (Causes damage to organs through prolonged or repeated exposure – blood) | 2.Type 3 and Type 4 protective clothing<br>  <br>Type 5 protective clothing<br>  <br>3.Safety boots<br>4.Face & Eye protection<br>5.Half-face respirators<br>6.Particulate air filters for respirators<br>7.Apron/ Knapjack<br>8. Long-sleeved shirts |  <br>  <br>  <br>  <br>  | EN140<br>EN 149<br>EN 143:2000<br>R95, R99, R100 | done with Test-Mate model 400 device | | start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..<br>3. All workers need to be tested once they leave the programme | | |
| | | | | 5 | Developmental and Reproductive toxicity<br>GHS08 DANGER<br>  | 1.Chemically resistant nitrile gloves<br>2.Type 3 and Type 4 |  | EN ISO 20345<br>EN 166:2001 | 20cc fresh blood sample. AChE tests done | | 1.All workers need to be tested before they start working. | | |

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| | | | | | H360D (May damage the unborn child) | protective clothing<br>  <br>Type 5 protective clothing<br>  <br>3.Safety boots<br>4.Face & Eye protection<br>5.Half-face respirators<br>6.Particulate air filters for respirators<br>7.Apron/ Knapjack<br>8. Long-sleeved shirts |  <br>  <br>  <br>  <br>  | EN140<br>EN 149<br>EN 143:2000<br>R95, R99, R100 | with Test-Mate model 400 device | | 2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..<br>3. All workers need to be tested once they leave the programme | | |
| | | | | 6 | Endocrine Disrupting Chemicals (EDC)<br>GHS08 DANGER<br>  <br>H372 (Causes damage to organs through | 1.Chemically resistant nitrile gloves<br>2.Type 3 and Type 4 protective clothing |  | EN ISO 20345<br>EN 166:2001 | 20cc fresh blood sample. AChE tests done with Test- | | 1.All workers need to be tested before they start working.<br>2.If the worker | | |

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| | | | | | prolonged or repeated exposure – blood) |  Type 5 protective clothing  3.Safety boots 4.Face & Eye protection 5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack 8. Long-sleeved shirts |      | EN140 EN 149 EN 143:2000 R95, R99, R100 | Mate model 400 device | | sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years.. 3. All workers need to be tested once they leave the programme | | |
| | | | | 7 | Acute toxicity to aquatic organisms  H400 (Very toxic to aquatic life) | | | | | | | | Ensure environmental monitoring is complied with such as ESRA protocols |
| | | | | 8 | Persistence in soil/water and soil absorption | | | | | | | | Ensure environmental monitoring is |

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| | | | | | potential & bio magnification & bioaccumulation<br>GHS09<br>WARNING<br>  <br>H410 (Very toxic to aquatic life with long lasting effects) | | | | | | | | complied with such as ESRA protocols |
| | | | Cholecalciferol | 2 | Acute Toxicity to mammals and birds<br>GHS06 DANGER<br>  <br>H301 (Toxic is swallowed)<br>H311 (Toxic in contact with skin)<br>H330 (fatal if inhaled) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing<br>  <br>Type 5 protective clothing<br>  <br><br>3.Safety boots<br><br>4.Face & Eye protection<br><br>5.Half-face respirators<br><br>6.Particulate air filters for respirators<br><br>7.Apron/ Knapjack |  <br>  <br>  <br>  <br>  <br>  | EN ISO 20345<br><br>EN 166:2001<br><br>EN140<br>EN 149<br><br>EN 143:2000<br><br>R95, R99, R100 | 20cc fresh blood sample. AChE tests done with Test-Mate model 400 device | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..<br>3. All workers need to be tested once they leave the programme | | |

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| | | | | | | 8. Long-sleeved shirts | | | | | | | |
| | | | | 6 | Endocrine Disrupting Chemicals (EDC) GHS08 DANGER  H372 (Causes damage to organs through prolonged or repeated exposure | 1.Chemically resistant nitrile gloves<br>2.Type 3 and Type 4 protective clothing  Type 5 protective clothing  <br>3.Safety boots<br>4.Face & Eye protection<br>5.Half-face respirators<br>6.Particulate air filters for respirators<br>7.Apron/ Knapjack |       | EN ISO 20345<br>EN 166:2001<br>EN140<br>EN 149<br>EN 143:2000<br>R95, R99, R100 | 20cc fresh blood sample. AChE tests done with Test-Mate model 400 device | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..<br>3. All workers need to be tested once they leave the programme | | |

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| | | | | | | 8. Long-sleeved shirts | | | | | | | |
| 2 | Avicides | Sedative powder | alphachloralose | 2 | Acute Toxicity to mammals and birds<br>GHS06 DANGER<br>  <br>H301 (Toxic if swallowed)<br><br>GHS07 WARNING<br>  <br>H332 (Harmful if inhaled)<br>H336 (may cause drowsiness or dizziness) | 1.Chemically resistant nitrile gloves<br><br>2.Type 3 and Type 4 protective clothing<br>  <br>Type 5 protective clothing<br>  <br><br>3.Safety boots<br><br>4.Face & Eye protection<br><br>5.Half-face respirators<br><br>6.Particulate air filters for respirators<br><br>7.Apron/ Knapjack |  <br>  <br>  <br>  <br>  <br>  | EN ISO 20345<br><br>EN 166:2001<br><br>EN140<br>EN 149<br><br>EN 143:2000<br><br>R95, R99, R100 | 20cc fresh blood sample. AChE tests done with Test-Mate model 400 device | | 1.All workers need to be tested before they start working.<br>2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years..<br>3. All workers need to be tested once they leave the programme | | |

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| | | | | | | 8. Long-sleeved shirts | | | | | | | |
| | | | | 7 | Acute toxicity to aquatic organisms  H400 (Very toxic to aquatic life) | | | | | | | | Ensure environmental monitoring is complied with such as ESRA protocols |
| | | | | 8 | Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  H410 (Very toxic to aquatic life with long lasting effects) | | | | | | | | Ensure environmental monitoring is complied with such as ESRA protocols |
| | | Uptake orally resulting in hepatic necrosis and eventual death | DRC 1336/ Starlicide | 2 | Acute Toxicity to mammals and birds GHS06 DANGER  H301 (Toxic if swallowed) H311 (Toxic in contact with skin) GHS07 WARNING | 1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing  |   | EN ISO 20345 EN 166:2001 EN140 EN 149 | 20cc fresh blood sample. AChE tests done with Test-Mate model 400 device | | 1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional | | |

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| | | | | |  H315 (Causes skin irritation) H317 (May cause an allergic skin reaction) H319 (Causes serious eye irritation) H332 (Harmful if inhaled) | Type 5 protective clothing  3.Safety boots 4.Face & Eye protection 5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack 8. Long-sleeved shirts |     | EN 143:2000 R95, R99, R100 | | | test needs to be done every 2 years.. 3. All workers need to be tested once they leave the programme | | |
| | | | | 7 | Acute toxicity to aquatic organisms  H400 (Very toxic to aquatic life) | | | | | | | | Ensure environmental monitoring is complied with such as ESRA protocols |
| | | | | 8 | Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation | | | | | | | | Ensure environmental monitoring is complied with such as ESRA protocols |

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| | | | | | GHS09 WARNING  H410 (Very toxic to aquatic life with long lasting effects) | | | | | | | | |
| 3 | Piscicides | Mitochondrial NADH: ubiquinone reductase inhibitor and toxin | Rotenone | 2 | Acute Toxicity to mammals and birds GHS06 DANGER  H301 (Toxic if swallowed) GHS07 WARNING  H315 (Causes skin irritation) H319 (Causes serious eye irritation) H335 (May cause respiratory irritation) | 1.Chemically resistant nitrile gloves 2.Type 3 and Type 4 protective clothing  Type 5 protective clothing  3.Safety boots 4.Face & Eye protection 5.Half-face respirators 6.Particulate air filters for respirators 7.Apron/ Knapjack |       | EN ISO 20345 EN 166:2001 EN140 EN 149 EN 143:2000 R95, R99, R100 | 20cc fresh blood sample. AChE tests done with Test-Mate model 400 device | | 1.All workers need to be tested before they start working. 2.If the worker sprays 8 hours per day for 5 days per week, an additional test needs to be done every 2 years.. 3. All workers need to be tested once they leave the programme | | |

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| | | | | | | 8. Long-sleeved shirts | | | | | | | |
| | | | | 7 | Acute toxicity to aquatic organisms  H400 (Very toxic to aquatic life) | | | | | | | | Ensure environmental monitoring is complied with such as ESRA protocols |
| | | | | 8 | Persistence in soil/water and soil absorption potential & bio magnification & bioaccumulation GHS09 WARNING  H410 (Very toxic to aquatic life with long lasting effects) | | | | | | | | Ensure environmental monitoring is complied with such as ESRA protocols |